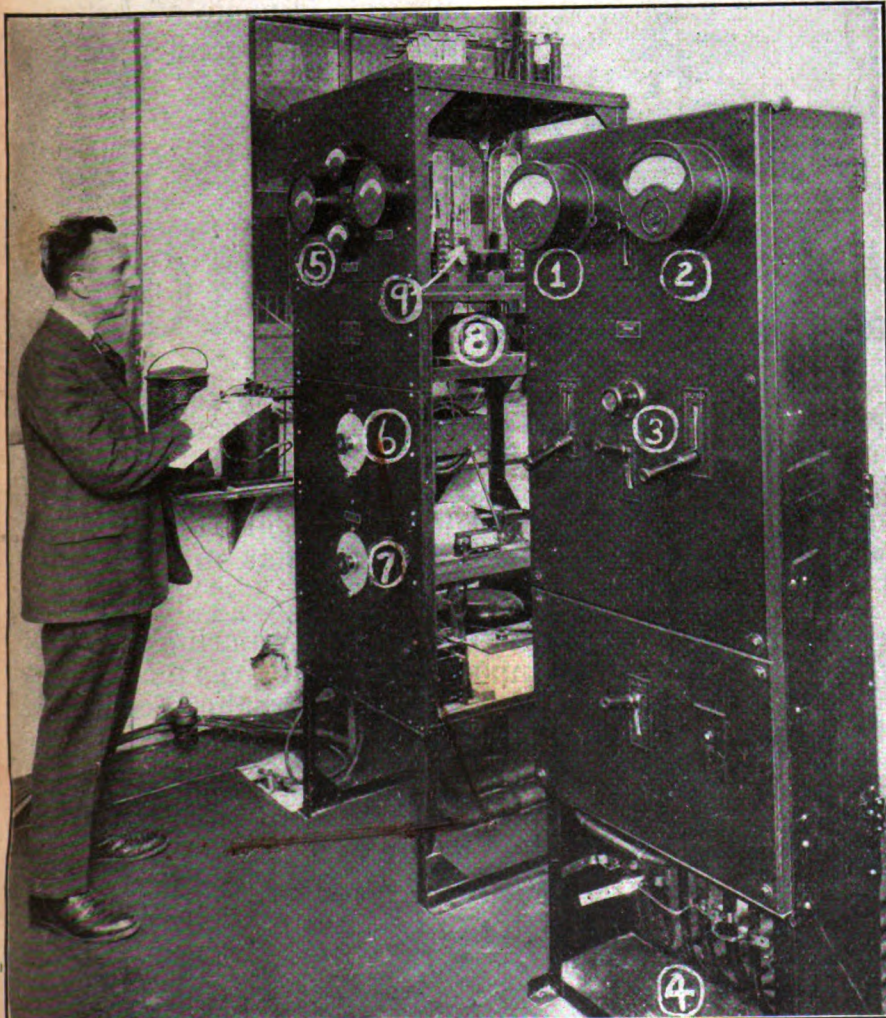


RADIO WORLD

ILLUSTRATED
PUBLISHED EVERY SEVEN DAYS

WBAY, New York, Will Broadcast Personal Messages See Page 16



(Photo by Morris Rosenfeld, New York)

The radio transmitter forming the heart of WBAY, the broadcasting station of the American Telephone and Telegraph Company, is shown in the accompanying photograph. It is located on the upper floor of the company's building, on Walker Street, New York City.

The tubes are mounted in the upper part of the framework of the transmitter (See 9). This location is used because it provides adequate ventilation. The current for heating the filaments is supplied from a constant potential generator. Means must be provided, in the radio operating room, so the radioman in charge can see at once just what power is being used.

1 and 2 indicate the two meters which are the telltales of the direct current flowing. These meters register the amount of current used.

3 indicates the rheostat and the protective devices which cut, in or out, the units of the set.

In order to operate these instruments the necessary electric feed wires must be brought to the panel by conduit pipes. These pipes are indicated by 4. Not only must the electric-power wires be run in a conduit pipe, but the conduit pipe must be grounded, as shown in the photograph. The ground clamp is fastened to the panel by screws. It runs to each pipe where it is grounded. This prevents the high-frequency current that is being generated in the air surrounding the instruments to become affiliated with the low-frequency currents, preventing the generators from being ruined.

The next step is to force the necessary current to the vacuum tubes. Here is the most critical and important stage of the transmitter. This is where the operator must know what the vacuum tubes are doing. The only method employed is the use of meters. These electric meters are somewhat like the meters indicated by 1 and 2.

5 indicates the necessary meters which permit the operator to know how the vacuum tubes are working.

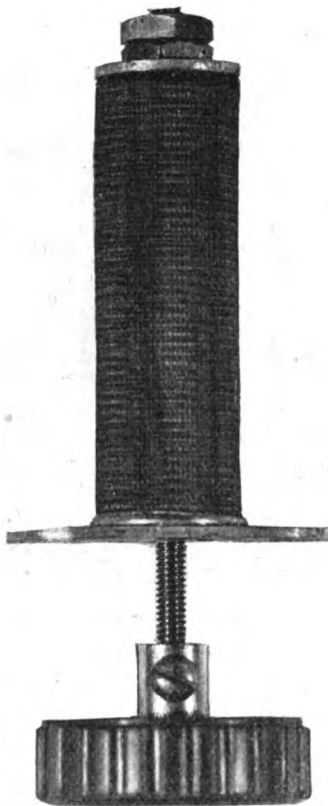
The frequency of the transmitted energy (wave length) is controlled by the value of the inductance in the oscillatory circuit, which includes the antenna. This inductance is adjusted by means of a variometer, indicated by 6. A variable condenser, connected across the plate-coil, controls the plate current through the oscillator tubes. This condenser consists of a variable unit in parallel with two fixed units which may be switched in or out of the circuit. The variable unit is controlled by a knob on front of set 7.

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MICROSTAT COMPANY
WILLIAMSPORT, PA.

RADIO WORLD

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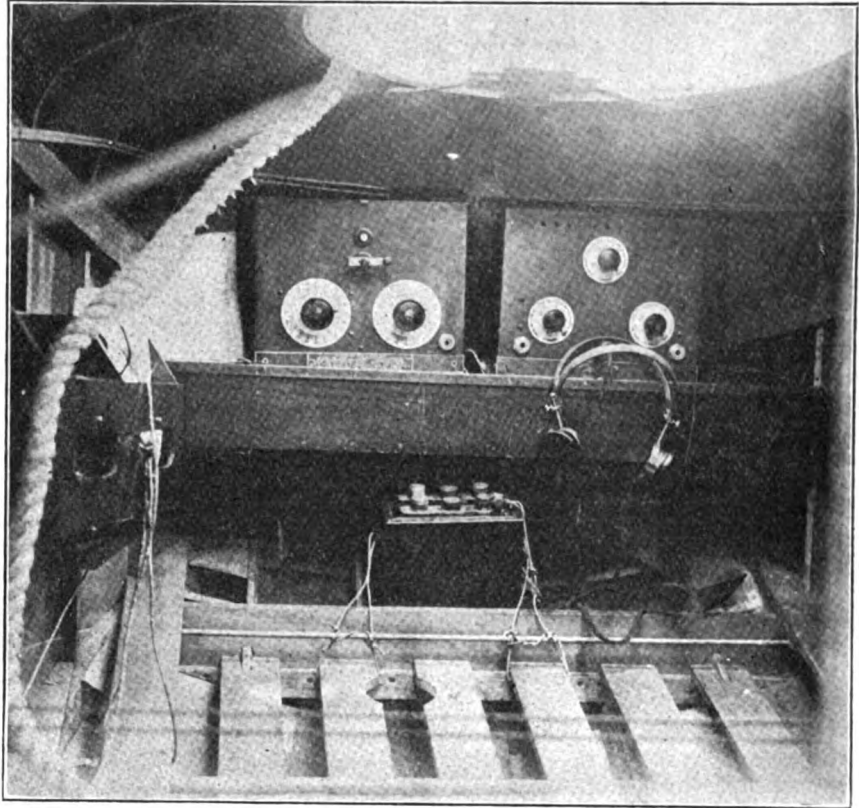
Vol. II, No. 1

September 30, 1922

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In the Heart of a Navy Seaplane

THERE is nothing complicated about radio reception. It proved its merits when the "Sampaio Correia," the Brazilian seaplane left New York City on its flight to Brazil. The accompanying photograph gives a splendid view of the radio installation aboard this "ship," and it shows what can be done in a similar way on any heavier-than-air vessel. The receiving-set consists of a tuner and amplifier unit. A fixed antenna is strung between extremities of wings and tail structures. This makes it possible for the pilot to pick up any messages forwarded which will enable him to make such changes in his course as he desires. Weather reports, storm warnings that are broadcasted hourly are of vital importance to the aviator and it is only by radio that he can get them. Seaplanes are also equipped with radio-compass outfits.



(C. Radio Corporation of America.)

Interior of the pit of an airplane showing how the radio apparatus is placed. The set is composed of a tuner and amplifier connected to a fixed antenna strung between wings and tail.



Here is
WVP,
Bedloe
Island's
Big
Radio
Station

To the right in the photograph you will see the antenna of WVP on Bedloe's Island, N. Y.

THE radiophone service of the future is possible to everyone who is provided with a suitable receiving-set. All that is necessary is some kind of aerial, which, for this purpose, may be a single wire, elevated 30 feet or more above the ground and running more than 100 feet, if possible. This

will enable the operator to have a receiving-set that will permit him to listen to the broadcasts on 360 meters. With a somewhat longer aerial, it may be possible that we shall employ a longer wave-receiver and utilize the longer waves used in radio. For this purpose we could listen to WVP, the Signal Corps station of the United States Army located at Fort Wood, Bedloe's Island, N. Y. There is nothing more fascinating than listening to a radiophone concert and service. One turns the tuning handle of the receiving set and, finally, when the tubes are lit, one is able to hear the broadcasting. It is well to remember that the radiophone is subject to the noise dreaded by all radio-men: atmospheric disturbances, or static—and, often, QRM. This is not so bad when listening on 1450 meters for WVP. The accompanying photograph shows the towers and aerial of the Fort Wood station.

(C. Underwood & Underwood, N. Y.)

Increasing the Wave Length of a Receiving Set

By George W. May, R. E.

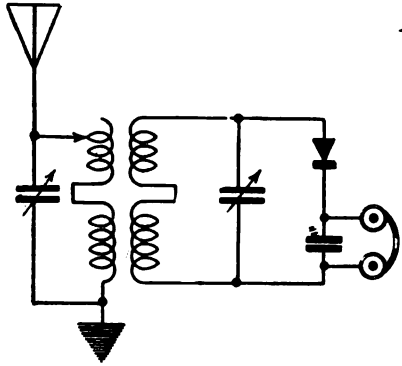


Figure 1—Inductance coil in series with single-circuit receiver, the details of which are fully described in the accompanying article. Drawn by S. Newman

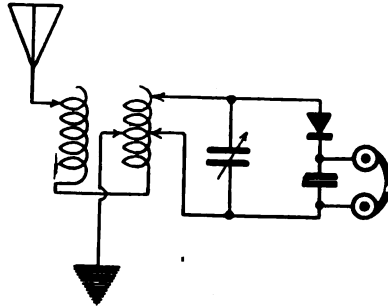


Figure 2—Inductance in series with primary and secondary of an inductive type receiver. Both elements must be loaded to obtain resonance.

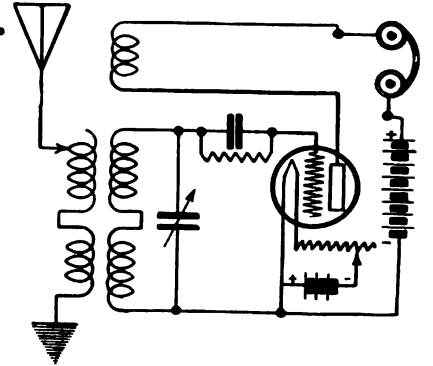


Figure 3—Vacuum tube receiver of the inductive type. Primary and secondary have inductance for increase in wave length as well as the tickler coil for regeneration.

WHAT must I do to my set in order to hear the longer wave-lengths? This question is asked by many fans who wish to listen in on stations with a wave length in excess of 600 meters. Although simple as it seems, the principle of loading up must be properly followed out, provided long wave-reception is desired.

On these long waves—such as 1450 meters, which is above the average wave-length of receivers generally used—some means of increasing inductance must be made. The average receiving-set is capable, ordinarily, of operating only over a comparatively narrow band of wave lengths. This should not be considered a great fault, because sets may be made to operate more efficiently over a narrow band of wave-lengths than over a wide band of wave-lengths. Occasionally one wishes to hear stations operating on the higher wave-lengths—higher than those afforded by the tuning-coil gear on one's

set. In all cases, the range of wave-lengths of the receiving set is increased to higher waves by means of the loading coil, or inductance. This means that more inductance must be added to the inductance already in the set. This instrument may take a number of forms such as tuning coils or honey-comb coils.

It is known that there are two circuits, namely: single- and double-circuit receivers. If vacuum tubes are employed, there also may be regeneration in both cases. In the single-circuit short-wave receiving sets—usually made up of a tuning coil and variable condenser in series with the aerial and the ground—have the crystal detector and telephones in shunt to the coil. Now, if longer waves are desired, simply add another coil in series with the aerial and ground. Remember, this coil is in series with the coil in the set.

There must be a sufficient number

of turns depending upon the maximum inductance of the other coil in the set. Remove the condenser in series and place it in shunt to both coils. The detector remains the same, whether crystal or vacuum tube.

When a two-circuit receiver is used, another coil must be connected in series with the secondary in order to balance the two circuits. If a loose-coupler is in use, a moderate amount of loading may be used in the primary circuit without any in the secondary as secondaries of this type instruments are usually wound with more wire to compensate for the slight loading.

If the circuit in use employs a vacuum tube as a means of regeneration, or in conjunction with a tickler coil, the question of loading up for the longer waves is a little more difficult as in the double-circuit receiving-set we must load up the three coils, namely: primary, secondary, and tickler coil.

Gave Him the "Double Throw"

By Jack Turner

Radio Editor, "The Age-Herald," Birmingham, Ala.

I SAW Ray D. Owe downtown the other night, and with him was Anne Tenna. I had told Ray that I would like to "meter," so he introduced me and I asked her if she wouldn't like to have a "feed, back" around the corner, and she said that it would just "tickler" to death.

When we went in, she took off her hat and I saw that she had her hair done up in "short," "continuous waves," and wore a "switch" or two. She said she just "came in" town. I asked her what "station," and she replied, "The 'Terminal'."

I said to her, "You are the 'cat's whisker'—you have eyes like 'crystal'—I 'solder' like you." When I told her that I was going to kill a mosquito that kept buzzing around my head, she said, "kilowatt?"

Anne ordered so much that I thought she would "choke," and when the

We have not as yet found out even an infinitesimal part of the many things radio will do for mankind.—Prof. J. A. Fleming

waiter brought a cake that was full of "currents," I broke my "plate."

There were many people there "antenna" them were dancing. I asked Anne for a dance and she didn't offer any "resistance;" but we didn't have much "selectivity" as I could only do the "one step." She told me that I danced like an "amateur." Once I hit the "ground" when I did a "loop." But she couldn't dance much "ether." After dancing with me once, she would re"fuse" if I asked her for an encore.

While I was talking to her, she told me that I was a "loud speaker" and that I "broadcast" everything I said. When the waiter "brought in" the check, I told him to "charge" it.

I asked her, "'Wire' you in such a hurry?" She answered: "I must go 'ohm' because I don't want to get 'insulate.'"

The Importance of the Variometer to a Receiving Set

By Donald Van Wyck

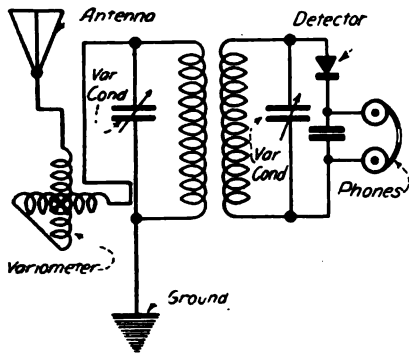


Figure 1. The use of the variometer as a variable inductance in the inductive-coupled receiving-set. Drawn by S. Newman.

A SIMPLE means of tuning-in a radio set is afforded by the variometer. This piece of apparatus, widely known, is one of the instruments that tend to make up a certain type of regenerative set. In its simplest form it is quite easy to make and parts for its construction may be easily purchased and assembled.

A variometer is particularly adapted for the construction of radiotelephone receiving sets. They effectively cover a wave-length range from 150 meters to about 600 meters. A variometer is built up of two spherical coils. One which revolves, is termed the rotor; the other, which remains stationary, the stator. The rotor, or secondary coil, turns about its axis inside the stationary coil, or stator, which acts as the primary. The variometer, as its name signifies, is a variable type of inductance, but it is different from tapped coils, or coils with sliders, in this respect: there is no variation in the length of wire. In the inductance of a variometer, the variation is accomplished by the rotor revolving inside the stator, or primary. This proves that the elimination of multiple point, or tapped switches, permits variation without any break in the circuit whatsoever. With this important feature, the variometer is adapted for the vacuum-tube work, since switches or taps are likely to leave a break in the circuit when the set is being tuned.

A variometer with a rotor shaped like a ball, is known as the ball type; another type consists of two cylindrical tubes, one rotating within the other. This type variometer does not have a minimum or as high a maximum inductance as the ball type. The best variometers have a minimum clearance between the rotor and the stator, and both coils have the same inductance. It may be then said that a variometer is a tuning coil in which the primary coil is fixed and the secondary coil

movable and revolving at right angles to the primary. One end of the primary is connected to one end of the secondary. It has no sliding contacts or other means of varying the inductance of the primary and secondary coils, but tuning is accomplished solely by varying the coupling between them. This is what happens in the variometer when the tuning adjustments are made by turning the variometer dial.

When a current flows through the coil—in this case the stator—a mag-

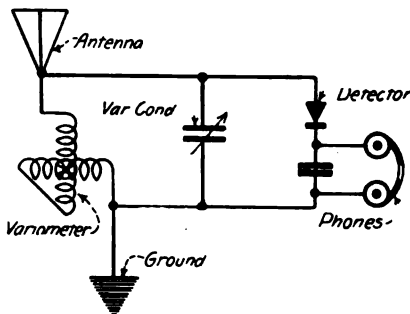


Figure 2. The use of the variometer as a direct-coupled tuning transformer, well adapted for short-wave reception. Drawn by S. Newman.

netic field is set up about the field surrounding the wires. When the current in the coil is varied, there will be a corresponding variation in the magnetic field. If another coil, the rotor, is placed in proximity, the changing magnetic field will induce, or set up, a voltage in the secondary coil. Connected to the second coil—or, as it is known the secondary—is a detecting

Argentine Fans to Build American Sets

ARGENTINE radio fans soon will be building receiving sets along the lines of the specifications issued by the United States Bureau of Standards. Believing in the development of radio, especially in the efforts of the United States Bureau of Standards to simplify and standardize home-made or assembled sets, the Argentine Embassy has just completed the translation of the Bureau of Standards illustrated reports on building simple and two-circuit radio receiving sets at home. These pamphlets, which were popular in this country, are expected to be equally as popular in the Argentine now that it is in Spanish.

Radio Catches Everything

IN a radio broadcasting studio the absence of a visible audience often makes a singer forget that several thousand people may be listening to him. Such was the case with a soloist at one of the local stations recently. At the end of a fine tenor solo, listeners heard the singer say, "How do you shut this — thing off, anyhow?"

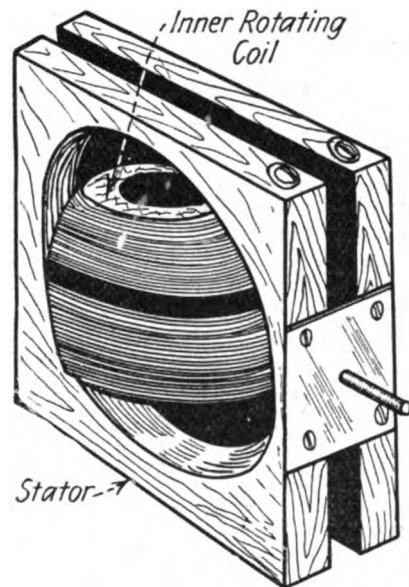


Figure 3. View of variometer giving a larger range of inductance variation than some of the other types of variometer. This is known as the ball type. Drawn by S. Newman.

device such as a telephone receiver, which records the change of current. The induction of current from the primary to the secondary is termed mutual induction.

In two of the circuits illustrated, the use of the variometer in Figure 1 is shown as a variable antenna-inductance; while in Figure 2, the use of the variometer as a direct-coupled tuning transformer is shown. This circuit is particularly suited for the shorter wave-lengths, such as 200 to 500 meters. A large range of wave-length variation cannot be obtained from a variometer when used as the sole tuning-element unless it is made very large and wound with a large number of turns of wire. The circuit shown in Figure 2 has been used for long waves using a large variometer and a vacuum-tube detector. The manipulation of the variometer is very simple.

Figure 3 shows a variometer used in a regenerative vacuum-tube set. One variometer is placed in the grid and the other in the plate circuit. Any circuit that gives regeneration is called a feed-back circuit, from the fact that oscillating energy is fed back from the plate circuit to the grid circuits. There are several feed-back circuits. The two most commonly used in radio receivers are the "tickler circuit" and the tuned plate, regeneration being accomplished by employing the variometers.

In this case, the inherent capacitance between the grid and plate is relied on for coupling. The choice among different forms of feed-back circuit lies in convenience, design, and use.

Successful Stunts of an Amateur Radioist

By C. F. Rye

Adjusting Diaphragms on Receivers

HAVING different makes of receivers on hand, including some cheap ones, I tried to make some of the low-priced low-ohm receivers more sensitive. I was successful with all.

Looking them over, I noticed that they varied in length from the magnet to the diaphragm, and as the more expensive ones were of standard length and much closer, I tried to duplicate them by cutting down the outside edge of the rubber on which the diaphragm rests, thus permitting the diaphragm to come closer to the magnet. By so doing, I expected increased action due to a stronger magnetic field.

The cutting of the rubber was easily accomplished by laying fine sandpaper on a smooth table, and gently rubbing the body of the receiver over the paper.

If you happen to take off too much, you can place paper washers under the diaphragm to raise it from the magnet.

You had better use a straight-edge rule to see how far the magnet is from the diaphragm as it may be too close and be the direct cause of a tinny sound.

You may wonder why the receivers on a head set do not sound alike—one

will be louder than the other. Try them with a straight-edge rule and see if the diaphragm of one is not in a stronger magnetic field than the other.

If so, try to bring the weaker up to the stronger, either by shimming with paper, or removing the bearing portion of the body where the diaphragm rests on it.

I have made a big improvement in my receivers of cheaper make by the method I have here explained. Many of the receivers have metal bodies instead of rubber. The only difference is that the metal takes more rubbing, but the result is the same.

* * *

Using Mercury on Galena

AFTER looking over my crystal set to see if I could improve on any of the connections in order to help the weak current on its way, I remembered that in only a few places was the crystal sensitive.

The thought naturally came to me: How about the places where the crystal rests in the metal cup? Are they sensitive?

Well, to eliminate doubt, so far as possible, I used some cold solder and a drop of quicksilver, or mercury, as a bed in the cup in which to lay my crystal.

The mercury dissolved the solder

and made a thick mixture which gradually hardened and made a metal contact all the way through, improving the strength of signals.

I used mercury in a similar way on a piece that was mounted when I bought it, and this piece also was greatly improved.

My purpose in doing this was to overcome the evil which often occurs in mounting galena—overheated metal in which the galena is placed. Such overheating causes a thin coat, or film, to gather on the outside of the galena.

Later, I cleaned other parts in my hook-up where it was impractical to solder, and gave it a coating of quicksilver, or mercury. I can assure you this operation did no harm.

* * *

Disconnecting a Soldered Joint Cold

IN my desire to secure the very best results from my set and eliminate all noises, I had to solder my joints. This worked well until I wanted to change my connections, as illustrated in a magazine. Then I had to think, as some of the joints were in places where I could not heat them without damaging my set.

After trying to disconnect the joints I used mercury, or quicksilver; and all that was needed was to clean a place on the solder and apply a little mercury to the cleaned spot.

In a little while, the joint was free and ready for a good connection to any other place, as it had a mercury coat on it that helped to make a good connection—just as a wet hand makes an electric connection.

In this case, no solder whatsoever was needed; yet all the good qualities of a soldered joint was accomplished with excellent results.

* * *

Two Aerials Instead of a Ground

MANY amateurs have a poor chance to make a good ground. My best results have been secured without any ground—with less trouble even than digging a hole to bury copper wire.

My plan is this: I set up another aerial and ran my ground connection up to it. My signals—on a crystal set—were loud enough to be heard a hundred feet away with the aid of a horn.

I have a good ground to the water-main, but I prefer my second aerial.

My two-aerial plan may be accomplished by using one of the wires of a double-wire aerial.

Seen at London's First Radio Show

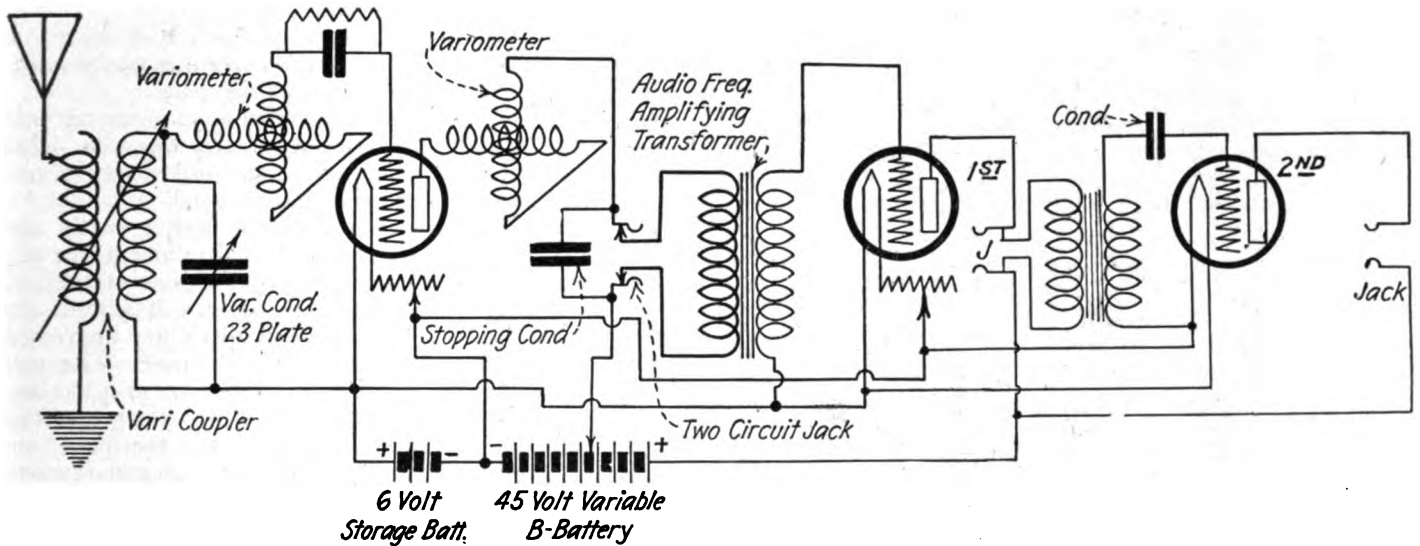


(C. Central News Photo Service)

Radio on motor cars adds to their luxury! This was shown at the First Radio Exhibit held in London. In the ancient, venerable halls of Westminster, modernity held sway. A motor box was fitted up with a receiving set, as seen in the photograph. All you see is the receiving apparatus safely ensconced below the back seat and a bright parasol resting casually in front. The parasol, on further investigation, is a loop aerial, by the aid of which one may ride out to the country and enjoy life. Of course, tea was served at this British radio show, for tea is a necessary element of every British function. This show was the first held in the British metropolis and was largely attended.

Employing Jacks with a Two-Stage Amplifying Receiver

By Fred. Chas. Ehlert



Schematic diagram of a regenerative set, employing variometers as means of regeneration. Jacks are utilized in the stages, which enable the radio listener to use as many stages as he desires. The grid condenser shown in the circuit of the second stage may be left in or out. This is to be considered by experimentation. Suggested by Fred. Chas. Ehlert. Drawn by S. Newman.

TO many experimenters, a two-stage amplifying receiver represents a more difficult problem than it really is. However, it raises important points which cannot be overlooked. The accompanying circuit is a most efficient outfit employing jacks. It is a circuit no amateur should overlook. Each and every part is shown. It may be assembled in an efficient way. It will not tax the financial resources of the average radioman. If experimenters have the material handy, I would suggest that this hook-up be put to the test. One thing that must not be overlooked, however, is the wiring. If leads are run back and forth over the set,

there is sure to be trouble from "howling" because of the feed-back effects between the grid and plate circuits of the various tubes. In some equipped sets elaborate precautions have been taken, with grounded shields between the steps.

Practically all amplifying sets are equipped with jacks. Therefore, I have included these jacks in this circuit. The detector jack is of the double-circuit construction. The first stage is, also, that of a double-circuit jack; in the last stage, an open single-jack is employed. Where it is necessary to run wires close together, slip some spaghetti tubing over them.

When mounting the transformers

I suggest that this be done at right angles to each other. If all my suggestions are carefully followed, no tube noises—such as howling—should be experienced. The detector plate-circuit should have, approximately from 18 volts to 22 volts, while the amplifying plate-circuits should range about 45 volts plate-current. A 6-volt storage battery will be sufficient to light the three tubes, but it is suggested that the amateur get a large ampere-hour battery from 80 to 100 ampere-hour capacity. This will permit batteries to furnish necessary power to the tubes, for a long time, without the troublesome necessity of placing them on charge.

This Discovery May Eliminate the "Catwhisker"

By E. Farig, Ph.D.

BY means of high pressure, and at a temperature of 1600 degrees Fahrenheit, or 1593 degrees centigrade for four hours, metals of a low-melting point (850 degrees Fahrenheit) lose all their original characteristics. They become infusible, cascatic, in form of crystals—hard, brittle, sparkling all over, and have radio-crystal rectifying properties. Pieces tested on a 300-meter wavelength, recorded speech and music perfectly—no screeching—and eliminated the tiresome catwhisker hunt for a

sensitive spot. Tests will be made with alloys to insure a uniform though sensitive rectification.

This same discovery was tested, taking the place of lead batteries, elements in storage and under these tests gave very promising results. This crude substance "metaloid," is a new product not yet known to science. The treatment for rectifying is simple and the mounting of these crystals offers no difficulties.

The best rectification quality I have found, is a passage of current of from .02 to .04 M-A; whereas 5 M-A is of no use. I think this discovery is of sufficient importance to let the industry know what is being done by research engineers.

Radio Conductors and Insulators

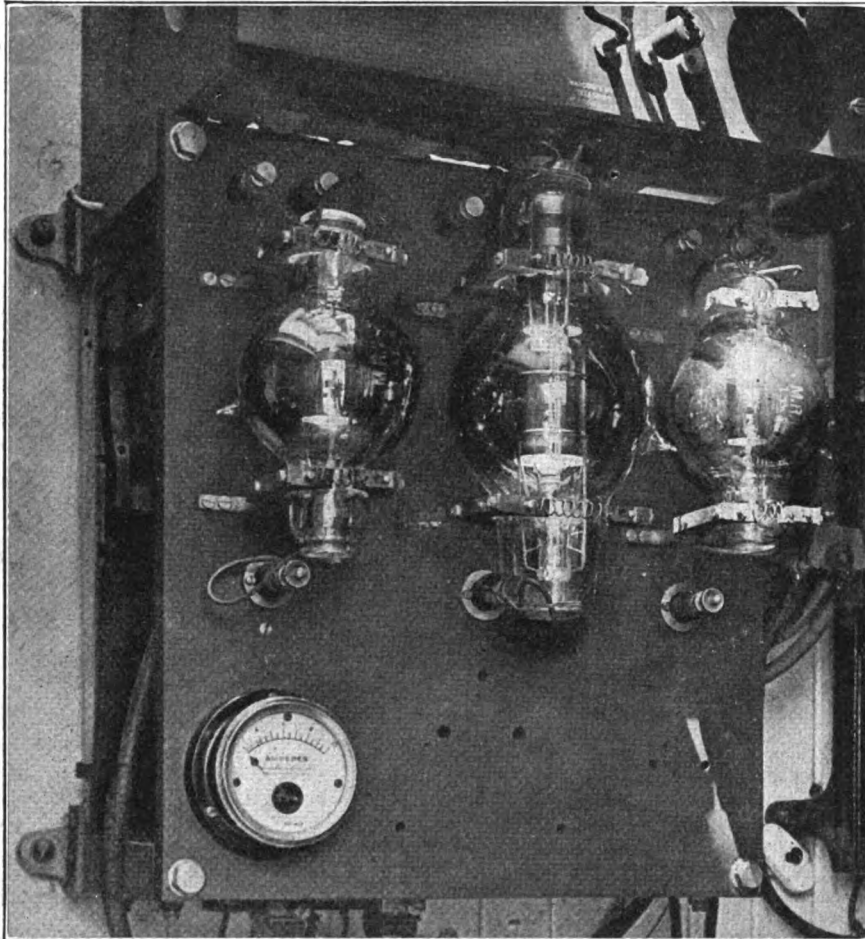
CONDUCTORS	INSULATORS	NON-CONDUCTORS
All Metals	Dry Air	Ebonite
Well-burned Charcoal	Shellac	Oils
Water	Mica	Porcelain
Moist Earth	Glass	Dry paper
Metallic Ores	Wax	Parchment
Animal Fluids	Jet	Silk
Plumbago	Resin	Gutta-percha
Acid Solutions	Sulphur	India-rubber
Living Vegetable Solutions	Amber	Dry leather
Saline Solutions	Paraffin	Bakelite

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Why it is Possible to Operate with a Vacuum Tube

By John Kent



(C. Ewing Galloway, N. Y.)

Type of Vacuum Tubes as generators for the delivery of electromagnetic waves for radio transmission.

RADIO frequencies lower than 20,000 are seldom used. If they were impressed on telephone receivers, the note—even if the receivers would respond—would be inaudible since the ear will not record frequencies much above 15,000 cycles. The problem is to reduce the frequency used in radio so it will not be inaudible in telephone receivers. This is accomplished by the detector, an instrument which groups a number of cycles of high-frequency current and delivers them as one cycle of low-frequency audible in the telephone receiver. Detectors are made in many shapes and forms. One of the best detectors ever invented is the vacuum tube. This instrument was perfected about 1910. Since that time, its use has been increasing daily.

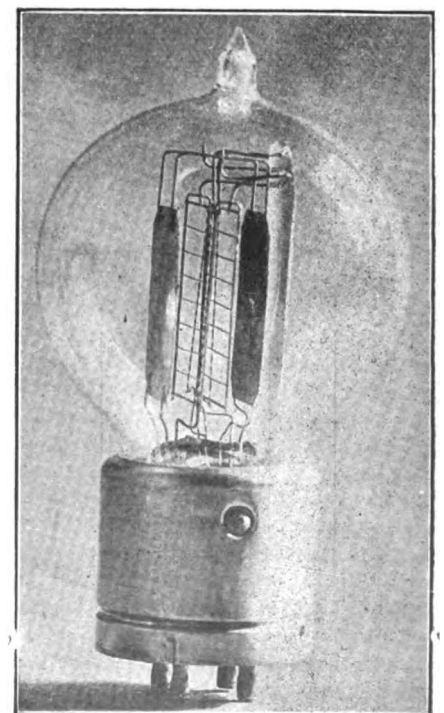
The vacuum tube consists of a evacuated vessel somewhat similar in size and construction to a small incandescent-lamp. Instead of two connections—made in the case of the electric lamp—

the vacuum tube, or, more properly, the electron tube, has four connections. Two serve the same purpose as those of the incandescent lamp; namely, to light the filament. The other two connections lead to two new elements known as the grid and the plate. There are, therefore, three elements in the vacuum tube—filament, grid, and plate. These elements are arranged with the filament in the center; the grid on the outside of the filament and the plate outside the grid.

The filament consists of a tungsten wire; the grid of a small coil, or mesh of wires; and the plate of a thin sheet of metal. The tube operates as follows: A 6-volt battery is connected to the filament which, when lighted, shoots off small particles of electricity in every direction. A battery of 22 volts is connected with the positive side to the plate and the negative side to the filament. When the battery is connected, the small particles of electricity which are shot off from the filament,

and which are negative in character, are attracted to the positive plate. Therefore, a current flows between the filament and the plate.

If a third battery, or an alternating current such as that due to a signal, is connected to the grid—and the voltage of the grid is changed—it will be found that the current flowing in the circuit formed by the plate and filament, will vary in exactly the same manner. The variation, however, will be much greater than the small voltage impressed on the grid would warrant. The current will increase when the grid is positive, and decrease when the grid is negative. The fact that the plate current is so much greater than the grid voltage would warrant, shows that the vacuum tube is acting as an amplifier. This is a valuable property, one which makes the vacuum tube successful in its application to radio. The same property, by a slight alteration of the circuit, may be used to make a vacuum tube and an efficient detector. The use of the amplifying property is familiar in the construction of numerous two-stage amplifiers now on the market. Amplifications of many hundreds and, frequently, thousands of times are possible. The plate current is sufficient to operate a pair of telephones, or ear pieces.



(Photo by Paul Thompson)

The 5-watt Transmitting Tube now used by the United States Navy.

Radio Big Help to Airship C-2 on Western Trip

By Carl H. Butman

WASHINGTON, D. C.—Radio aided the United States Army airship C-2, on the westward leg of her transcontinental trip. During the sixty-hour cruise, hundreds of miles of which were traversed in darkness, radio was always available to lend a guiding hand when any doubt as to the position of the airship existed on what was the first transcontinental airship cruise.

All Army airships and airplanes are equipped with the latest radio apparatus. In many instances, radio has informed the pilots as to location, course, or weather. In the event of an accident or trouble, it has been the means of bringing aid.

The first thousand miles of the western trip was made in approximately twenty hours, flying time, Major Strauss, the commander, reported from Belleville, Illinois. All along her westward route from Norfolk over Akron, Belleville, Fort Sill, San Antonio, El Paso, Yuma, to Arcadia, California, Captain G. A. McEntire, the radio officer, kept in touch with Army, weather bureau, and private radio stations which advised him regarding the meteorological conditions to the westward. Radio will again guide C-2 on her return trip to Langley Field, Virginia, this week.

The radio equipment of the C-2 consists of a modified SCR-67-A radio telephone and telegraph vacuum-tube set, with a sending radius of about ten miles for the phone circuit and forty miles for the telegraph. The transmitting wave used was 480 metres, but messages on nearly all wave lengths were receivable. In the present installation batteries are used in sending, but the radio experts of the Army Air Service have been experimenting on a generator geared to one of the driving engines, which will give these radio sets more power. The antenna is a single wire trailed below the airship and is about 100 feet in length.

The C-2 will remain at Ross Field for several days in order to afford her crew a needed rest and give the people on the Pacific Coast an opportunity to witness several exhibition flights. After some slight overhauling she will return to Langley Field over the same route, Major General Patrick, chief of the Army Air Service, stated a few days ago. This transcontinental flight was intended merely to point the way for flights across this route for larger airships. The southern route was

chosen because hangar facilities and landing crews were available at the several stations en route.

Arrangements were made whereby most of the flight of the C-2 across the United States was done at night. Airships are in their element in night flying, as atmospheric conditions are much calmer than during the day, less hydrogen gas is lost through expansion and better static equilibrium is main-

tained. Night flying in airships is a reasonably safe proposition, for even should motor trouble develop, repairs can be made while the ship is drifting in the air, no forced landing being necessary.

It was during the night trips that the radio equipment proved most valuable as well as a means of entertaining the crew, who frequently listened in to radio concerts while en route.

M. R. Brennan, Superintendent of the N. Y. Police Telegraph Bureau at WLAW Station



(C. International News Reel Photo.)

The interior of the radio broadcasting-station of the New York Police Department has been assigned the call letters, WLAW. M. R. Brennan, Superintendent of the Police Telegraph Bureau, is photographed at the transmitting apparatus. Tubes are used as means of power transmission. The filament current-control of each vacuum tube requires about 6.25 amperes. Current for lighting the filaments is supplied from a constant-current generator. The modulation system used with this equipment, in connection with the Western Electric tubes, insures the highest efficiency in clearly reproducing speech and music. It has complete and perfect modulation. In this photograph the transmitting gear is at the right. It is better known as the panel-control board. On this board all adjustments of power are made. The horn is a Western Electric power amplifier-unit, used as a loud-speaker in connection with the receiving set. To the left of the horn is the receiving set. The little round object lying on the table is the transmitter. Through this the broadcasting is started. This transmitter, in turn, sends the spoken words to the main transmitter, where the vacuum tubes perform the necessary work. To obtain the best results, the magnitude of the feeble currents produced by the microphone must be increased many times before they are impressed on the radio transmitter. For this purpose, an input amplifier provides the necessary amplification. This consists of a three-stage amplifier so mounted that all the controls of the amplifier are accessible. Current to operate the microphone is supplied by an 18-volt storage battery and is regulated by a rheostat on the input-amplifier panel.

The Passing of Poldhu—MBD

Famous Cornwall Station where Marconi First Used Transatlantic Radio Had a Romantic History

By *Arthur G. Shirt*

AS science progresses, instrument after instrument go their silent way to the junk-heap, forgotten by all except a few, whose duty it is to classify and preserve the remembrance of radio gear that has come and gone. There is little or no sentiment attached to this process. Like obsolete theories, the wireless antiques are of no interest. On the other hand, when a unit of a great system of communication passes into the discard, such as the famous MBD, at Poldhu, Cornwall, Wales, it is only too proper that due respect should be paid to its memory. Poldhu, now abandoned in favor of the station at Clifden, Ireland, has played its part in the building up of the immense world-circling Marconi system of radio communication. It has stood the test, and from

the night of December 12, 1901, when the first weak signals were pushed across the Atlantic to the day, in September, 1922, when the station was closed to traffic, Poldhu has maintained its end of the system.

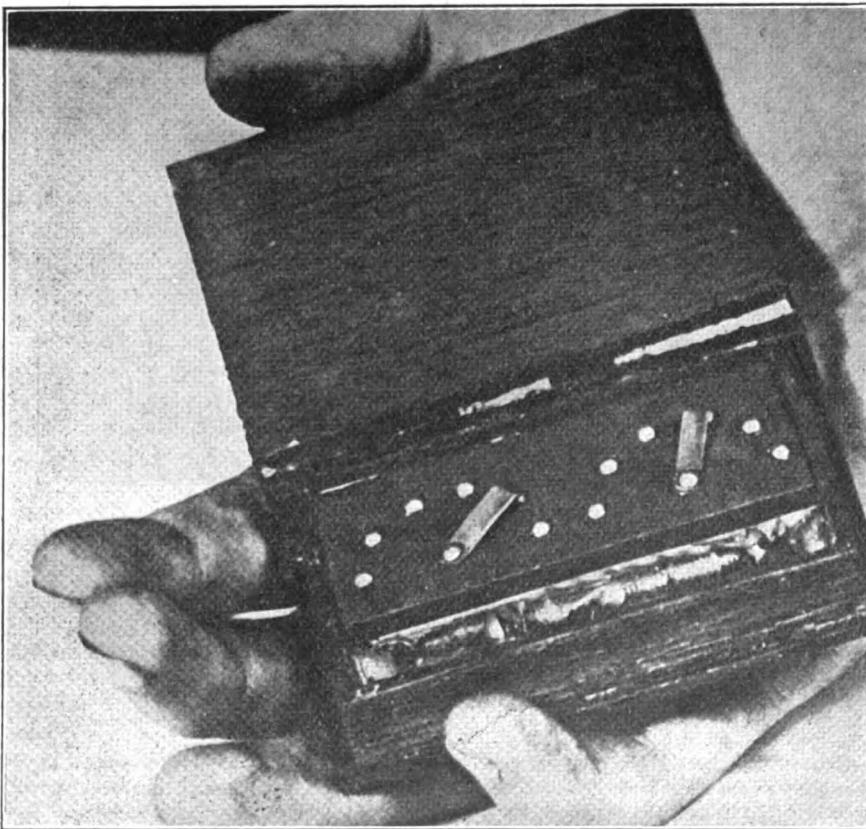
The story of the first transatlantic signals weaves itself around the Poldhu station. Marconi was in England at the time, conducting experiments before the officials of the postoffice department, and demonstrating, with the rapidly increasing range of his crude instruments, that the limit of radio signalling was practically unlimited. But men who called themselves practical—men opposed to Marconi, who was supposed to be visionary,—said that the curvature of the earth would prevent transmission to any great distance. They were

judging the capabilities of this new force which follows the contour of the earth by the conduct of other systems of signalling, such as the heliograph and other sight devices. Marconi, not as well acquainted with wireless phenomena then as he is to-day, thought differently; but up to that time, the distances covered proved neither one thing nor the other. Naturally he was particularly anxious to establish transatlantic records, so that for once and all this question of limiting the scope of radio waves should be settled. For him, it meant a matter of gaining the backing of those who withheld their valued support unless this particular controversy was cleared up.

So eager was Marconi to prove that curvature of the earth would not interfere with the progress of electromagnetic waves, that he started on the station at Poldhu at a time when his instruments had accomplished the record of only thirty-six miles! What greater tribute could there be to Marconi's faith in the possibility of his invention? At the same time, a similar high-powered station was commenced on Cape Cod, which was to be the American side of the great test. Marconi knew that to produce electro-magnetic waves of a force sufficient to bridge the Atlantic, he must have instruments far in advance of what he then possessed. He couldn't have instruments that differed to any great extent, for what he had already evolved represented the peak of radio progress; but he could and he would have them larger and more powerful in every respect. So the layout of the station at Poldhu, as it was when the signals were hurled across the Atlantic, were no different in theory than the amateur spark-coil outfit of to-day, with a transformer, condenser, and inductance coil. But there was a generating plant consisting of an alternator capable of an output of about twenty kilowatts, which through suitable transformers, charged a condenser having a glass dielectric of great strength.

The aerial at Poldhu consisted of fifty almost vertical wires, arranged in the vertical fan style, and supported at the upper end by a wire

Radio Set Just Fits Man's Hand



(G. Underwood & Underwood, N. Y.)

So many amateurs have been making miniature radio-sets that we are showing in the accompanying illustration an unusually small one. It fits into the palm of the hand. There is no question that it works but no records are claimed for receiving long distance with it. Remember it's only a miniature set, but it works.

An Amateur, to Get a License, Must Read Ten Words a Minute

(Republished by General Request)

INTERNATIONAL MORSE CODE AND CONVENTIONAL SIGNALS

- 1. A dash is equal to three dots.
- 2. The space between parts of the same letter is equal to one dot.
- 3. The space between two letters is equal to three dots.
- 4. The space between two words is equal to five dots.

(Continued from preceding page) stretched between two masts. The masts were 150 feet high, and 200 feet apart. As first erected, they were not strong enough to withstand the gales of a Cornwall winter, and on September 18, 1901, were blown down during a raging storm. Work was again started immediately, in an endeavor to have the Poldhu station and the Cape Cod station ready at about the same time. But a further delay came in the form of a storm on the American coast, which wrecked the masts at Cape Cod. This was in November of the same fatal year, and Marconi's discouragement was extreme. But with a determination that characterized his actions from the very start, he completed the reconstruction work at Poldhu, and then journeyed across the Atlantic with a few assistants and a makeshift receiving set, which he installed in a rough building on the cold shore of St. John's, Newfoundland. He could build no masts, and so sent his aerial aloft by the means of kites, which made the stupendous task he was then engaged in doubly hard. The variation of the wind produced constant changes in the angle and the altitude of the aerial, so that capacity and period of electrical resonance was never the same, making it almost impossible for Marconi, tuning with the temporary instruments below, to remain on any one wave length for any period of time.

On the night of December 11, all was ready. The operators at Poldhu had been instructed to begin sending the test signal—which was the three dots of the letter S—on and after December 11, keeping a steady transmission of that letter for ten minutes and then resting five minutes. When Marconi first listened in at the appointed time, he knew that so far as it was possible to depend on human co-operation, that Poldhu was working and periodically directing her signals towards the anxious inventor in Newfoundland. Across the ocean! Could it be done? Some of the greatest scientists in the world had said that the feat was impossible! But as in the case of the amateur trials, just twenty years later, the momentary failure was no indication of what was to follow. Marconi listened all the night of the 11th, and heard nothing. The day of the 12th was spent in correcting the receiving instruments so that they responded to Marconi's ideas as to what should obviate last night's difficulties, and in the evening of the 12th, to the overjoyment of Marconi, the monotone signals from Poldhu station were

A	• —
B	• • • •
C	• — • •
D	• • •
E	•
F	• • — •
G	• — • •
H	• • • •
I	• •
J	• — — —
K	• — •
L	• — • •
M	— —
N	• •
O	— — —
P	• — • •
Q	• — • —
R	• — • •
S	• • •
T	— —
U	• • —
V	• • • •
W	• — — —
X	• — • •
Y	• — — —
Z	• — • •
Ä (German)	• • • •
Á or Å (Spanish-Scandinavian)	• — • • •
CH (German-Spanish)	— — — —
É (French)	• • • • •
Ñ (Spanish)	• — • • •
Ö (German)	• — • •
Û (German)	• • — —
1	• — — — —
2	• • — — —
3	• • • — —
4	• • • • —
5	• • • • •
6	• — • • •
7	• — — • •
8	• — — — •
9	• — — — •
0	• — — — —

Period	• • • •
Semicolon	• — • — • —
Comma	• — • — • —
Colon	• — — — • —
Interrogation	• • — — • •
Exclamation point	• — — • — —
Apostrophe	• — — — • —
Hyphen	• — • • • —
Bar indicating fraction	• — • • —
Parenthesis	• — • — — • —
Inverted commas	• — • • • —
Underline	• • — — — • —
Double dash	• — • • • —
Distress Call	• • • — — — • • •
Attention call to precede every transmission	• — • • • —
General inquiry call	• — • • • — — — • —
From (de)	• — • • •
Invitation to transmit (go ahead)	• — • —
Warning—high power	• — — • • — —
Question (please repeat after .....)—interrupting long messages	• • — — — • •
Wait	• • • • •
Break (Bk.) (double dash)	• — • • • —
Understand	• • • • •
Error	• • • • • • •
Received (O. K.)	• — • •
Position report (to precede all position messages)	• — • — • —
End of each message (cross)	• — • — • —
Transmission finished (end of work) (conclusion of correspondence)	• • • • • —

heard in Newfoundland. They were faint, of course—dot, dot, dot # #, dot, dot, dot # with a few omissions when the wind got to playing havoc with the fixed capacities of the aerial system. But they were signals! The impossible had been achieved! The Atlantic had been bridged! That accomplished, Marconi could bid for all the support in the world, confident that the radio waves he employed were capable

of something revolutionary in the way of communication. Such is the story of Poldhu—of its building and of its mission. From that day, when its fan aerial was the object of much wonder and speculation, to this, when its arrangements are antedated and its presence in the chain of Marconi stations no longer needed, it has made wireless history. Now it passes forever from our view.

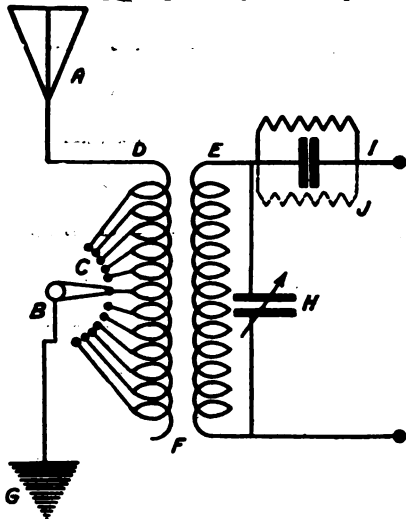
The Radio Primer

A Weekly A. B. C. of Radio for the Beginner, in which Elementary Facts and Principles Are Fully and Tersely Explained and all Words and Terms Used by Amateurs and Experts Defined

By Lynn Brooks

WHAT is a circuit? What are the different parts and what do they represent? Are all circuits illustrated alike?

The accompanying circuit is a good example. It shows the tuner up to but not including the detector circuit. It is a desirable circuit for tube detectors. It is a circuit which may be found in any form of publication. A is the aerial; B the primary switch-handle. C is the tapped primary of the primary



Schematic diagram showing the tapped primary and the secondary of any loose-coupler or vario-coupler. Whenever this diagram is shown it represents the parts explained herewith.

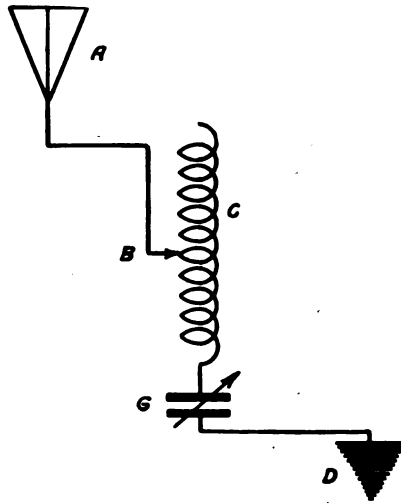
coil marked D. E is the secondary coil. F shows how the coupling of the magnetic waves are induced into the secondary. G is the ground connection. H is the variable condenser in shunt to the secondary of the tuner. I is the grid condenser. J is the grid leak. Usually the grid condenser and leak come together. The grid leak is drawn in either position as shown in the diagram by letter J.

* * *

How can the primary winding of a loose coupler, or vario-coupler, be determined when using a variable condenser? When drawn in a circuit does it always appear this way?

A schematic diagram is herewith published with the variable condenser in series with the primary of the vario-coupler, or loose coupler. This is often termed a tuned circuit. The inductance of the coil is varied by cutting in or out of the circuit a number of turns of wire at a time. The variable condenser consists of two sets of plates—one being stationary and the

other movable. By rotating the plates, we vary the electrical capacity of the condenser. This tuned circuit will re-



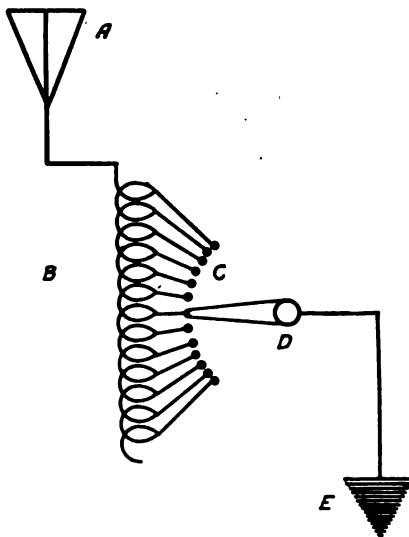
This diagram shows the variable contact on the primary which makes it possible to increase or decrease inductance in the primary circuit. A variable condenser is also inserted in series with this primary inductance.

spond to a number of wave lengths at the same time; or, in other words, it will tune broadly.

* * *

Is there any other method used that will answer the purpose of the slider principle?

This has been overcome by making taps on the winding. Wires are soldered on these taps and then brought out to the front of the panel on switch points and a switch handle. The ac-



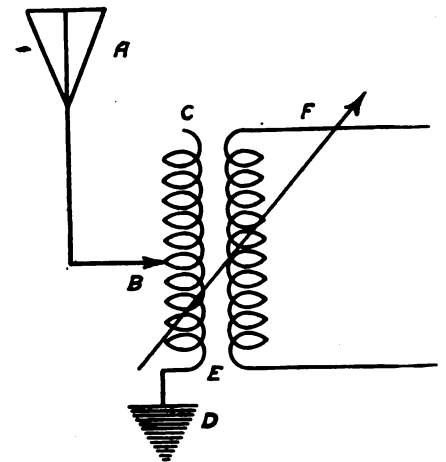
A tapped primary is illustrated in this manner. It may be seen that if the switch handle is moved, inductance of that coil will be increased or decreased according to the way it is moved.

companying sketch shows how the taps are brought from the primary winding to the handle.

* * *

In using a vario-coupler, or loose coupler, with a variable condenser in shunt to the primary, how should this appear in a diagram? Does it look the same in every illustration?

When using a vario-coupler, or loose coupler, where two windings are employed—such as primary and secondary—the accompanying sketch will show how it is always illustrated. Here the secondary is in shunt to the primary winding, while the arrow shows that the coupler is variable to the principle



When this diagram appears it means that the variable condenser is placed in shunt to the primary of the loose coupler or variocoupler. The arrow drawn through the primary and secondary means that the coils are variable.

of coupling. The secondary coil is usually arranged so that the magnetic field may occupy the same space as the field of the primary coil, or may be varied in position so that it occupies only a part, or none, of the same space. This is called the varying of the coupling between the coils. A is the aerial. B is the primary-coil tap. C is the primary coil. F is the secondary coil. H is the primary condenser in shunt. E is the coupling. D, ground.

In summing up in regard to the diagrams published on this page, symbols are drawn the same in all circuits no matter where such circuits are printed. I would advise every radio amateur or experimenter unfamiliar with such diagrams, or symbols, to study them carefully so that he may readily and easily understand any hook-ups that may appear in radio literature.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

RADIO will be one of the most efficient means of capturing fugitive criminals, says Richard E. Enright, police commissioner of New York City. Mr. Enright made this important statement in an address before the conference of American and Foreign Police Chiefs last week. He added that in a year's time most of his department's out-of-town business will be carried on by radio. In a few years, the police of all parts of America will be in touch by radio, making it possible to co-operate in the apprehension of criminals on a scale heretofore impossible. The days of the guilty are numbered.

An average of 2,500 radio messages a day are handled during each five-day trip across the Atlantic, by the radio operators of the Cunarder "Majestic."

Under the auspices of the Australian government another very large radio station is to be erected near Sydney, its cost to be more than \$5,000,000 and its operation to be conducted by the Amalgamated Wireless, an organization springing from the Marconi Wireless Telegraph Company.

Sweden awarded the contract for equipping her new powerful radio station, to be erected forty miles south of Gothenburg, to the Radio Corporation of America in spite of a lower bid from the German Telefunken Company. The reason was that the American company offered better terms of payment.

The amount of the equipment contract is \$432,500, one-third cash and the balance from future receipts without interest charges. The total cost of the station will be about \$1,300,000.

The first American singer to have his voice broadcast by European radio telephones is Charles Hubbard, a tenor born in Auburn, N. Y. He sent out several numbers from the Eiffel Tower station which has a wave length of 1,760 meters.

The Virgin Islands will install radio apparatus for broadcasting official information and entertainment, according to Adolph Sixto, delegate from St. Thomas. Recently he visited Washington officially, and called at the White House, where he told the reporters that, as a member of the Manufacturers' Commercial Association of the Islands, he was hoping to introduce radio broadcasting as soon as suitable equipment could be secured for sending and receiving.

Rear Admiral H. J. Zeigemeier, director of Naval Communications, who has been designated to represent the Navy at the First Pan-Pacific Commercial Conference, at Honolulu, October 25 to 31, will speak there on communication and transportation, giving special attention to a survey of the present cable and radio activities. He will discuss the establishment of lower special rates, fixing responsibility and granting improved facilities for the press.

New vacuum-tube transmitters are being installed on the submarines of the U. S. Navy. Tests on submarines have been very satisfactory, according to naval experts. The set makes use of equipment already in the hands of the Navy, with some additional material necessary to modernize it. Tests show daytime ranges of from 150 to 250 miles while a submarine was on the surface. It is claimed by experts that it is possible for the submarine to operate its radio while submerged.

WLAW, broadcasting station of the New York City Police Department, although in operation less than two weeks, has been reported from points in New Jersey as coming in so strong and clear-cut that its modulation is a distinct improvement over other stations in the metropolitan district.

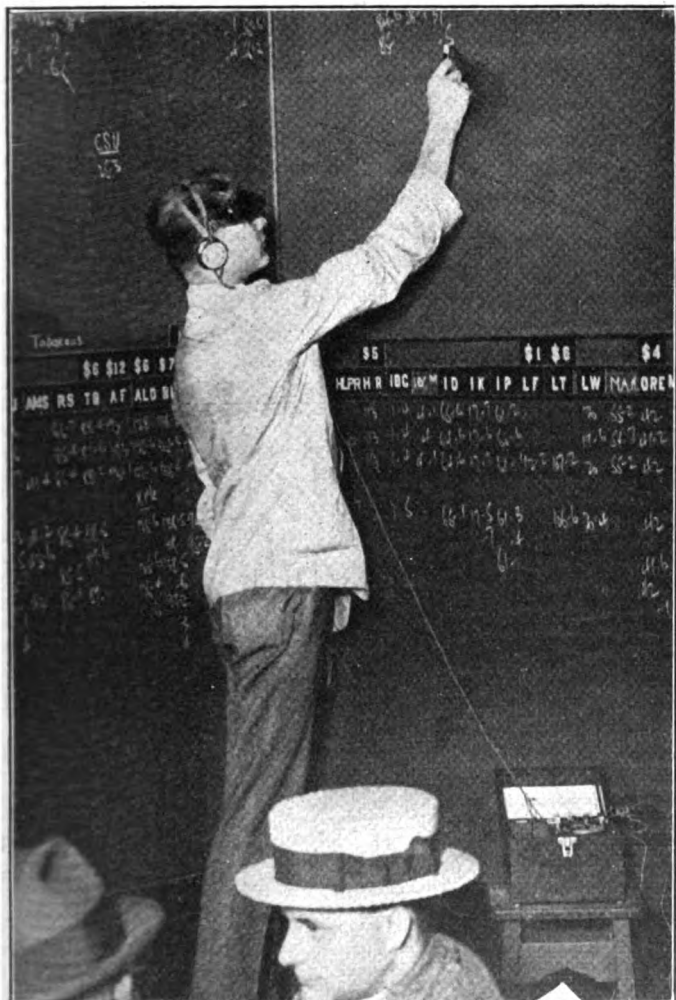
Three other cities besides New York are applying radio extensively to aid their police systems in suppressing crime. They are Denver, Col.; Dayton, Ohio; and Chicago.

When William Gibbs McAdoo, former Secretary of the Treasury, and a party of his friends, including George E. Hill, of Rigby, Idaho, electrical dealer, started down the Snake River on a fishing and hunting trip, recently, the raft on which they were carried was equipped with a Crosley Harko Senior and two-step amplifier, used in connection with a loud-speaker. Mr. McAdoo is an ardent radio fan, and has expressed a determination to take a receiving set with him every time he enters territory in which there are no facilities of obtaining news.

Just over the crest of the Kaiser Range in the High Sierras, at an altitude of nearly 10,000 feet, the Southern California Edison Company is operating three continuous-wave radio stations at the highest altitude in which radio communication ever has been installed. Radio communication is being used by the company for the direction of practically all the construction work under way by its tunnel workers, who are a part of an army of 4,500 employees engaged in the company's enormous water power electric development in the mountains of Northeastern Fresno County, on what is known as their Big Creek-San Joaquin River development program, which will bring into service 125,000 horsepower of new electric energy next year.

The Troy Polytechnic broadcasting station was made possible through a large gift from Washington A. Roebing, the late Charles G. Roebing, and John A. Roebing, of the John A. Roebing Sons' Company, Trenton, New Jersey, all graduates of the Institute and famous as the builders of the Brooklyn Bridge. The equipment was installed during the summer months under the supervision of the professors and instructors of the Department of Electrical Engineering, in the Russell Sage Laboratory, erected in 1906 with a part of the million-dollar gift from Mrs. Russell Sage in memory of her husband, who was one of the Trustees of the Institute.

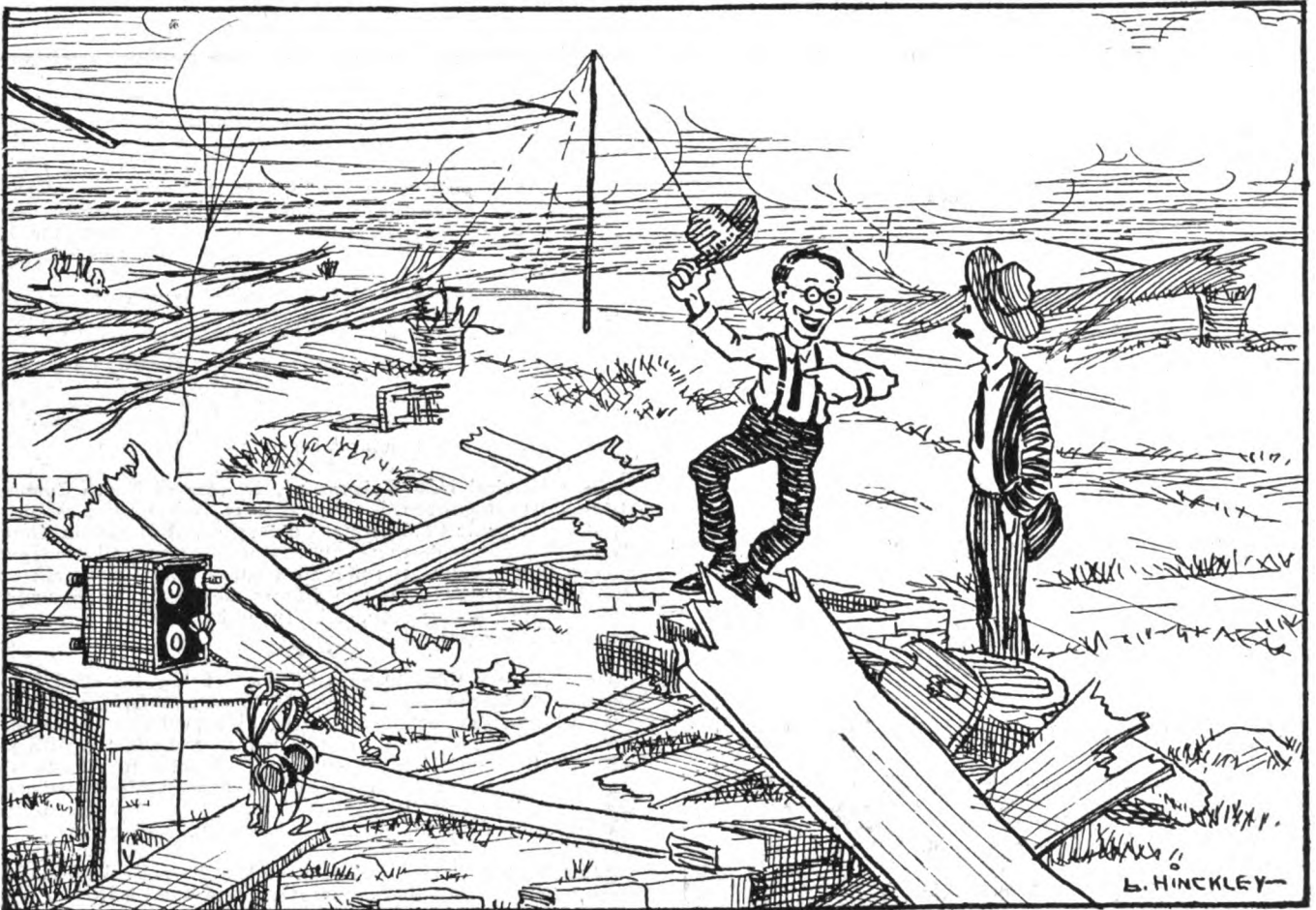
Quotations Received by Radio!



(C. Kadel & Herbert News Service.)
Radio in Wall Street is the very latest innovation for the radiophone. The above photograph shows the interior of a prominent Wall Street brokerage, using the radiophone to receive stock quotations and current prices.

After the Tornado—Something Was Saved!

Cartoon by L. B. Hinckley



Radio Bug—"Whoops! neighbor. I claim I'm the original lucky guy. Look! It never touched my radio set!"

Latest Important Radio News

THE Federal Telegraph Company of Delaware is soon to be launched to take over the \$13,000,000 contract with the Chinese government, recently secured by the Federal Telegraph Company of California. Owen D. Young, president of the General Electric Company, will be chairman of the board, and R. P. Schwerin, head of the California corporation, will be president. The new company will be capitalised at \$9,500,000, divided into \$3,500,000 preferred stock and \$6,000,000 common. Profits from the Chinese contract are estimated at \$6,500,000, in addition to a percentage of the net earnings of the stations for a long term of years.

Notice of a 10 per cent. increase in wages, effective October 1, has been posted in all the larger copper mining camps in Arizona. Companies granting the increase include the Phelps Dodge Corporation, the Calumet & Arizona, Miami Copper, Inspiration, Old Dominion, New Cornelia, United Verde, Ray Consolidated and others. This increase is due very largely to the demand being made by radio manufacturers for copper.

A prominent radio manufacturer notifies us that, according to his estimate, over one hundred million dollars' worth of radio apparatus will be sold this winter.

United States Government experts report that high frequency waves from radio broadcasting stations have caused vegetation to take on a

larger growth and reach maturity sooner than under ordinary conditions.

Lee de Forest, the eminent radiotrician, arrived from Europe on the "Berengaria," last week. He brought with him his latest radio invention, the phonofilm, by which he will reproduce speech in moving pictures.

Radio has been utilized to intercept rum runners on the high seas. According to the "Times," New York, a ship ostensibly bound from New York for Greece was halted by the authorities after radio had notified them of her position and cargo.

The aerial for the new broadcasting station on the Municipal Building, New York, is in place.

American radio exports during July totaled 225,475 pounds of apparatus, valued at \$385,861, which shows that some American exporters are taking advantage of trade opportunities.

Radio Success in Bahamas

About a year ago, the Bahaman Government purchased three radio transmitting sets from the United States Shipping Board and put them in operation with such successful results that three more sets have been purchased for inter-island communication. The equipment is of the 1-kw spark type such as is used on Shipping Board vessels. It gives excellent communication between the islands of the group.

13 More Broadcasters

THIRTEEN limited commercial broadcasting stations were licensed by the Department of Commerce during the week ending September 16, as follows:

- WLAN—Putnam Hardware Co., Houlton, Mo.
- WMAF—Round Hills Radio Corp., Dartmouth, Mass.
- KFCD—Salom Electric Co., Salom, Oregon.
- WEAN—Shepard Co., Providence, R. I.
- WNAC—Shepard Stores, Boston, Mass.
- WLAQ—A. E. Shilling, Kalamazoo, Mich.
- WOAI—Southern Equipment Co., San Antonio, Tex.
- WLAK—Vermont Farm Machine Co., Bellows Falls, Vt.
- WLAT—Charles G. Bosch Co., Burlington, Iowa.
- WLA?—W. V. Jordan, Louisville, Ky.
- WLAR—Mickel Music Co., Marshalltown, Iowa.
- WMAC—F. Edward Page, Fernwood, Cazonovia, N. Y.
- WGAX—Radio Electric Co., Washington Court House, Ohio.

Don't Miss This!

(Radio World, Vol. 1, No. 2, dated October 7, will contain a complete list, alphabetically arranged, of every broadcasting station in this country up to the day of going to press. Be sure to get a copy of Radio World, containing this list, as you will need it during the fall and winter months.)

Radio and the Woman

By
Crystal D. Tector

"MY Dear Crystal," writes a girlhood friend who has just married, "we—that is, John and I—have decided to live in the country. Of course, he had to give in to my whim to have my home where I want it. He dearly loves the big town, I know, and has terrible hankering for his club and all that sort of thing; but I do cherish a little home in the suburbs and all that goes with it. It does seem so cuddly and dear—and he will have to be home every night. But I could not let my selfishness run away with everything, and John finally capitulated provided I would let him install a radio set. He says it will be a nice thing which to entertain the neighbors. Now, what is a radio set?"

Poor misguided thing. I won't betray her by even mentioning her first name; but to imagine that there is even a woman in all this world who does not know what a radio set is! It seems absolutely preposterous. What, my RADIO WORLD readers, do you think I did by way of reply to such a letter—even if it was from an old and very dear friend? Well, I had the impertinence to tell her that if she would buy a copy of this issue of RADIO WORLD, she would find her answer in my department. It just took her off her feet, and she phoned me hoping that I wouldn't write anything to make John angry.

My Dear Mrs. Newlywed—and all others who may be in your state of ignorance—a radio set is just about the one thing that will make your home, especially if it be in the country a perfect haven of joy. Friend Husband and I are commuters—that is, we belong to the vast army of the American citizenry who live a suburban life and come to the city just every so often for our pleasure; but we do notice that whenever we invite any of our big-town friends to visit us, their faces beam with more than customary satisfaction. We were among the first to take up radio. It seemed a heap of trouble and looked like a terrible expense; but we have been more than repaid; in fact, we said, the other night, after listening to one of the most wonderful concerts that I ever heard—the music coming in clear and distinct and absolutely without a blemish—that we would not be without our set for more than a thousand times what it has cost us. And the expense hasn't been so very much at that.

To tell the gospel truth, I would rather have a radio set than a motor-car any day in the week. It affords more keen and honest enjoyment—and it is such an unselfish pleasure! The satisfaction that one gets in entertaining one's friends—and in a manner so absolutely original and fascinating! Why, the other night, we actually heard an entire play—"The Wolf," by Eugene Walter—broadcast from Schenectady. The manner in which it was explained and the clearness in which the lines were spoken and the action brought out, made it a feature of more than ordinary interest. Some of my friends tell me that I am too much of an enthusiast—that I let my happiness run away with me—but I just want to tell you that if the drama can be broadcast so entertainingly as this play, very few trips to New York will F. H. and I make to take in the theatre.

But speaking of the city, I did notice the last time I was on The Avenue—as all good New Yorkers term their famous Fifth Avenue—that several of the better-class tea shops were equipped with radio sets. And I was told that with the new arrangement regarding broadcasting it is very easy to tune in whenever anything particularly interesting is on the ether. In this way, one need not listen to everything that is being broadcast. For instance, there is nothing particularly interesting in a lot of women sitting around tea tables hearing the latest market quotations or the weather reports; but if a good concert or some vocal music or health talks are in the air, why it is an easy matter to tune in and catch them.

And I do feel that the broadcasters would do well to broaden their programs for the women, particularly during the daytime. So much is being done for the farmer—and we all recognize his great and important place in the course of events—but we women should not be overlooked. I would suggest more easy-to-make recipes. Every woman is interested in her kitchen whether she has one or not. I think, too, that practical advice on washing fine lingerie would not be amiss; for few women, to-day, will trust that part of their wardrobe to the laundry. Domestic science is good in small

doses, particularly if it is practical. Rich or poor, we women are all alike so far as our households are concerned. We want to be told how to keep them in order.

And just now, I wish some clever bugologist would radio to me how to get rid of cockroaches!

I have received several letters during the past week from mothers who want to know if they can really count on radio to keep their babies quiet. Now I am not so foolish as to say that you can clamp a pair of headphones on a baby's cranium and let the wave lengths do the rest. Many mothers have that idea. Imagine the poor child if an unruly bit of static should jar it. Then, too, baby isn't going to be very much enthused or its teething be made less painless by listening to the latest market reports or a sermon. Children are uncertain beings and they must cry and be uneasy during a



(C. Central News Service.)

"I did notice that several of the better-class tea shops were equipped with radio sets."

goodly part of their young lives. They wouldn't be normal if they didn't. But I do say that many a mother is going to find in radio a very pleasant form of recreation for her little ones. I know that several of my neighbors do not hesitate to leave their babies with me when they want to go to town for a shopping spree—and that these little ones have been sort of quiet and pleased whenever my radio set has been tuned in—and it generally is.

Friend Husband told me the other day that he read in "Apartments To Let, Furnished," of one that gave "radio" as a modern convenience. That shows what we are coming to. The day is not far distant when every woman who is renting an apartment will examine the radio set as closely as she examines the kitchen.

Mrs. Hattie Kolb, of Chicago, writes me that she is studying the science of radio in the hope of taking a position as radio instructress in one of the Chicago public schools. She says that, in her city, radio will soon be a part of the public-school courses. Teachers will be wanted and she will be a pioneer in the field.

WBAY to Serve a Commercial Purpose with Radio Toll Station

By Golda M. Goldman



Photo by Morris Rosenfeld, New York.

The American Telephone and Telegraph Company's Building, Walker Street, New York City, the home of WBAY. The building is 350 feet high, and the antenna is 100 feet above the roof.

THE commercial uses to which the radiophone is being put are far removed from the knowledge of the amateur. Only he who possesses a set beyond the average is in touch with the manifold ways in which the radio is serving the business world. And now comes the latest development in the commercialization of this power. The American Telephone

and Telegraph Company is presenting New York City with a radio toll-station, known by the call number, WBAY.

While mechanically inclined radioists for years have been contriving receiving sets and snatching messages in code out of the air, it is really only within the year that the perfecting and popularizing of radio broadcasting has

swept the country with a wave of interest. Broadcasting stations appeared almost simultaneously in many of the principal cities, and every dealer whose business was in need of expansion or new blood immediately stocked in radio accessories and did a thriving business. The result, as all fans know, was that Herbert R. Hoover, Secretary of Commerce, found it necessary to call a conference of radio experts who made recommendations of proper wave-lengths to be used for various purposes, so that, today, most stations are working on a 360 wave-length. This necessitates a schedule to which all broadcasting stations in one vicinity must adhere, only one operating at a time, and so avoiding confusion.

When it became evident that the public had become even more interested listening-in than in reading anything except the radio page in the papers, big business men began to consider it as a tremendous possibility for advertising, and the American Telephone and Telegraph Company could have installed over one hundred broadcasting stations in New York's business section alone. The difficulty was that these merchants knew nothing of conflicting wave-lengths, of government regulations, or of the fact that, after installing a station at tremendous cost, they would be able to use it only a few minutes each week. Therefore, as one of the officials put it, "It would have been like taking money from a baby," these stations were never built. Instead, The American Telephone and Telegraph Company decided to extend its own "leased facilities" business, by which private wires for banks, newspapers, etc., are arranged, and so built one of the finest stations now operating, which it plans to rent to advertisers for a quarter or a half hour at a time, much as they might pay for a telephone call.

The public has, however, been educated up to a high standard of broadcast material, and there is no intention of lowering these standards through the manner of presenting the advertised commodity. John Doe, real estate broker, is not expected to announce merely that there will be a sale of particularly fine lots on the following day, with details concerning their desirability. The number of fans who would listen for any length of time to any crudities of the sort would be decidedly limited. Instead it is intended that all matter shall be

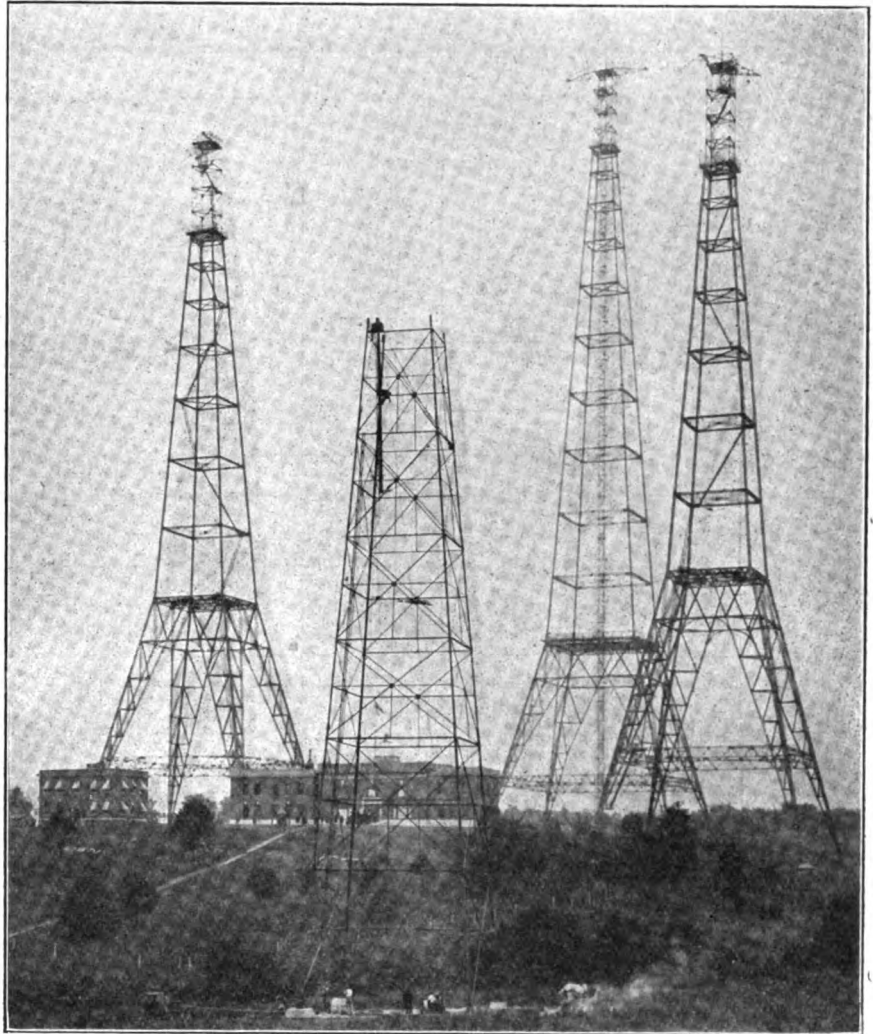
(Continued from preceding page.) presented in artistic form, through speeches on allied subjects, the advertising to be subtle and indirect. A life-insurance company, for instance, rather than send out a stereotyped list of benefits to be derived from a policy, will send one of its skilled physicians to give a health talk. It will mean merely this: At present the purpose behind most broadcasting is to entertain the unseen audience to such an extent that it will buy new improvements for its outfit, and stimulate friends to buy, which is of course advertising in itself. So are the present programs advertisements for the artists and lecturers, which in no wise detracts from the value of the donated services. Primarily the present stations emphasize entertainment, with the advertising incidental, while WBAY will only use the entertainment as a means for much valuable advertising.

At present the operation of this plan is held up by the limited number of wave-lengths legally permitted, and the schedule of hours in operation. Relief is expected from two bills now in Congress requesting broader powers for the Department of Commerce, and through the department an increase in the number of wave-lengths available. As most amateur sets will cover quite a wide band of lengths, it would then be possible for more than one station to operate at the same time. With the press of business before Congress, it may be months before this new departure will be inaugurated. Meanwhile, WBAY sends out the afternoon and Thursday evening programs which it started on August 3., and continues to experiment with and perfect its apparatus.

There are many features of this apparatus in the new station which are of note. In the first place, the studio itself has been so skillfully built and arranged that it is echoless. Felt padding on the walls and parts of the ceiling assists in giving to all voices the effect of a clearer enunciation. A second advance in technical apparatus is to be found in the microphone, or transmitter, which like all the rest of the electrical equipment was designed and manufactured by the Western Electric Company. It is so perfected that it is no longer necessary for the speaker or singer to limit his movements to such positions as will bring him close to the transmitter. This gives him the opportunity to exercise all the freedom of action which is so essential a part of a finished entertainment.

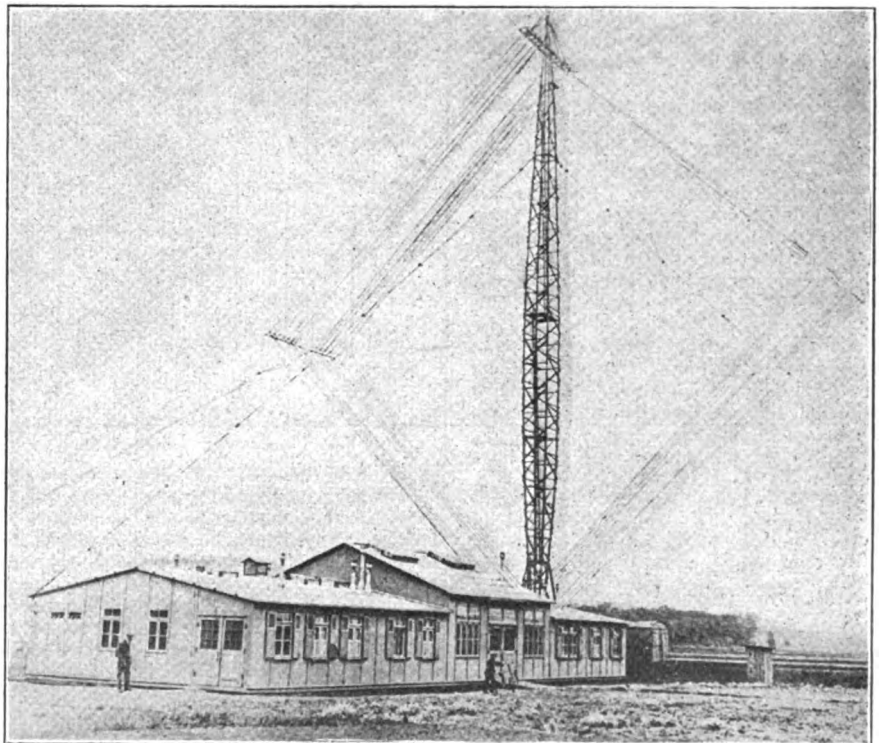
A photograph of the interior of the operating room of WBAY, with a complete description of all the important parts of the apparatus, by our technical editor, will be found on the front cover of this issue.

Two of the World's Greatest Radio Towers



(C. Underwood & Underwood, New York)

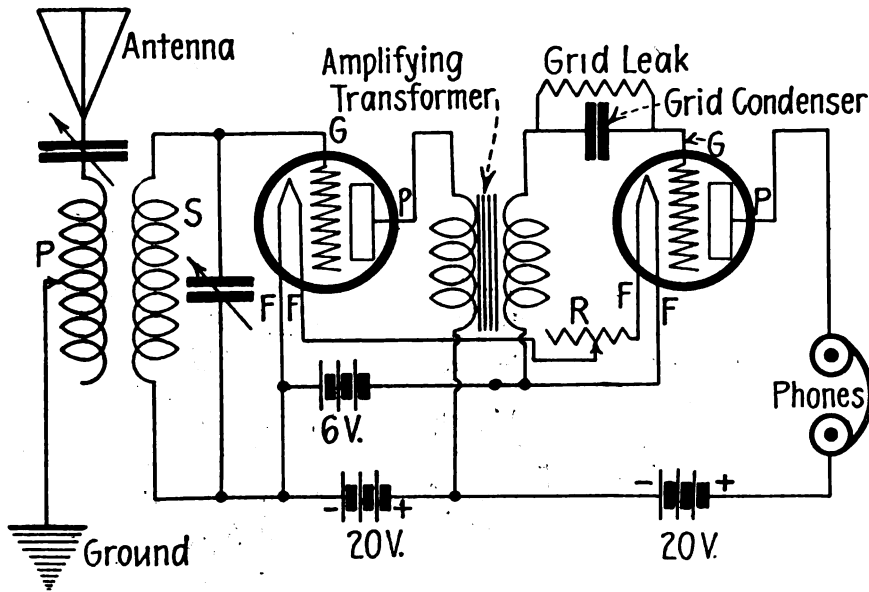
The famous station at Arlington, Va. The towers are 450 feet high.



(C. International News Reel Photo)

Center of Germany's radio: The new powerful station at Oranienburgerstrasse

Answers to Readers



Schematic diagram requested by Mr. William Lang, St. Louis.

PLEASE publish a hook-up showing the necessary connections when using a vario-coupler and one stage of amplification of the straight amplifying-type receiving set.—William Lang, St. Louis.

The accompanying diagram shows the proper hook-up for the straight-type amplifying receiver. It will be noticed that the grid condenser and leak are inserted in the grid of the amplifying tube, however, we suggest that it be placed in the grid circuit of the detector tube for better results. Sometimes it is more of an experiment; therefore, we advise the experimenter to try out the grid condenser in the tube of the detector circuit.

Do the radio-frequency amplifiers increase the range of a set. Do loop aeriels work best with such amplifiers?—Albert Murphy, Rosedale, L. I.

Radio-frequency transformers are made to increase the range of a receiving set. They are placed prior to the detector tube and amplify the original frequency-wave before it reaches the detector. Loop aeriels are used almost exclusively in order that most of the unwanted noises may be eliminated. The loop aerial also has the function of giving directional effect upon the signals desired.

Where can I buy plans to build the superregenerative receiving-set invented by Major Edwin H. Armstrong? I have a regenerative set and am getting good results. I would be gratified if I could see a description of the circuit and how it is assembled.—S. A. Masters, Lakeland, Fla.

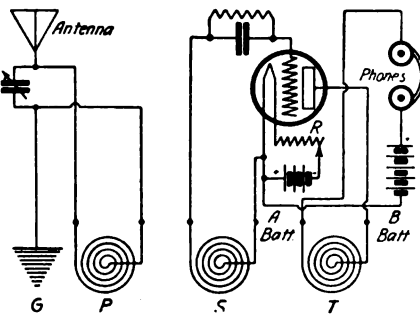
A full description of the Armstrong superregenerative set was published in RADIO WORLD No. 25, dated September 16, in an article entitled "How to Make a Two-Tube Superregenerator," by Frederick J. Rumford.

I have a short-wave regenerative set which I made, as described in RADIO WORLD, No. 22, dated August 26, with jacks in each stage. The detector works fine, but when I plug in on the second step, signals are not so loud as the detector. What is the trou-

ble? I am using Thordason transformer.—John Kelly, Camden, N. J.

Test each tube out separately. In some cases, amateurs connect up incorrectly the secondary of the audio-frequency transformers. Make a good check-up of this and experiment awhile until you locate the trouble. Test out each and every part as you go along, from tube to tube. See that the proper plate-voltages are had, as well as the correct wiring to the tubes and jacks.

Will you publish a hook-up for a regenerative receiver employing honeycomb coils, 43-plate variable condenser and a variable condenser? Does it matter which binding post you take the lead from in a honeycomb coil?—William J. Kelly, Rockaway Beach, N. Y.



Schematic diagram requested by Mr. William J. Kelly, Rockaway Beach, N. Y.

The accompanying is a diagram of the so-called regenerative receiver. This is the honeycomb type. In the above hook-up, it is very easy to discern where the honeycombs are placed. VC is a variable condenser of 43 plates. P is the primary, S is the secondary and T the tickler. The rest of the circuit is self-explanatory. Either binding post may be connected from the honeycomb to such connections as needed.

What do you consider the best hook-up for a crystal set? My set consists of a two-

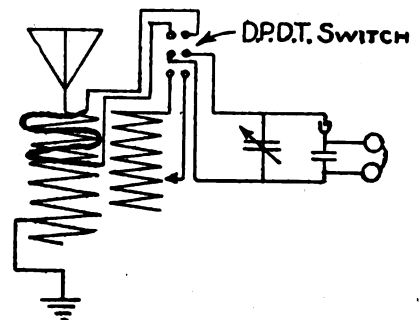
slide tuning coil, one detector, one condenser and a set of 3000-ohm phones. I have seen and tried various hookups, but none seem to work.—Norman Blankenship, Cushing, Okla.

RADIO WORLD No. 11, dated June 10, in "How to Construct One- and Two-Slide Tuners," by George W. May, covers your query fully.

What is the rated voltage for the V-T-1 tubes?—RADIO reader.

As the writer has had years of experience with these tubes, he considers it most essential that you secure a 6-volt battery. In all cases, the tube will draw approximately from 5 to 6 volts. As amperage is the big factor, these tubes are limited to about 1.25 amperes and, in all cases, should not be allowed to go beyond this rating as it may mean the burning out of the tube. It will be found that the tube will work best when kept at a cherry-red glow.

Is there a circuit I could use in which I could have both a tuned circuit and an untuned circuit? If possible I would like to see a hook-up of such a circuit.—James Brandon, Boston.



Schematic diagram requested by Mr. James Brandon, Boston.

There is such a circuit. We have had one drawn, and it is published herewith for your convenience. A double-throw, double-blade switch is used which enables the operator to switch from the untuned circuit to the tuned circuit. It may be said that these principles are used in the Navy type receiver, used both on battleships and in land stations. The idea is to keep the switch placed in—on the untuned circuit—which has a coil about the primary winding. This makes it possible to allow signals of a broad interfering-wave possible. If the operator wishes to eliminate interference in order to read some distant station he will then throw the switch over to the tuned circuit and start tuning in the desired station. This will make a valuable circuit for such work, especially where a close watch is to be kept on everything that is transmitted.

Radio Club Starts School

A RADIO school four nights a week will be conducted this fall by the Hudson City Radio Club, of Jersey City. Code will be the first thing taught because, says the secretary, "a lot of people don't know what they are missing. Don't holler about the ham with his spark and write to the radio inspector when it is some ship on WNY or NAH or some

The Hudson City Radio Club was organized in April, 1920, and incorporated in August, 1921, with thirty-six members. It aims to have at least 136 during the coming year. Anyone interested should write to H. A. Bremer, No. 89-91 Franklin street, Jersey City, N. J.

Civil Service Examination for Junior Radio Engineer

For Men and Women—Opens October 10, 1922

THE United States Civil Service Commission announces an open competitive examination for junior radio engineer on October 4, 1922, at which examination is requested in applications received in time to mail examination papers. Vacancies in the Signal Service at Large, Camp Alfred Vail, N. J.; a vacancy in the position of radio laboratory assistant, Fairfield Air Intermediate Depot, Fairfield, Ohio, and vacancies in positions requiring similar qualifications at Washington, D. C., or elsewhere in the United States, at \$1,200 to \$2,000 a year, or higher or lower salaries, will be filled from this examination unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

As the Commission has had considerable difficulty in securing sufficient eligibles for this position, qualified persons are urged to enter this examination.

Range in salary.—The entrance salary within the range stated will depend upon the qualifications of the appointee as shown in the examination and the duty to which assigned.

Bonus.—Appointees whose services are satisfactory may be allowed the increase granted by Congress of \$20 a month.

Certification.—In filling vacancies in positions with headquarters outside of Washington, D. C., certification will be made of the highest eligibles examined nearest the vicinity of the place at which the appointee will be employed except that upon the request of the department certification will be made of the highest eligibles on the register for the entire country who have expressed willingness to accept appointment where the vacancy exists.

Citizenship and sex.—All citizens of the United States who meet the requirements, both men and women, may enter this examination; appointing officers, however, have the legal right to specify the sex desired in requesting certification of eligibles.

Duties.—The duties of the appointee will be to assist in the development, design and construction of practical and special radio apparatus, and other related work.

Subjects and weights.—Competitors will be rated on the following subjects, which will have the relative weights indicated:

Subjects.	Weights
1. General physics.....	20
2. Mathematics through calculus	25
3. Practical questions on radio engineering	30
4. Education, training, and experience	25

Total 100

Slide rule.—Competitors should provide themselves with a slide rule; in case its use is allowed it will be so stated in the examination sheet.

Preliminary requirement.—The applicant must show that he has been graduated with a degree from a college or university of recognized standing with the completion of at least 118 credit hours, or that he is a senior student in such an institution and furnish proof of actual graduation within three months from the date of the examination. The applicant must show that his undergraduate work included a course in electrical

engineering, and also the usual college course in general physics, general chemistry, and mathematics through calculus. Special credit will be given for experience in a scientific, industrial, or technical laboratory.

Statement of college course.—The applicant must submit a statement of courses taken at college signed by the proper authority of the college or university attended, and give a detailed record of his technical experience and have the vouchers filled out by men professionally qualified to vouch for his ability, fitness, and personality.

Age.—Applicants must not have reached their fifty-fifth birthday on the date of examination. This age limit does not apply to persons entitled to preference because of military and naval service.

Retirement.—Classified employees who reached the retirement age and have served fifteen years are entitled to retirement with an annuity. The retirement age for railway mail clerks is 62 years; for mechanics and post-office clerks and carriers, 65 years, and for others 70 years. A deduction of 2½ per cent. is made from the monthly salary to provide for this annuity, which will be returned to persons leaving the service before retirement with 4 per cent. interest compounded annually.

Photographs.—Applicants must submit to the examiner on the day of the examination their photographs taken within two years, securely pasted in the space provided on the admission cards sent them after their applications are filed. Proofs or group photographs will not be accepted. Photographs will not be returned to applicants.

Residence and domicile.—Applicants may be examined at any place at which this examination is held regardless of their place of residence; but only those who have been actually domiciled in the State or Territory in which they reside for at least one year previous to the examination, and who have the county officer's certificate in the application form executed, may become eligible for permanent appointment to the apportioned service in Washington, D. C.

Applications.—Applicants should at once apply for Form 1312, stating the title of the examination desired, to the Civil Service Commission, Washington, D. C., or to the Secretary of the United States Civil Service Board at any place listed hereon. Applications should be properly executed, excluding the medical certificate, and must be filed with the Commission at Washington in time to arrange for the examination of the applicant.

The exact title of the examination, as given at the head of this announcement, should be stated in the application form.

Preference.—Applicants entitled to preference should attach to the applications their original discharge, or a photostat or certified copy thereof, or their official record of service, which will be returned.

There Is Hope!

Since large corporations find it profitable to provide entertainment by means of radio for their employees in isolated places, this may also be the solution of keeping the hired girl back on the farm.



THOUSANDS of families have only "gone in for wireless" after hearing demonstrations of Magnavox Radio—the Reproducer Supreme.

It is the Magnavox Radio which gives every receiving set its greatest enjoyment and use—doing away with the restrictions and limitations of the individual headset. The receiving set only brings the message, while Magnavox Radio tells it clearly and in full volume to all within reach of its voice.

In perfection of mechanism, quality of manufacture and satisfaction in actual service, Magnavox Radio has absolutely no competition.

R-3 Magnavox Radio with 14-in. horn (here illustrated), is ideal for use in homes, offices, etc. Requires one ampere field current from your filament battery. Price \$45.00



R-2 Magnavox Radio with 18-inch horn for those who wish the utmost in amplifying power; for large audiences, dance halls, etc. Price \$85.00



Model "C" Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Radio.

AC-2-C, 2-Stage - - \$80.00
AC-3-C, 3-Stage - - 110.00

Our interesting new booklet (illustrated in 3 colors) sent on request!

THE MAGNAVOX COMPANY

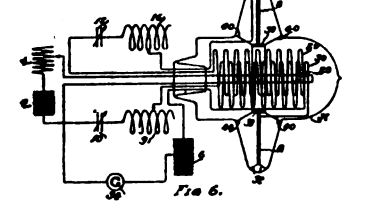
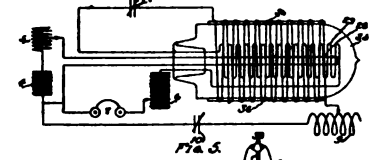
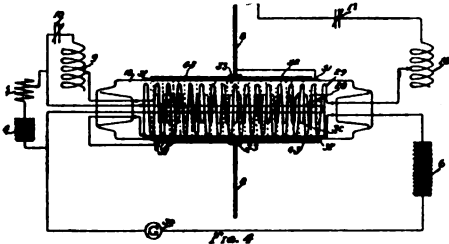
Home Office and Factory: Oakland, Cal.
New York Office: 370 Seventh Avenue

Radio Patents

Invention Will Locate Distant Transmitting Stations

No. 1,427,833. Patented September 5, 1922
Patentee: Frederick S. McCullough, Cleveland, O.

THE invention on which Mr. McCullough has received letters patent, is important to radiotelegraphy—first, because it will determine the direction of distant transmitting stations; secondly, because it will detect incoming electromagnetic waves. In the radio directional-systems hitherto used, there have been employed large antennae arranged in certain shapes and directions, and also loops or coils of wire, these coils generally having a number of turns wound on a square frame with the sides several feet,



Three schematic diagrams showing modifications of Mr. McCullough's system. Figure 6 shows the flat spiral coil enclosed in an evacuated tube.

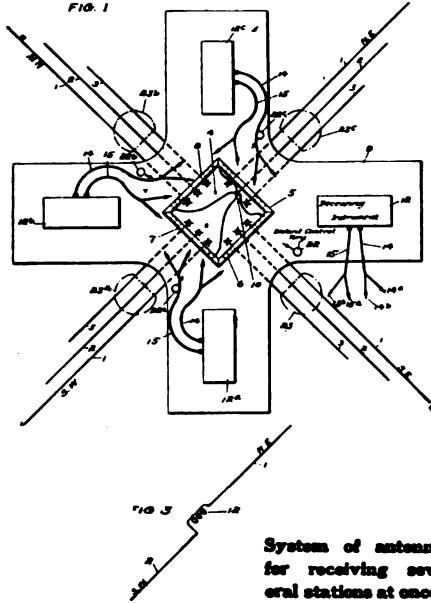
or several yards, in length. While directional loops of such size may answer for permanent land-stations, it can be readily seen that there are grave objections to them for portable stations such as those on a small boat, and more particularly on aircraft. For the latter, it is essential to have the apparatus in as compact form as possible, and by his system, Mr. McCullough provides means of small size which will satisfactorily determine the direction of transmitting radio stations. Together with his direction finding, he provides for the detection of the incoming electrical oscillations.

* * *

Low-Antenna Signaling

No. 1,424,365. Patented August 1, 1922.
Patentees: Edward H. Loftin, Washington, D. C., and Henry H. Lyon, Hyattsville, Md.

THIS invention relates to radio antenna systems and, more particularly, to stations employing low horizontal antenna or lineal collectors. In a copending application Serial No. 371,557, filed April 5, 1920, the inventors pointed out the necessity for selecting an optimum length for the horizontal component in such



System of antenna for receiving several stations at once.

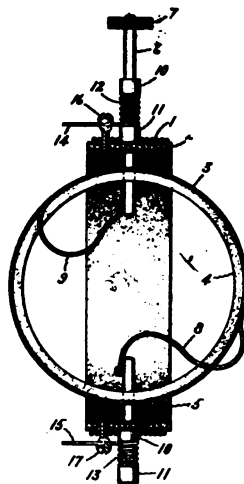
antenna for tuning to obtain the best results on given wave-lengths. The purpose of the present invention is the devising of a system of antenna for a radio station whereby advantage may be taken with facility and efficiency, of the antenna for general communication with a number of stations employing various wave lengths and having various directions.

* * *

Electrical Connection to Prevent Shock

No. 1,422,420. Patented, July 11, 1922.
Patentee: Charles D. Filkins, Schenectady, N. Y.

THE object of Mr. Filkins's invention is to provide a reliable means for providing an electrical connection to a movable element in an electrical device which will allow any desired freedom of movement of



By this device, Mr. Filkins intends to provide a method of making the connections to the movable coil of a variometer which will overcome common disadvantage.

the movable element without interfering with the flow of current.

In the construction of variable-coupling-devices, or variometers, for use in radio circuits it has been customary to provide a

fixed coil and a movable coil which is adapted to rotate with respect to the fixed coil in such a way that the coupling between the two coils may be varied by rotating the movable coil between a position where its plane is parallel with that of the fixed coil and a position where its plane is at right angles to that of the fixed coil. It has been customary in such devices to make electrical connections to the movable coil by means of flexible leads brought from the terminals of the movable coil to fixed terminals located at some convenient place on the apparatus. This method has the disadvantage that it is not possible to rotate the movable coil continuously in one direction, and since the leads are usually located out of sight of the operator there is the danger that the operator will attempt to rotate the coil too far in one direction and break the leads. The leads are, also, apt to be broken by the continual bending which is incident to the normal operation of the device.

By his invention, Mr. Filkins hopes to provide a method of making the connections to the movable coil of a variometer which will overcome the above-mentioned disadvantages; also, to provide a means for holding the movable coil in a desired position and prevent it from moving when the apparatus is subjected to vibrations.

* * *

To Regulate the Flow of Electric Currents

No. 1,426,465. Patented August 5, 1922.
Patentee: Ernest G. Danielson, San Francisco, Cal.

VARIABLE resistance is the subject of Mr. Danielson's invention. Primarily it relates to a composition of matter, useful for providing an electric resistance device, and more particularly to a variable resistance which may be used in a potentiometer.

An object of the invention is to provide a variable resistance device of the poten-

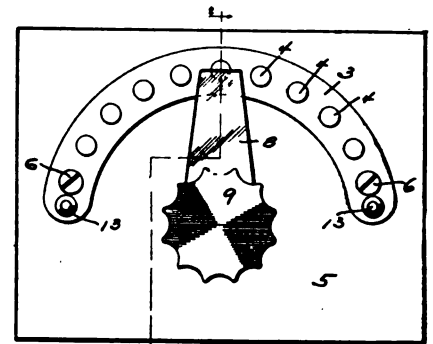


Fig 1

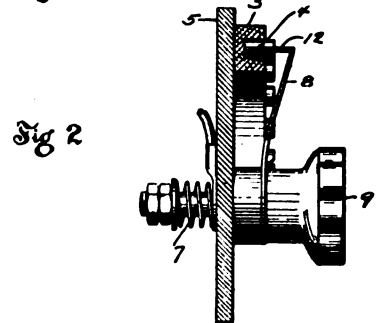


Fig 2

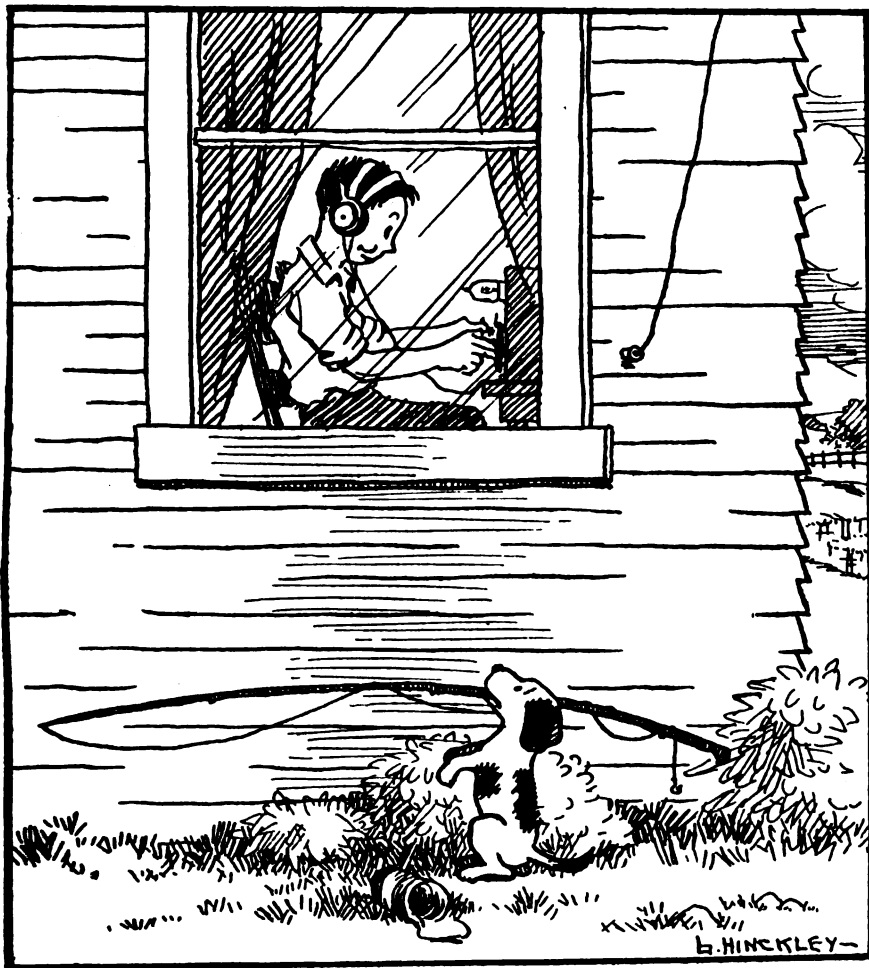
Figure 1 is an elevation of Mr. Danielson's invention mounted on a panel.

Figure 2 is a cross section taken on the line 2-2, Figure 1.

tiometer type in which a metal to metal electrical contact is made between the contact arm and the variable resistance element; to provide a new and useful composition of matter; to provide an inexpensive and reliable resistance element; to provide a simple and inexpensive variable resistance device so constructed

(Continued on following page)

Forsaken!



Cartoon by L. B. Hinckley.

Army Radio Nights

FOLLOWING the success of the first army night broadcasting entertainment from the big station of the Westinghouse Company, at Newark, recently, all Army Corps commanders have been instructed by the War Department to cooperate with local broadcasting stations in entertaining the fans and especially in establishing regular monthly army nights.

Major-General H. C. Hale, of the Second Corps Area, New York, who put on the first army radio entertainment which made such a hit that local fans demanded more, has made arrangements for a monthly program.

The nine corps commanders who cannot stage their own show on army radio sta-

tions, will cooperate with local stations, furnishing band and vocal music, speeches on military science and training, or other forms of entertaining or instructive programs. Very soon now, each of the corps areas throughout the country will have a new source of radio shows.

(Continued from preceding page)

that for the same adjustment of the contacts, the value of the resistance thus chosen cannot be interfered with by such effects as variable contact resistances or loose contacts. Heretofore, variable resistance devices of this nature have comprised a strip of pressed or molded graphite over which a carbon button, carried by the contact arm, is movable. The resistance of the contact between the button and the strip is variable, due to variable conditions of pressure, surface condition of the strip and other causes, so that for any given adjustment of the contact button, different resistances are obtained at different times. In the variable resistance of Mr. Danielson's invention, the contact between the variable resistance and the contact arm is metal to metal, so that the contact resistance remains constant.

RADIO TOOL SET

Consisting of Hammer, Screw Driver, File, Reamer, Awl, Drifter, Tweezers, Gimlet, Chisel. All scientifically tempered tools. Brass Case, nickel plated finish.

\$1

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KNOCKED-DOWN VARIABLE CONDENSER

MONEY-SAVING PRICES

An accurately made, fully efficient instrument that cannot get out of order or adjustment. Fully guaranteed. Extra heavy aluminum plates. Condensate and plated. Knob and pointer included. Furnished assembled or knocked-down at the following low prices. Ready assembled by anyone following instructions furnished. Save money—order from us. Folder upon request.

No. of Plates	M.F.D. Capacity	Assembled	Knocked-down
8	.00007	\$1.75	\$1.50
11	.00025	\$2.50	\$2.00
21	.00085	\$3.25	\$2.50
43	.001	\$3.90	\$2.90

Lott's Better Radio Condenser Co.
473 ORANGE STREET NEWARK, N. J.

CRYSTAL SET \$4

"THE LITTLE WONDER" \$2.50 UNMOUNTED

Wonder in name and a wonder in performance. Cannot be equalled for the price. Catches distinctly everything within 25 miles.

Send for FREE catalog, describing our "Little Wonder" set and listing radio supplies.

Radi-O-Plate Panels. All sizes cut to order.

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of Radio Manufacturers, Jobbers and Dealers in the United States and Canada. Issued Quarterly—January, April, July and October, 1922. Issue corrected to September 15th, 1922. Classified under three different headings—Manufacturers, Jobbers and Dealers—and alphabetically arranged by states, cities and towns and names of firms. Containing approximately 15,000 names and addresses.

We have been exceptionally careful to see to it that every Manufacturer, Jobber and Dealer is listed and under the PROPER CLASSIFICATION. Most mailing list concerns charge more than \$100 for a list of this kind and, as a rule, those supplied are far from being correct. Compare this list with any other, and you will find it to be the very best obtainable anywhere at any price.

October issue ready for distribution September 25th. Price \$5.00 per copy, or \$10.00 per year (four issues, including monthly supplements which keep the list absolutely correct and up-to-date at all times). October edition limited. Send your order with remittance today.

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Radio Goods that Stand the Test

Manufacturers, send a sample of your goods to our Technical Editor, Fred. Charles Ehlert, 9008 Pleasant Street., Queens, Long Island, N. Y. It will be carefully tested and returned. If your goods satisfy our experts, RADIO WORLD'S endorsement will be published in our merchandise department without charge or obligation of any kind on your part. This is a free service on the part of RADIO WORLD, calling for no expense whatsoever on the part of the manufacturer, except the sending of a sample of his goods.

Super-Sensitive Radiotelephone Head Set

Manufactured by the Teleradio Engineering Corp., 490 Broome Street, New York City.

A RADIOTELEPHONE head set worth testing. It was tested out in various circuits from 200 meters to 20,000 meters. When connected in on short wave-lengths, especially in copying C-W stations and spark stations, in which very good results were obtained, eliminating the hissing noise sometimes experienced in other phones. In copying long-distance transoceanic messages, these phones responded very well. The phones used were of the type C make. They are of solid construction and neat appearance, made adjustable to fit the head. The resistance of these phones was found to be 2,000 ohms.

Na-Ald V-T Tube Socket

Manufactured by Alden-Napier Co., 52 Wil- low Street, Springfield, Mass.

A VACUUM-TUBE socket of genuine condensite. The best part of this De Luxe socket, as it is called, is the patent clip. This clip makes a positive connection to the prongs of the vacuum tube, under all conditions. There is a wiping action across the bottom, and as the tube slips into place this contact is made at the side. The operator using these sockets in his set may be sure that he is free from the open-circuit troubles in this part of his apparatus. As this contact is slotless and made of genuine condensite, it is practically unbreakable. It serves equally well for 5-watt power tubes, as there is ample spacing between the contact strip and the bottom of the base.

Na-Ald Small V-T Tube Socket

Manufactured by Alden-Napier Co., 52 Wil- low Street, Springfield, Mass.

A VACUUM-TUBE socket which requires very little room on a panel when space is limited for mounting sockets. This tube socket is molded of genuine condensite and holds the standard made tube. It is neatly constructed. Spring contacts are provided to make quick connection with the different prongs of the tube. This tube socket is not affected by the heat of the tubes or the heat of the soldering iron when soldering connections.

Na-Ald Condensite Dial

Manufactured by Alden-Napier Co., 52 Wil- low Street, Springfield, Mass.

A DIAL of genuine condensite which will not warp. It allows the dial to run true. It is one of the 3-inch dials on which the fingers may be placed on the knob without covering the numbers on the bevel edge. It is unique in design. With its elimination of excess material, it reduces the absorption losses considerably.

"P-T" Ultra-Sensitive Crystal Detector Contact Wire

Manufactured by "P-T" Crystal Contact Co., Box 164, Boston, Mass.

As all who have worked with crystal detectors are aware, the great disadvantage a solid rectifier presents is the difficulty of

maintaining it in sensitive adjustment. A "P-T" Ultra-Sensitive Contact gave fine results, using a light-contact mineral. When used with an ordinary good specimen of crystal it was extremely stable in operation.

Be sure to keep the crystal free from dust or moisture. Never touch it with the bare fingers, as the natural oil of the skin greatly reduces its sensitivity. If necessary, clean the crystal with soap and water or alcohol, using an old tooth brush.

To secure the best results with the "P-T" contact, use a very short piece of this delicate wire, preferably less than half an inch. Do not coil it, but press firmly on the mineral at right angles, adjusting for best sensitivity and stability; a little practice will enable you to secure both. Use the test buzzer if available as it is of great value. The "P-T" Ultra-Sensitive Contact is ideal for use in pocket, large portable sets, or in any type crystal-set manufactured.

Bakelite Socket for Vacuum Tubes

Manufactured by I. R. Nelson Co., Newark, N. J.

A VACUUM-tube socket made of genuine bakelite. Of neat appearance and solid construction. It is made for the standard vacuum tube. It has for its contacts four metal springs, which make possible instantaneous connection when the four prongs of the vacuum tube are placed into the socket for operation.

Crystal Receiving Set

Manufactured by American Radio Co., Baltimore.

A CRYSTAL receiver of neat design, made to operate over a wave band from 200 to 800 meters. It has for its primary a coil, upon which is a movable band employed to cut in or out the turns of wire needed. This is controlled by a knob on front of panel. The tapped secondary, also, is controlled by a knob and is adjusted so that secondary may be run in or out of primary for the amount of coupling needed. Tested, it was found to record radiophone messages approximately twenty-five miles, using outside antennae. It has, also, two mounted crystals whereby the listener may use either crystal he wishes in case one fails him.

Microstat Vernier Rheostat

Manufactured by Microstat Company, Williamsport, Pa.

THE MICROSTAT is a vernier rheostat on an entirely new principle, of neat design and construction. Its purpose is to allow the possibility of securing exact filament adjustment over the ordinary wire rheostat. Laboratory tests show that it is equal to ten times the possible calibration of a wire rheostat. Where the smallest amount of filament current is needed, especially when working with a critical tube, this rheostat was found to make good its name—"the rheostat with a thousand adjustments." One knob operates the control. No pushing or pulling of knobs. Just turn. The exact calibration of the microstat is due to the gradual entering of two points into a resistance material, which gives the exact and most minute measurements of current to the filament as the operator brings the points together or separates them through the screw handle. The microstat takes up very little room on the panel, with each part carefully and accurately machined.

New Firms and Corporations

Hush-A-Phone Sales Corp., Manhattan, chattels, \$250,000; A. F. Waltzinger, W. J. Cobb, A. H. Hallam. (Attorney, G. Hoerner, 27 Cedar St., N. Y.)

New York Aerial Concert Corp., Manhattan, \$20,000; J. J. Haley, J. A. and M. E. Nugent. (Attorneys, Nugent & Nugent, 280 Madison Av., N. Y.)

Radiotive Corp., Brooklyn, has increased its capital from \$10,000 to \$100,000.

Radio Winding Corp., Manhattan, has increased its capital from \$10,000 to \$20,000.

Southern California Radio Trade Association. President, Leo Taufenback, president Western Radio Electric Co.; vice-president, Al Meyers, manager L. J. Meyberg Co.; secretary, Dean Farran, manager radio department C. R. Kierulff Co.; treasurer, G. S. Corpe, president Coast Radio Company of El Monte.

Balentine Radio Company, 306-300 Scollard Bldg., Dallas, Texas.

Dallas Radio Supply Co., 1927 Main St., Dallas, Texas.

Surf Electric Shop, 102 Strong Ave., Appleton, Wisconsin.

Pacific Electric Company, 116 South Main St., Sheridan, Wyoming. A. Williams, prop. Chaudler Electric Service Co., St. Marys, Ohio.

Unit Knob and Dial Co., Manhattan, radio instruments, \$50,000; R. L. Tait, H. Seutt, I. B. Canfield. (Attorney, M. J. Spalekhamer, 115 Broadway, N. Y.)

Radiud Corp., Manhattan, radio, \$20,000; J. Perimuth, E. A. Zadig, E. H. Bronner. (Attorney L. Bronner, 305 Broadway, N. Y.)

Pruver Electric and Machine Co., Manhattan \$5,000; D. and A. Pruver. (Attorney, A. Welsa, 154 Nassau St., N. Y.)

Hartnett Electric, Hempstead, Nassau Co., \$20,000; T. J. and R. J. and F. J. Hartnett. (Attorney, T. J. Cuff, Hempstead, N. Y.)

Lyradion Manufacturing Co., \$1,250,000; Harry H. Phillips, F. J. Conard, Charles Ora, Chicago. (Corporation Trust Co. of America.)

Dealers Make Mistake by Rating Receiver Sensitivity in Ohms.

"YES, this is a very good receiver. It has a resistance of four thousand ohms." This is the sort of sales talk that many radio clerks give to unwary purchasers of headsets. In talking so, they not only show ignorance concerning telephone construction and design, but help to create an impression that is entirely wrong. They are responsible for the belief that the sensitivity of a headset is indicated by the resistance of the receivers.

In commenting on this, Frederick Dietrich, president of C. Brandes, Inc., recently said the policy of selling headsets on the strength of their resistance is wrong and should be discouraged by dealers. It not only hoodwinks a misinformed public but is a gross injustice to manufacturers who, for sound technical reasons, do not wish to carry the direct-current resistance of their headsets to such a high value. One might as well measure the horse power of an automobile by the size of its carburetor. The average two-thousand ohm headset is as sensitive and, in many cases, more so than the receiver with a resistance of four thousand ohms. Radio receivers should be rated by their impedance. The Brandes headset is designed to have the same impedance as the average circuit in which they are used, since it has been found that this gives maximum efficiency. This impedance varies, of course, with the frequency of the current. The Brandes company has taken, as a standard, one thousand cycles; and, at this frequency, their headsets have an impedance of twenty-two thousand ohms. It has been found that this is the resistance of the average crystal or tube circuit. This, however, does not guarantee the efficiency of a headset, since there are many other requirements and features that determine the operating efficiency and sensitivity of a radio headset.

Mysterious Selenium

Metal Discovered a Century Ago, Now Important to Radio, Will Do Many Things

*By Maurice Freidlander
Live Wire Radio Co.*

SELENIUM is an unknown substance to the layman. Scientists admit that they have not mastered this mysterious, non-metallic, hexad element which occupies an intermediate place between sulphur and tellurium.

It was discovered by Jona Jakob Berzelius, the Swedish chemist, in 1817. It has taken 105 years to perfect selenium so that, in conjunction with radio, it now becomes a foremost substance for the scientist, inventor, and experimenter. F. V. Madaler, after fifteen years of research, has perfected, at his Selenium Laboratories, the most sensitive cells on a large scale which are guaranteed more sensitive than any cell manufactured.

Selenium is produced in two different forms: rods and powder. There are two different colors: reddish brown and black. When melted it has the consistency of ceiling wax and is shiny black color. In this condition, it is practically a nonconductor; but by passing it through a chemical process, it will change in color and become an electrical conductor very sensitive to the light. That means it will alter its resistance to electricity if more or less light is reflected on it.

This very interesting action of selenium started scientific men throughout the world to discover more about this mysterious metal from a scientific and technical form of view. Selenium, it is claimed, will solve interesting radio problems: seeing by wire and producing electricity from day or sunlight.

Selenium cells are already in use for switching on and off electric lights on a life buoy and in outlying districts; starting and stopping machinery at a distant point, by wireless; measuring the light for exposure of camera films; transferring pictures by wire or wireless; measuring light of sun, moon and stars; registering railroad lights and electric-light meters; reproduction of sound waves as produced by music; avoiding friction in electric clocks, assorting cigars, coffee beans, and, in fact, any article where a difference in shade from white to black is to be distinguished; protection against burglary.

The inventor will realize the big field for selenium. The scientist of the past was unable to make or buy the proper selenium cells and, therefore, could not complete his invention. Selenium cells are not easy to make, as the most important feature must be in permanency in sensitiveness and action.

Selling Goods by Radio

Department of Commerce's "Sell-it-by-Air" Service Hailed by Merchants

TIPPING off American business men, by radio, in regard to foreign sales-openings in order to get the jump on America's competitors for the world's markets is the latest trade promoting stunt of the United States Department of Commerce.

Inquiries for American goods coming into the Bureau of Foreign and Domestic Commerce from consuls, commercial attaches, and other government representatives in foreign countries are now distributed to New England manufacturers and merchants, through the air, by the bureau's Boston office in collaboration with the WGI broadcasting station at Medford, Mass.

The service was tried out one night recently, as an experiment. By first mail the

Parthenology

The dictionary says it is pronounced like this: par-the-nol-o-je and means the scientific study of virginity.

Think of the Seventy Thousand who read RADIO WORLD every week that have never seen your advertisement.

Here is a study in virginity, for RADIO WORLD offers you a virgin field to merchandise your radio goods.

Up-to-date radio "fans," dealers, jobbers read RADIO WORLD—because they get all the radio news—four to six weeks earlier in RADIO WORLD than they can get it in any of the old radio monthlies.

Take this little lesson of parthenology to heart, make a scientific study of this new virgin field RADIO WORLD offers you. Write Fred S. Clark, manager of RADIO WORLD, 1493 Broadway, New York for detailed circulation statement, and tested results on keyed advertisements.

Better still, send us a four-time trial order at \$4.50 per inch, right now, before we double our rates. RADIO WORLD is a marvelous, quick-action result-bringer for classified ads; rate, five cents a word.

next morning, several letters were received from nearby firms. One of the leading New England manufacturers of artificial leather, who happened to be "listening in" that night, learned of two possible openings for his goods—one in Mexico and the other in Colombia. He was much pleased, commending the Department of Commerce for taking advantage of "this most valuable time saving device." In the opinion of another New England merchant, the new "sell-it-by-air" service should appeal particularly to the out-of-town manufacturers and merchants who are not in daily contact with the offices maintained by the Commerce Department in Boston, New York, San Francisco, Chicago, New Orleans and other leading cities.

"For example," says this executive, "there are many manufacturers interested in radio who wish to sell abroad, but who are prevented from keeping in constant touch by frequent visits and telephone calls with the trade openings reported to the government agents. As the radio stations reach many outlying cities, it would seem that this service should be of especial value to more distantly situated business men within a wide radius."

Selling American goods in foreign markets, by radio can be extended readily to

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

ANNUAL SHOW OF THE ST. LOUIS RADIO ASSOCIATION, St. Louis, Mo., October 4 to 7, inclusive.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 4 to 22. U. J. Hermann, managing director, 549 McCormick Building.

RADIO CLUB OF AMERICA. First autumn meeting will be held the last Friday in September. Renville H. McCann, secretary, Columbia University, New York.

CINCINNATI RADIO-AND-ELECTRICAL EXPOSITION, Music Hall, Cincinnati, O., October 2 to 7, inclusive.

TRI-STATE TOBACCO GROWERS' RADIO SHOW, Covington, Ohio, October 21 to 23, inclusive.

NEW YORK ELECTRICAL AND INDUSTRIAL EXPOSITION, Grand Central Palace, New York City, October 7 to 14, inclusive.

NEWARK'S SECOND ANNUAL RADIO SHOW, Robert Treat Hotel, Newark, N. J., October 4, 5, 6 and 7.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31, inclusive. Direction American Radio Exposition Company, 120 Broadway.

BOSTON RADIO EXPOSITION, AND NEW ENGLAND AMATEUR CONVENTION, Mechanics Building, Boston, October 30 to November 4, inclusive.

SPRINGFIELD RADIO EXPOSITION, Springfield Auditorium, Springfield, Mass., October 3 to 7, inclusive.

SOUTHERN CALIFORNIA RADIO SHOW. Combined exhibition of the Southern California Broadcasting Association, the Southern California Radio Association, and the Southern California Radio Trade Association. Los Angeles, October 9 to 14 inclusive.

PHILADELPHIA RADIO SHOW, October 3 to 7, inclusive.

other parts of the United States, is the opinion of Dr. Julius Klein, director of the Bureau of Foreign and Domestic Commerce. Director Klein pointed out that his Bureau maintains thirty-four district and cooperative offices in this country in addition to the Boston branch. The sending out of the information in each case is a problem for the local manager to arrange with some nearby broadcasting station as all of them have been authorized to undertake the work.



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Moulded genuine Cantonite.
Requires but small space for mounting. Readily accessible binding posts. No stress metal to interfere with efficiency. Unaffected by heat of bulbs or soldering iron. Probes nickel plated brass binding screws. Flash cut slot. Price possible because of large production.

Special proposition for dealers and jobbers.

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Two important features for next issue of Radio World, Dated Oct. 7

Shall German Vacuum Tubes Be Admitted Free of Duty?

The pros and cons of this important question answered by technical and trade authorities.

A Complete Up-to-Date List of Broadcasting Stations

RADIO WORLD of Oct. 7 will contain also a complete list, alphabetically arranged, of every broadcasting station in this country up to the day of going to press.

Be sure of getting these two important features. Place a standing order with your newsdealer, or subscribe through your news agent at \$2.00 a year (12 issues), \$3.00 six months, or \$1.50 three months. RADIO WORLD, 1493 Broadway, New York.

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 9 Central Ave. Newark, N. J.

RADIO SYMBOLS
 There appeared in Radio World No. 26, dated Sept. 23, a complete table of the radio symbols used in all circuits. If you have not secured your copy send 15 cents. Or, better still, subscribe at \$6 a year; \$3 for 6 months, or \$1.50 for 3 months, and have subscription start with that issue. Radio World, 1493 Broadway, New York.

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 RADIO WORLD wants young hustling subscription representatives in every college, school, factory and big business concern thruout the country. Send us your name and address for full particulars. RADIO WORLD, 1493 Broadway, New York City.

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 Advertising rates on request.

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IMPORTANT NOTICE:
 While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

How Photographs Are Radioed Across the Atlantic Ocean

IF you were to see some one operating what appears to be an ordinary typewriter, and were to observe that the machine was producing a picture instead of a letter, you would doubtless be astonished, says Henry Smith Williams in "The American," New York. Astonishment would not be lessened when you were assured that the picture thus transcribed by the machine reproduces a photograph that had been taken within the half hour over in Europe. The explanation that the picture had come across the ocean in the form of a radio code would not offer much enlightenment.

Yet that phrase describes, after a fashion, the new method of sending pictures by radio that has been developed by Dr. Arthur Korn, of Berlin. The machine that interprets the code is an ordinary typewriter, merely modified so that it types dots of various sizes instead of letters. The operator who receives the code has nothing to do but strike in the sequence the keys representing the groups of letters that have come by radio.

The picture thus typed out is made up of dots of different sizes, much like the ordinary half-tone printed in a newspaper or magazine. The dark portions of the picture are made up of larger dots; the light portions, of small dots; and the intermediate shades of dots variously graded in size. When this is understood it is easy enough to see how the typewriter builds up the picture, and we begin to get an inkling of what the code is like. The letter A, for example, of the keyboard may be represented by a fine dot, letting white paper show to make a high light; and the letter P, toward the other end of the alphabet, by a coarse dot, building up a deep shadow.

It remains, however, to explain how the

code of grouped letters was made at the transmitting end of the line. And this, it appears, was by far the most difficult part of Dr. Korn's problem.

The method, briefly stated, is to roll a negative of the original picture about a glass cylinder upon which a beam of light plays intermittently as the cylinder revolves. Shadows of varying intensity are thus thrown on the surface of a cell made of the strange metal selenium, which has the curious property of transmitting electricity more readily when illuminated. A highly ingenious mechanism causes a telegraphic key actuated by the current passing through the selenium to produce the dots and dashes of the Continental Morse code in such groups as to represent a different letter for each of seventeen graduations of light, so that the letters from A to P are represented.

The message sent by radio consists only of these groups of letters, and, of course, the typewriter that is to reproduce the picture is constructed with the same correspondence between letters and dots.

The transmitting machine works automatically, sending its groups of letters in sequence determined by lights and shadows of the picture; and at the receiving end an automatic recorder may take the message, reproducing the groups of letters in the same sequence. Then a typist, who knows nothing whatever about radio, may reproduce the picture by merely striking the keys of the typewriter in the sequence called for by the copy.

Thus the mystery of sending a photograph by radio across the ocean disappears—but not the wonder of it. Even when we understand how the thing is done, it still remains a scientific miracle.

Amplifier Using Alternating-Current Supply

THERE has been developed at the Bureau of Standards, Washington, D. C., an amplifier which uses 60-cycle alternating current to supply power for both the filaments and plates. The necessity for storage batteries and dry batteries is thus eliminated. The final form of amplifier uses five tubes and a crystal detector, there being three radio-frequency stages and two audio-frequency stages. A description of this amplifier is contained in a paper by P. D. Lowell, "Note on the development of an electron-tube amplifier which uses 60-cycle alternating current to supply power for the filaments and plates," which appeared in the July, 1922, issue of the Journal of the American Institute of Electrical Engineers, volume 41, pages 488-490. It is expected that this paper will also be available as a publication of the Bureau of Standards in a few months.

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35c. Dubilier Condenser28
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PERFECTION RADIO CORP.
OF AMERICA

702 BROADWAY NEW YORK

Had Your "Ethercise?"
Early Morning Physical Culture Now Comes by Radio Waves

SETTING-UP exercises by radio, beginning at 7 o'clock each morning, is the latest use to which the radio has been put. On September 5, a series of weight-reducing and weight-gaining exercises, designed for various members of the family, was inaugurated and broadcasted from Amrad Station WGI, Medford Hillside, Mass., as a regular feature of its program.

The object of this course is to place at the disposal of all radio users the most approved methods of physical efficiency. Three exercise-classes, lasting fifteen minutes each, are held every morning. These personal efficiency courses are in charge of Arthur E. Baird, head of the Department of Physiotherapy, Caines College of Physical Culture.

While this use for radio is entirely an experiment, being the first time such a course has ever been attempted by radio—in fact, the first time a radio broadcast has been given at this hour of the day—reports indicate that the exercises are being tried by people all over New England. One young woman wrote in that the little girl of the house, arising early one morning, saw her mother bending over and waving her arms with the telephone receiver on her head. The little girl was so frightened that she notified the neighbors.

The three sets of exercises are graded as follows: the first for the normal business man or woman who wishes merely a set of toning-up exercises; the second for those who are overweight and wish to reduce, and the third for those who are underweight and wish to build up. The exercises are accompanied by talks on personal hygiene.

An Epitaph

BILL, the burglar, tried to crack
A safe protected through the back;
The let-loose voltage wasn't slow,
And Bill's gone where the burglars go.
—"Practical Electrons."

The "COPPER GIANT" "B" Battery

IS GUARANTEED FOR TWO YEARS in ANY receiving set, because it does not deteriorate while standing idle. This is a very large battery designed for stationary or semi-portable installations where absolute reliability over a period of years is the first consideration. Standard voltages—22, 50 and 100. Any voltage made to order. Write for illustrations.

J. A. RITTER, Lansdowne, Pa.



Agents

LARGE MANUFACTURER OF SHIRTS wants Agents to sell complete line of shirts direct to wearer. Exclusive patterns. Big values. No capital or experience required. Write for free samples. MADISON SHIRT MILLS 507 Broadway New York, N. Y.

\$4.00 CONDENSERS, \$1.38

Very finest 43 or 23 plate

\$6.50 PHONES, \$3.98

3000 Ohm Turnneys

RADIO ENGINEERING COMPANY

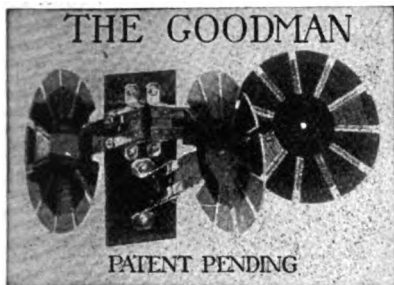
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For the Biggest Proposition in Radio.
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Pictures and Facts About Armstrong Amplifier

Radio World has published a number of pictures, diagrams and descriptive articles regarding the New Armstrong Super-Regenerative Amplifier. The numbers containing this material are dated June 24, July 8, July 15, and August 5. They will be sent postpaid on receipt of 15 cents each, the four copies complete for 60 cents. Or you can subscribe, \$6.00 year; \$3.00, six months; and have your subscription start with the number dated June 24. RADIO WORLD CO., 1400 Broadway, New York.



The Nickest Short Wave Tuner on the Market
Only \$6.00 & PP on 1 lb.
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Remington Terminal Indicators

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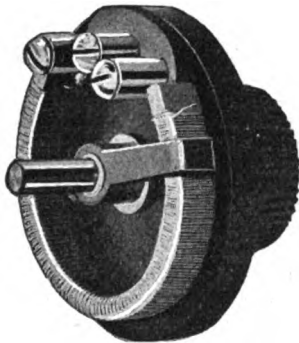
A perfect panel engraving imitation. Fits any binding post. Black japanned, white enameled letters. Supplied in the following: Antenna, Ground, Phones, Grid, Input, Output, A Bat +, A Bat -, B Bat +, B Bat -. Lettering in two positions. Order direct from ad.

Dealers Write for Discounts!



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COMPACT—POWERFUL, Beautiful in Appearance and a tone AS CLEAR AND NATURAL AS LIFE

These things make

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TRADE MARK PATENT PENDING

THE IDEAL LOUD SPEAKER Complete with Unit and Cord

COMPACT—less than 8x5½x5 inches yet the SPIRAL sound chamber is two feet long—as long as the horns used in the very largest instruments.

POWERFUL—direct comparison with other speakers costing up to \$25 shows SPIROLA CONCERT to give greater volume. Using a small aerial and an ordinary set with two stages of amplification we receive Atlanta, Ga.; Nashville, Tenn.; Kansas City, Mo.; and St. Louis, Mo.—stations from six to seven hundred miles away—so loud they can easily be enjoyed by a roomful of people. Nearer stations come in as loud as the loudest phonograph music.

BEAUTIFUL—finely proportioned, with a fine hand rubbed natural wood finish and bronzed throat, we believe you will agree with us that SPIROLA CONCERT is the most beautiful loud speaker on the market today.

FLAWLESS REPRODUCTION OF SPEECH AND MUSIC—this is what SPIROLA CONCERT was primarily designed for—to eliminate the distortion and metallic tone so commonly heard—and we have succeeded completely. We want you to actually hear SPIROLA CONCERT for yourself. If you are a doubter due to previous experience so much the better. If you can not find it at your dealer send us \$12.50 and we will send it to you prepaid. Try it out for ten days and then if you wish you can send it back and your money will be immediately refunded. We take the risk.

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One Year (52 Issues).....	6.00
Add \$1.00 a Year for Foreign and Canadian Postage.	

Radiofacts

A VACUUM tube may be used as a rectifier, or detector, of high-frequency oscillations. When connected up to the proper circuit, it performs this function with as much efficiency as the crystal detector.

The chief problem connected with direct transmission by wire and radio, those of amplification with proper modulation, seem to have been solved, and the happy combination of wire phone and radiophone opens up new fields of usefulness to these twin wonders of modern science.

Practically every minute of the day and night the radio news of foreign countries comes over the radio waves. If you have a radio apparatus with vacuum tubes adapted for short-wave receiving, you might as well increase the inductance and capacity, or put up an extra long antenna and listen to the stations in almost any country on the globe.

Arlington broadcasts its time signals 11.55 a. m. to 12 noon, and from 9.55 p. m. to 10 p. m., Eastern Standard time.

Having your aerial higher at one end than the other will not be a disadvantage under the circumstances, but a complete advantage, because it will place it diagonally in relationship to the aerial of your neighbor, rather than in parallel.

Why not a "radio-order house" to supplement the mail-order business during congested shopping periods, such as Christmas?

There is one material in the many places of radio apparatus that cannot be replaced by any substitute scientists have as yet discovered. This material is mica, a mineral substance having unique dielectric properties. It resists the passage of electricity even at remarkably high voltages. It is a material which forms an invaluable function in radio.

Learn the code if you want to get the full enjoyment to be found in radio as a hobby.

In stores where the radio department represents an investment of \$1,000 or more, that department should be put in charge of, not necessarily, a radio expert but a man who is thoroughly familiar with radio parts, installations, and hook-up problems.

It is more than probable that within another year every town of any size in the United States and Canada will have a broadcasting station.

When one considers that a good talking machine costs at least \$100 and a good radio-receiver from \$15 to \$20, it is obvious, as the technical details are perfected, to what extent radio will grip the public.

American radio companies are developing systems of radio communication with Central America, with New Orleans as the main centre for American reception and transmission.

The principal reason why radio-telephony is very little known in Italy is because all the inventors find that if they wish to have a chance to sell their inventions they must go abroad.


The rheostat is necessary because it regenerates the brilliancy of the filament. If the rheostat is turned so as to increase the brilliancy, more electrons will flow in the tube.

Slate, electrically, is a very poor dielectric and nonconductor. It was used in past years as a panel for transmitters, but it has not been used for receivers. At present, nothing is superior to bakelite or hard rubber.


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 Variometers\$2.00
 Variocouplers 2.00
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 Variometer Brass Set..... .40
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NA-ALD
 GENUINE
 CONDENSITE DIAL
The dial that runs true.
 Numerals engraved on bevel and knob so shaped that fingers do not bite them. Thin edge with clear graduation to make accurate reading easy. (Concealed set screws in metal insert. Will not warp or slip. Finish and enamel permanent. Low price with this quality possible only through quantity production.
Special dealer and jobber proposition. An opportunity.
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The Teleradio Tube Socket
 Whose handsome design is adapted for table or panel mounting. Of shell-drawn aluminum. All parts perfectly insulated—legs are not current-carrying. Terminals plainly marked.
 List Price, 60c



2,000 Ohms, \$6.50
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 Each
 Teleradio Supersensitive Headsets equal the performance of phones selling at \$12.00 and \$15.00.

If your dealer has not stocked Teleradio Products write us direct
DEALERS and JOBBERS write for our PROPOSITION

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 Variable Condensers, 3, 11, 23 and 43 Plates, list prices are \$1.50, \$2.50, \$2.00 and \$4.00, respectively. Filament Protectors, 60c. Fixed Phone and Grid Condensers, 35c each.

TELERADIO ENGINEERING CORPORATION
 484-490 BROOME STREET NEW YORK

Trying to "Raise" Us
 SOMEHOW the song hits sent out by radio don't seem so charming without the accompaniment of dancing silk-clad legs," says the pert paragrapher of "The Evening Telegraph," New York.

"Just think! When old Doc Snodgrass was examining my heart action with a stethoscope yesterday he all of a sudden calls out, 'Hello! Hello! Is this Central?'"

"The radio thinks it says he that has ears to hear, let him hoist an aerial," was thought out by "The News," Dallas, Texas.

Despite the hopes of inventors and ex-

perimenters the radiophone will never replace the telephone. It's too easy to hand a person "a good talking to" by telephone without giving the other fellow a chance to "talk back." With the radio, one can swear a blue streak into the transmitter and unless the desired recipient is "in tune" he can't hear a word of it.—"The Mail," New York.

Radio has afforded the young thing (the modern flapper) an opportunity to

give her all-too-celebrated "line" a fresh twist, we gather from "The Globe," New York. She adopts semi-technical radio terms under the delusion that it adds smartness to her characteristic lingo. "Quit the static," she warns her "tweddie" when the latter shows signs of becoming boring. Or, not being a mental contortionist, sometimes he fails to follow the trend of her conversation. Then, "Tune in, old dear," she advises him, "there's been a change in the daily program!"

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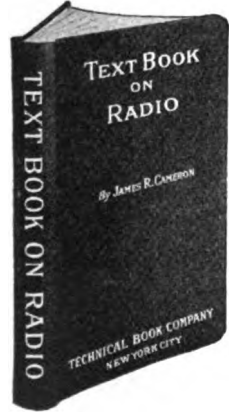
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Complete 50c. instruction book for 30c. only on radio reception and how to make eight classes of crystal and vacuum tube receiving sets. Wonderful information makes you understand radio. With every order we send free our price list of parts prepared especially for the several sets described. Buy direct from factory and save many dollars. Both instruction book and price list sent on receipt of 30c. only. Money back if not pleased.

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Be a Radio Expert. Make big money. Win success in this new, uncrowded field. Trained men needed. \$1,800 to \$6,000 a year easily earned. I will train you quickly, at home, in your spare time to construct, install, operate, repair, maintain and sell radio outfits. Short course, low cost, easy terms, money back guarantee. Write for "Radio Facts" FREE. Engineer Mohaupt, American Electrical Association Dept. D-2, 4513 Ravenswood Av., Chicago, Ill.

GOING—and Going Fast

We have only a few left and they are going fast, but while they last we will continue to sell them at the reduced price.

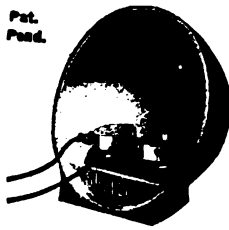
VT 1 Detector and Amplifier.....\$7.50
VT 2 Detector and Amplifier.....\$8.00

The above tubes are the genuine army J's and K's, respectively.

"RADIO BUILDER" PLANS FREE!
By Mail, 5c.

LIBERTY RADIO CO.

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Pat. Pend.  **SHELTON LOUD SPEAKER**
No tubing or horns to distort delicate notes. Swells every sound into full richness!
SHELTON CO.
20 Clinton Street
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\$5.00 AT ALL GOOD DEALERS OR DIRECT BY MAIL

GITHENS TRUTONE RADIO HORN—LOUD SPEAKER


First one to sell on ten day trial Money back Guarantee
Retail Price \$21.00 Includes Loud Speaker

Trutone has been pronounced the best on the market by experts. It has a clear true tone. Every radio fan should try Trutone and compare it with others. If YOU don't find Trutone the best, your money will be refunded. It is sold on a ten-day trial money-back guarantee. If not carried by your dealer write us.

Distributors and Dealers, write!

AUTO PARTS MFG. CO.
1815 Trombly Ave., Detroit, Mich.

A Broadcasting Corporation to Stabilize Radio

AN interesting plan for putting radio broadcasting on a permanent basis is now being discussed among the makers of radio apparatus, says "Electrical Merchandising."

The plan proposed calls for a "public-service broadcasting corporation" organized not to earn money but to spend it, and to be operated under the direction of—not radio or electrical men—but experienced entertainment people who know the public's tastes in music, lectures, and amusement programs. To the funds of this broadcasting corporation, the manufacturers would be asked to contribute two per cent of their gross sales of radio apparatus. Figuring \$100,000,000 of radio sales this year, it will be seen that the new broadcasting corporation would start operations with an annual budget of \$2,000,000. Independent manufacturers and jobbers and dealers would also be given an opportunity to contribute to the broadcasting pool, inasmuch as all would benefit from a plan which made radio increasingly popular with the public.

In this way, at least, one of the knottiest problems in the whole radio situation seems to be on the way to a solution. With a dependable broadcasting service in operation, the dealer can sell radio outfits with the fullest assurance of his customers' satisfaction.

Navy Day in the Air

RADIO broadcasting will be employed in connection with the celebration of Navy Day designated as Friday, October 27, by Theodore Roosevelt, Jr., assistant secretary of the United States Navy, at the instance of the Navy League. While representatives of the Navy League and other Naval organizations throughout the country will undertake to promote general interest in the Navy and its gallant traditions through meetings, concerts, banquets, and with the aid of the moving-picture industry, a number of the larger and more powerful broadcasting stations have been requested to send out a radio program. In this connection, all Naval stations have been ordered to assist in making Navy Day a national celebration to be remembered by radio fans. Either the Navy or the League will furnish speakers, glee clubs, or other forms of entertainment to radio stations cooperating.

A special program is being planned for the Naval Station, NOF, Anacostia, D. C. It is probable that either Secretary Denby or Assistant Secretary Roosevelt will deliver a speech on the work of the Navy. The Marine Band is scheduled for a special concert which will probably be broadcast from Anacostia.

The gigantic scheme of entertainment for Navy Day will, by the aid of radio, be carried not only to municipalities, but into the very heart of the country in every State, and every fan who owns a radio set should watch for the schedules and prepare to listen in.

WJZ, Newark, N. J., got one step ahead of the Navy League by offering its station one night each month for transmitting speeches and entertainment. Such nights will be known as Navy nights. Naval officials of New York have accepted the offer of WJZ and plan to use, as one attraction, the Naval bands of such ships as may be in port on Navy Night.

Letters from the Navy League to the Department of Commerce District Radio Inspectors have asked their cooperation in securing the aid of broadcasting stations. It is said that most of the large newspaper broadcasters from the Atlantic to the Pacific Coast will also assist in broadcasting Naval achievements.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

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RADIO MAILING LISTS

6906 RETAIL RADIO DEALERS covering the United States, by states, price per thousand.....\$7.50
888 Radio Manufacturers, per list.....10.00
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These are neatly typewritten and ready to send on receipt of remittance covering the amount. Guaranteed 98% correct.
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Ford Roadster Top Re-covering \$5.20. Touring \$6.95, and \$9.95. Chevrolet, Dodge or Maxwell \$13.95. All other 5 passenger cars \$16.50 with plate glass lights. Regular Side Curtains \$3.95 up. Special Winter Side Curtains that open with doors \$11.99 up. Ford Seat Covers \$2.16 up. Ford Cushions \$5.75. All goods same as car mfrs. use. Quality the best and guaranteed to fit. Printed instructions given how to apply. Send for samples. Prices above include delivery at your door.
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Manufacturers' Guarantee 1000 Burning Hours
This is a real \$5.00 value

43 Plate Condensers .001 Mfd..... \$1.95
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"MIRAD"

"Quality Radio Priced Right"

3 Plate Variable Condensers..... \$1.50
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(Money back guarantee.)
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Constant voltage, large amperage. Will run
two months without recharging.
Attractive Dealers' Discounts
Write for Details
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Buy your Radio Supplies at a large dis-
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Improve Your Crystal Set
Solid Gold Contact Cat Whiskers. Will
Not Corrode, Rust or Oxidize. Will last
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Special "EDMAR" Mounted Crystals. If
it isn't the best you ever used, return it
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Sold Knock-Down Only (Without Knob
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23-Plate\$1.85
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3-Plate (Vernier)..... 90c

Order Direct From Us. Sent Postpaid to You.
The Eddy-Marsh Company
86 Westminster St. Providence, R. I.

**Turning Print Into Sound
by Radio**

THE Lee de Forest talking film (or "phonofilm"), can be hitched, after the film is developed, on to broadcasting instruments, it is claimed, so that the voice pictures can be wirelessly great distances and then turned back again into sound waves, says "The Times," New York. So far, the problems of running a typewriter or a linotype by sound waves has not been mastered, but close approaches to it have been made.

By the use of light similar to the photography of sound waves by Mr. de Forest, the printed word has been turned into sound, so that the blind can read by ear. The arrangement of black and white in the ordinary letter causes such varying effects when the letters are intensely lighted and passed over selenium photoelectric cells that the electric current can be controlled by them so as to produce sounds which the blind can interpret into letters.

In both the de Forest invention and the machine which renders the printed word into sound for the blind, the key is the peculiar property of selenium. In darkness this substance is resistant to electricity. In light it conducts electricity. In varying light it modifies the current of electricity passing through it. In the de Forest invention the aperture for the admission of light for the sound-wave photography is said to be in some way controlled by the vibration of the sound. This produces the variations in the sound pictures on the film. When reproduced these variations modify the light which passes through. The modifications of light keep the electrical resistance of the selenium cells in constant variation. The electrical current, is thus controlled by the pictures of the sound waves. The current is magnified by the audion tubes and in turn it controls a diaphragm or microphone, like that of the ordinary telephone receiver, finishing up the process of reconstructing the sound.

**When There's An "R"
There's Radio**

OYSTERS are in season and so is radio. Curiously, the two seasons coincide; if there is an "R" in the month, radio transmission is good. The radio season opened officially on September 1, and is now in full blast. In anticipation of the unprecedented interest in radio during the fall and winter, the Bureau of Navigation, Department of Commerce, is taking steps to minimize interference and insure, so far as possible, strict compliance with the law. The radio inspectors in each of the nine districts have been instructed to cover the principal radio centers and points where serious interference may be expected. On these trips they will inspect stations for license, examine applicants for radio-operators' licenses and determine whether the transmitting stations are adjusted to meet the requirements of the law.

**Claims Spirits Talk by
Radio**

MRS. M. E. CADWALLADER of Chicago, vice-president of the National Spiritualists' Organization, says that she has made plans for the broadcasting of messages from the dead that may be received throughout the length and breadth of the land by all who care to hear. John Slader, a Chicago medium, it is reported, is working with Mrs. Cadwallader. There is no hesitancy in Mrs. Cadwallader's assertion that the dead actually converse with certain members of the living human race and her announcement that these messages can be broadcast, as if they came from the living throat, has been greeted by the true believers with acclaim.

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Detectors | Amplifiers
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Detectors and Amplifiers repaired for \$2.50.
The repaired tubes, we warrant, will give you the same absolute satisfaction that you would expect to receive from new tubes.
We are now in a position to give guarantee for prompt deliveries with satisfactory results. A reasonable trial will confirm our reliability.
George H. Poroll Co., Inc.
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Adjustable in Place
MICAPHONE
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Put Them in Your Phones
Made for All phones
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Ask Your Dealer

Radio Supplies
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Sockets, Rheostats, Etc.
Guaranteed **Crystal Set \$4**
Or Money Refunded PRICE,
Send fifty cents for 20 efficient blue-print hook-ups.
Any Radio Set Made to Order
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MILLBRO RADIO SUPPLY
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NOVO B BATTERIES
Medium Variable, \$1.00; Large Variable,
\$1.50. Exide Storage Batteries, 80 am-
pere hours, \$19.75.
Full Line of Radio Parts at Extremely Low Prices

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22½ - 45 & 105 VOLTS
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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified advs., if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 6794.)

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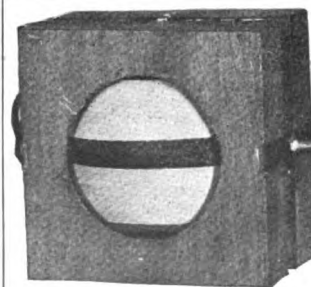
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Radio - Frequency Amplification Explained

Interview with Charles Kilgour, Radio Engineer, Brings Out Interesting Information in Regard to Phenomenon of Radiotelephony

ALTHOUGH radio frequency amplification is no mystery to the average amateur, there are many, especially those who have but recently become radio fans, who will be interested in a brief explanation of this phenomenon. Mr. Charles Kilgour, radio engineer, in charge of the corps of engineers employed by the Crosley Manufacturing Company, operators of the radio station WLW, in Cincinnati, Ohio, has made a close study of radio frequency amplification.

"Everyone knows the purpose of the ordinary two-stage amplifier is to make louder the sound as originally received through the detector tube or crystal," says Mr. Kilgour. "This amplifier makes any audible signal louder; therefore, it is called an audio-frequency amplifier.

"The extremely weak electrical alternating currents induced in the antenna circuit of the receiving set have a frequency far too high to produce an audible effect on the head phones. Broadcasting stations usually use the 360-meter wave-length, which means that the current picked up has a frequency of more than 800,000 cycles per second. The lowest note of the piano or organ has about 16 beats, or cycles, per second, while the highest beats approximately 8,000 times per second.

"The high-frequency current picked up from the broadcasting station is called a radio-frequency current, because it is at this high frequency that the message is radi-

ated through space. Combined with the radio-frequency pulsation there is a low frequency variation which is the part we wish to hear. The detector so alters the current that the high-frequency part has no effect on the head phones, while the low-frequency part acts upon them, causing them to give out an audible note. This is called rectification.

"Understanding this, it is apparent that a radio-frequency amplifier does its work before the detector has acted. It is inserted in the set between the tuner and detector. As in the case of the audio-frequency amplifier, a vacuum tube with its proper circuits is used to strengthen the electrical current. In this case, however, this is accomplished before the current has been rectified by the detector. One stage of radio-frequency amplification will not have as great an effect on the output as a single-stage audio-frequency amplifier of proper design, but it has several important advantages.

"If a great volume of output is desired, why do we not use more stages of audio-frequency amplification? We cannot ordinarily use four or six stages because audion amplification becomes very noisy when cascaded in this manner and sounds generated in the tubes themselves have a tendency to drown out the signal. On the other hand, a radio-frequency amplifier does not have this bad quality in anything like the same degree."

Latest Foreign Radio News

THE first radiotelephone system to be established in Japan, will communicate between Fukuoka in Kyushu and Fusan, Morea. It is planned to connect this line with land lines. Considerable delay has been experienced in its installation, but the station, from latest reports, should be in operation. The next installations planned by the Department of Communications of Japan are from Kyushu to Formosa and from Kyushu to Tsushima in the south and from Hokkaido to Saghalien in the north. A company is now being formed to establish a radiotelephone system between Kagoya and Osaka, a distance of about 120 miles.

Effective June 1 last, the legal time in Poland will be the same as that of Central Europe.

French radio-compass stations in Algeria, France, and Morocco give bearings on 450, 600, or 800 meters, as the ship station may desire. For each bearing a charge of 6 francs is made. American ship stations should obtain these bearings on the 800-meter wave.

The new wireless station at Shabolevka, in Moscow, was able to receive messages from the recent Conference at Genoa. Messages are sent by the commissariat for foreign affairs through this station. The receiving department is equipped with three apparatus, all of Russian construction. The station has two masts each 560 feet high.

The wireless coast station at Bonifacio, Corsica, will communicate with any ship desiring information of meteorological order relative to barometrical pressure, wind (direction and velocity), condition of the sky, barometrical tendency, and the visibility and condition of the sea. The land line tele-

graph rate is 3 cents per word and the coast station rate is 8 cents per word. The same information (given by Bonifacio) is obtainable from the station at Marseilles. The rate is the same.

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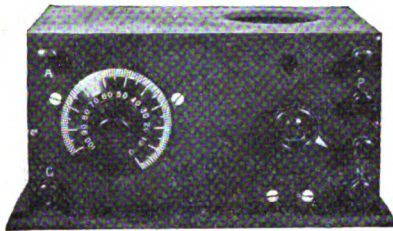
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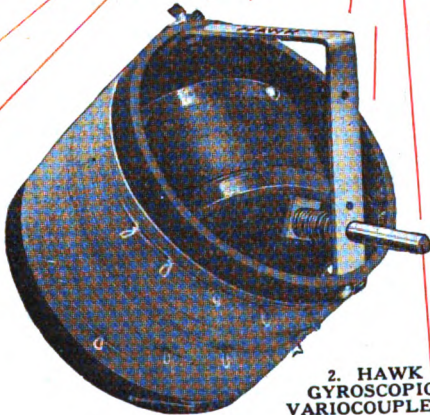
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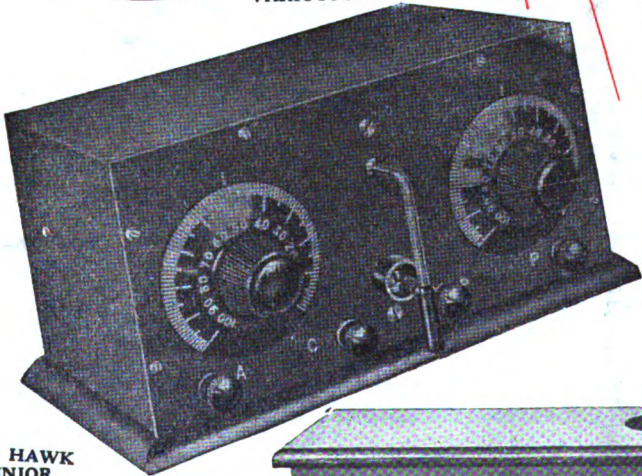
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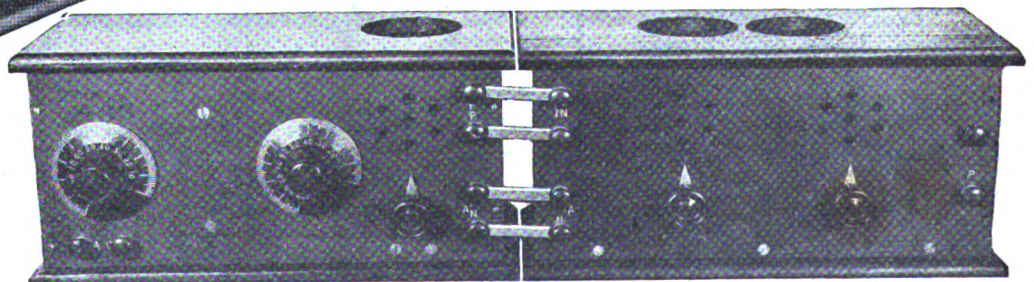


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the tube from the outside and a small loop should be left outside the building to permit the rain and water to drop off both the lead-in and the insulating bushing.

Where it is not considered advisable to drill a hole in the window frame, a small board may be placed underneath or above the window, and a hole drilled through this board. Either of these methods will permit opening the window without interfering with the wire. Both meet the requirements of the Fire Underwriters. Where a window is permanently closed, a small hole may be drilled in the glass and the wire brought through the glass.

The proper grounding of the ground wire sometimes puzzles an amateur. The ground clamp is a strip of metal made to fasten around the pipe. It is held in place by a clamping device. It is important that the pipe be scraped very clean. After being sure that the pipe is cleaned the ground clamp may be attached. The small photograph above shows how to connect the ground to the ground clamp.



(Both photos C. Kadel & Herbert News Service.)

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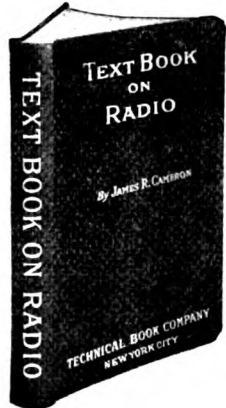
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Vol. II, No. 2

October 7, 1922

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Superheterodyne Receiver as Applied to the Armstrong Superregenerative Circuit

By Charles R. Leutz

DURING the past five years, considerable expert engineering has been directed toward finding an efficient and satisfactory method of amplifying radio-frequency energy at short wave-lengths. A glance at the characteristic curves of the present available detector tubes will show a very weak signal cannot be rectified efficiently or completely. In view of this, additional audio-frequency amplification would not be of assistance. All detector, or rectifier, characteristic curves indicate that the resultant audio-frequency current is approximately proportional to the square of the impressed radio-frequency voltage. Therefore, the efficiency of the detector decreases rapidly with decrease of signal until a stage is reached at which the detector almost ceases to

function. Many types of amplifiers have been devised to magnify radio-frequency energy before applying it to the detector; and many have worked very well on long wave-lengths—resistance, inductance, or capacity couplings. However, to use the same method of coupling for extremely high frequencies corresponding to wave-lengths of 50 to 200 meters, most results have been complete failures. There is a good reason for this. The low-capacity reactance existing between the structural elements of the amplifying tubes acts as the equivalent of a dead short circuit around the cou-

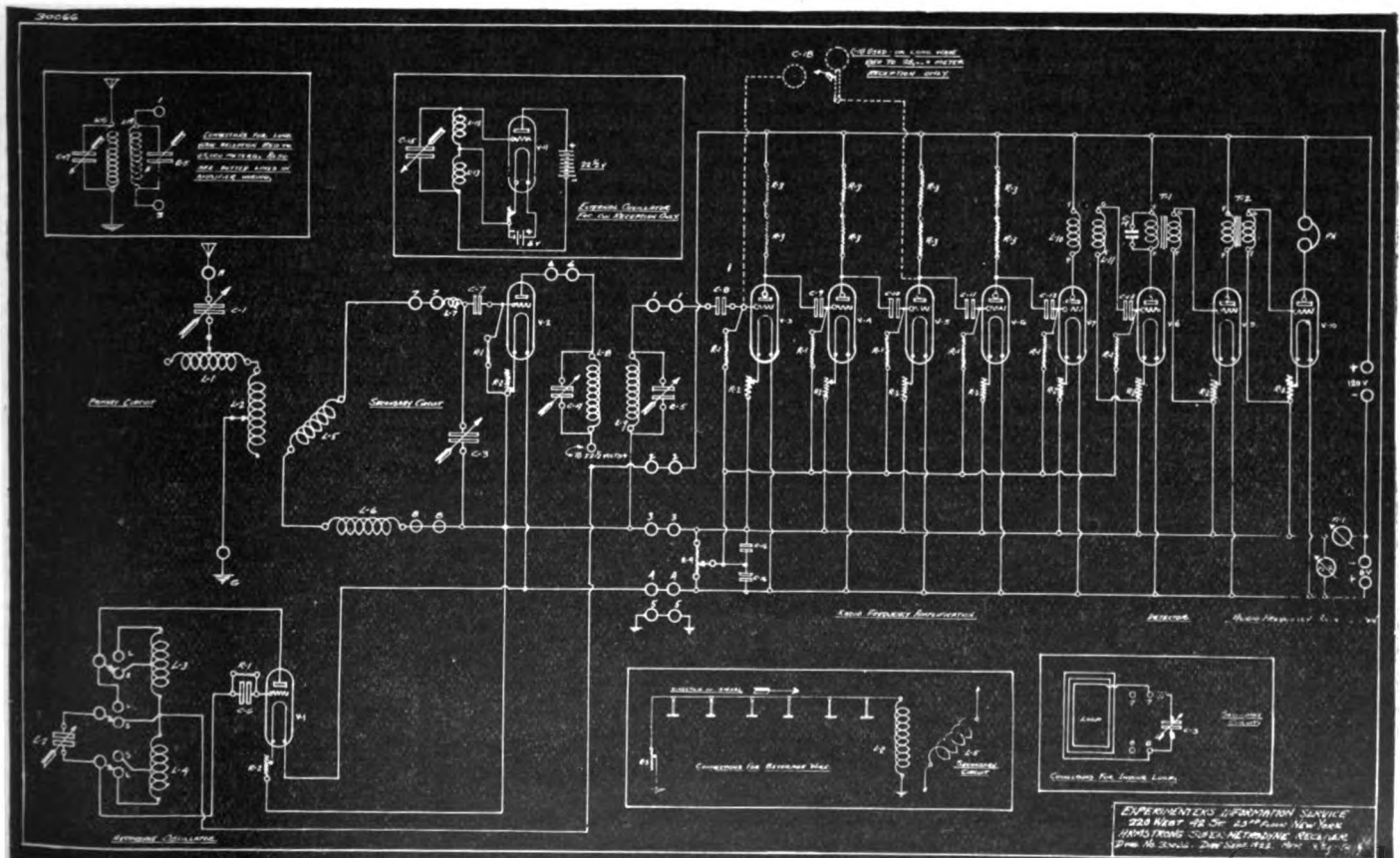
pling medium and prevents a difference—a potential being transferred to the exterior plate-circuit.

This short circuit can be eliminated by tuning with a parallel inductance, but this leads to difficulties in the form of complicated adjustments and local oscillations.

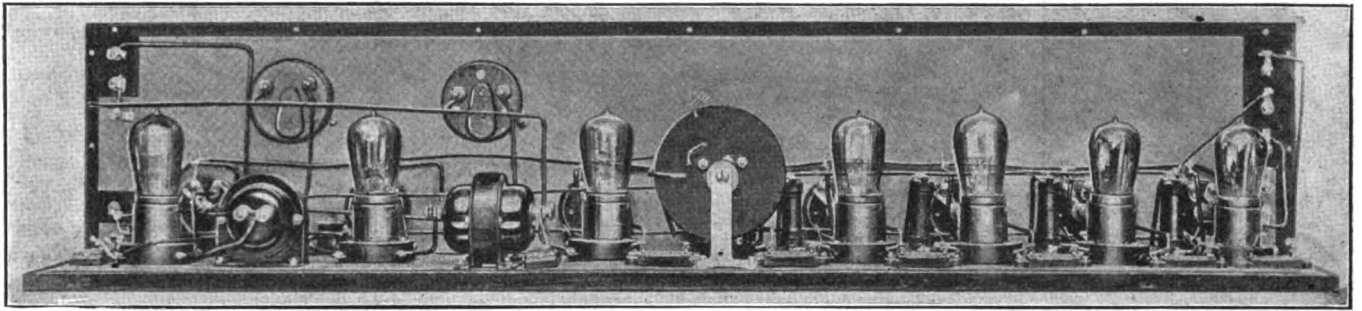
The French and English have constructed special tubes with a view to reducing the internal capacity, by special design. In addition, they have designed special transformers; but the efficient results in each case have been confined to a narrow band of wave lengths; for example, 300 to 700 meters.

Any attempt to increase the effective working wave-length band, particularly toward lower waves, has resulted in failure. It is obvious that if the receiver is to have a com-

(Continued on page following)



Schematic design of the Armstrong superheterodyne receiver fully described in this article



Thos. Coke Night, Photographer.

Illustration showing the rear view of the panel with the instruments mounted. Seven tubes are used for this particular hook-up. The arrangement should be given close attention, as this is the best method for wiring such a set.

(Continued from page 3)

mercial value a range of wave lengths from, say, 100 to 850 meters must be available with a minimum amount of adjustments and with uniform efficiency over the entire wave-length range.

In December, 1919, Major Edwin H. Armstrong gave publicity to an indirect method of obtaining short-wave amplification, called the superheterodyne. The idea is to reduce the incoming frequency which may be, say, 1,500,000 cycles (200 meters) to some suitable superaudible frequency which can be amplified sufficiently, then passing this current through a radio-frequency amplifier and finally rectifying and carrying on one or two stages of audio-frequency amplification if desired. Transformation of the incoming signal-frequency to the amplifier frequency is usually accomplished by a heterodyne oscillator and rectifier.

This action may be understood readily by referring to the wiring diagram. The primary circuit, C-1, L-1, L-2, is tuned in resonance to the incoming signal-frequency—say, 1,500,000 cycles. The secondary circuit, L-5, L-6, L-7 and C-3, is tuned in resonance to the primary circuit, the coupling between these two circuits being adjusted between L-2 and L-5. V-2 is a rectifier or usual detector tube, and V-2 with the associated parts is an external heterodyne-oscillator. V-3 to V-8 is a resistance-coupled radio-frequency amplifier designed to operate efficiently at a frequency of 100,000 cycles, corresponding to 3,000 meters, the last stage of this amplifier (V-8) also acting as a de-

detector rectifier. The amplifier on the input side is coupled to the first detector by the tuned circuits C-4, L-8 and C-5, L-9, and on the output side to the detectors and audio-frequency amplifier tubes. L-7 is in inductive relation to L-4.

Now, assume that the heterodyne oscillator is tuned to 1,400,000 cycles or 1,600,000 cycles, either position will produce a beat frequency of 100,000 cycles. The combined currents of 1,500,000 cycles and 1,400,000 cycles (or 1,600,000) are then rectified by the detector V-2 to produce in circuit (C-4 L-8) a direct current with a superimposed 100,000-cycle component. This 100,000-cycle component is then amplified by V-3, V-4, V-5, V-6 and rectified by V-8 and the resultant audio-frequency note amplified by the audio amplifying tubes V-9 and V-10. In the case of continuous-wave reception, the best method of obtaining the audible note in the phones is to employ a second heterodyne adjustable to 1,000 cycles either side of the amplifier frequency of 90,000 to 101,000 cycles, and loosely couple this to the amplifier circuit. It is also possible to receive continuous-wave signals but producing oscillations in the amplifier of a slightly higher or lower frequency than the amplifier-tuned transfer wave-lengths. Oscillations and, also, regenerative amplification can be controlled by the special condenser, C-18. This special condenser must obviously have a very small minimum capacity or it would be difficult to stop the amplifier from oscillating.

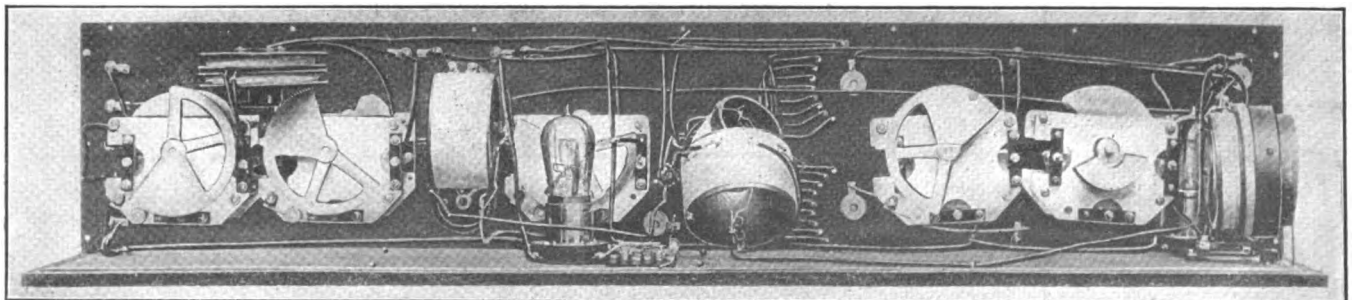
Reception of spark and telephone

signals can be carried on with equal efficiency and without any distortion, which is odd inasmuch as heterodyning a spark or telephone signal with an ordinary regenerative receiver will result in loss of note or tone. The efficiency of rectification of the incoming signal, when heterodyning depends on the phase relation with the local current. The efficiency of the rectification is a maximum when the two currents are 180 degrees out of phase, or in phase; a minimum when 90 degrees out of phase.

In ordinary heterodyning, the initial phase difference will be different for each wave train from spark transmitters, as the initial phase difference depends on the sparking at the transmitter. The frequency of the two currents are practically the same, and the length of the wave train is small compared with the time required to form a complete beat at audible frequencies. Different wave trains are, therefore, rectified with different degrees of efficiency and the plate current becomes irregular.

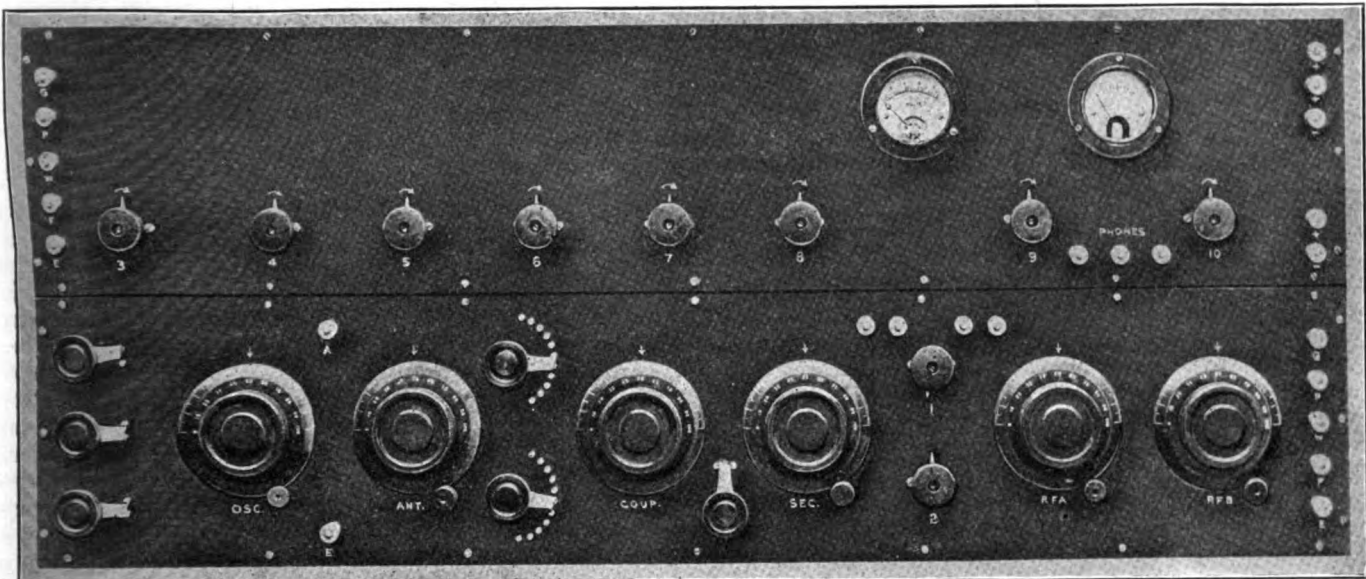
The beat frequency is high in the superheterodyne—several beats per wave train being established. The phase angle between the two currents changes through a number of cycles and the initial phase difference need no longer be considered.

The adjustments for 1 C-W and telephony are a combination of the previous mentioned adjustments for spark and C-W reception. Bear in mind that the amplifier circuits should be damped slightly to prevent distortion due to maximum resonance.



Thos. Coke Night, Photographer.

Photograph to illustrate how the apparatus works in conjunction with the set in the photograph at the top of this page.



Thos. Oaks Night, Photographer.

Photograph of the front of the panel showing its appearance after the set is finished. This is the Armstrong superheterodyne receiver used for short-wave reception.

The present equipment being used is shown schematically in the wiring diagram, and actually in Figures 1, 2, and 3. The radio-frequency amplifier circuit is designed for 3,000 meters. Special attention has been paid to the effective design of the receiver circuits. L-2 and L-5 consist of a 180-degree coupler and give a 180-degree scale movement to a 90-degree coil relation. The condenser, C-3, has shaped plates to give a straight-line wave-length variation. The maximum capacity of this condenser is very low and the values of inductance are large in order to develop the largest possible potential on the detector grid. In view of the fact that a loud signal is produced with only a fraction of a volt on the detector grid, the ratio of L and C is important. To keep the high-frequency resistance low, the coils are designed to have very low values of distribution capacity and the condensers are of special design, having only one-tenth the resistance of the ordinary condensers. The inductance, L-5, is used in parallel to C-3 to give the first wave-length the range 150 to 450 meters; and L-6 is connected in series to L-5 and both in parallel to C-3 for the second range—310 to 850 meters.

As the mechanical distance between L-8 and L-9 is increased, the tuning becomes sharper and a very high degree of selectivity can be obtained. The output resistors, R-3, can be replaced by iron-core chokes

of proper value. The resistors can also be replaced by inductances and capacities, each tuned to 3,000 meters and give an additional advantage of having the amplifier reject all frequencies but the frequency to which it is tuned. The last stage of radio-frequency amplification is coupled by the tuned transformer, L-10, L-11. A potentiometer is provided for the common grid-leaks on the radio-amplifier tubes providing a means to adjust the characteristic curves to a point when maximum amplification is obtained without chance of the amplifier oscillating. The complete equipment is built in two units each entirely shielded with 10-ounce copper. The phone cords are also shielded with Belden braid. The shields are connected to the negative side of the filament battery.

To use a loop the links are taken out at posts 8 and 7, and loop inserted there using C-3 to tune. For long-wave reception, a large inductance is connected in place of L-9 for the secondary and that coupled to the antenna. The resistance-coupled amplifier will function down to 850 meters. The long-wave reception would not be possible if a tuned radio-frequency amplifier was employed. The first rectifier, V-2, and heterodyne V-1 are not used, of course, for long-wave reception.

Material increases in signal audibility can be made by inserting a variometer in the detector plate

lead, at post 6, 6, tuning the plate for regenerative amplification. In place of tuning the plate, it is also possible to provide inductive coupling between the plate and grid of the detector, V-2, in the usual manner.

The results obtained with this unit have been very satisfactory. The antenna used was 125 feet long and 50 feet high, located in New York City. On 600 meters, spark signals from NGE (Miami), NAU (San Juan), NAR (Key West), NAW (Cuba), NAP (Pensacola), NAO (New Orleans), VCE (Cape Race), and ships in the canal zone were received with sufficient audibility to be heard 50 feet from the telephones. On 360 meters radio-telephone signals from KYW (Chicago), WOC (Davenport), WWJ (Detroit), WHB (Kansas City), WSB (Atlanta), WHA (Wisconsin) were received with the same signal audibility. On 200 meters, a continuous stream of 8th, 9th, 4th and 5th district amateurs were near. All these results were obtained in the late summer with the usual heavy static conditions.

This data, photographs, and schematic drawing of this design were supplied through the courtesy of the Experimenters Information Service, 220 West 42nd Street, New York City. This firm has available for distribution complete sets of blue-prints covering the entire construction of this equipment.

TWO IMPORTANT RADIO ARTICLES IN NEXT WEEK'S RADIO WORLD

Dated October 14. On Sale October 11.

Using the Vario-Coupler on a Short-Wave Regenerative Set, by George W. May.
What Makes the Radio Receiver Work, by Donald Van Wyck.

FULLY ILLUSTRATED WITH HOOK-UPS AND SCHEMATIC DIAGRAMS

Radio to Play Important Role in New Aircraft Carrier, "Langley"

By Carl H. Butman

WASHINGTON, D. C.—There is a strange Naval craft cruising about Chesapeake Bay. She looks something like a marine dance-hall, as her upper deck is broad, flat, and unobstructed. She does not carry the usual masts and funnels. No aerials are visible, yet this curious ship answers to the radio call NNC, designated in Naval radio or signal language as "Nan Nan Cast." Being mastless, one wonders about her aerials, but there are both permanent and adjustable aerials and radio masts which can be raised or lowered at will. She is also equipped with new and novel radio apparatus. She carries a number of flyers and many kinds of flying craft.

The vessel is the newly commissioned aircraft carrier, "Langley," built out of the hull of the old collier "Jupiter," the first Naval vessel to be equipped with electric drive. She is now making her "shakedown" or trial cruise in Chesapeake Bay under command of Captain S. A. R. Doyle, U. S. N.

The "Langley," named for the late Samuel P. Langley, the American scientist who was the first practical student of aeronautics and mechanical flight, is a veritable floating landing-field and mother ship for both aeroplanes and seaplanes; but, at the same time, she is a sea-going radio laboratory for the study and development of radio communication between aircraft and ships.

Her great flying deck, which stretches for 520 feet from stem to stern and is 65 feet wide, prevents the erection of permanent masts for radio or other purposes; for her "top sides" must be clear for the launching and landing of her aircraft. Special telescopic masts have been installed amid-

ships, approximately 250 feet apart, fore and aft, which can be elevated when desired, or housed below decks when the planes are being projected into the air by the catapults or alighting from the air on the spacious upper deck. The masts, 50 feet in height and used primarily for the radio aerials, are controlled by hand-operated gears which raise and lower them somewhat as periscopes are operated. When lowered, the aerials are unhooked and stored below or laid alongside the palisades which guard the edges of the flying deck. The masts are elevated simultaneously after the antenna wires are hooked on. This aerial is the principal one used for long-distance communication. Auxiliary antenna are carried aft along both port and starboard sides. These antenna are hung outboard on davits which can be swung in, like ordinary boat-davits, and housed close to the vessel's side when not in use. Primarily these antenna are used to work nearby land stations and aircraft when aloft, as they do not interfere with the operation of the landing deck. At sea, with no aircraft aloft the vessel uses its mast antenna; but when planes are taking off and landing the auxiliary side antenna are used, although the masts could be raised for transmitting a message and then lowered.

Located below decks is the usual radio room found on all men-of-war with its equipment for transmitting and receiving, generators and batteries. The day of a radio house on the "top side" of military ships has passed. To-day the operator on watch sits below instead of "on top of the world" as on merchantmen and liners.

When operating with the radio compass on the Langley, however, the radioman comes up on the top deck and brings his house with him. In this very important work, an original idea has been carried out by the Naval constructors; for ascertaining the position of aircraft, ships or shore stations, the radio-compass house, built on the lines of an elevator, is run up to the top side where it projects above the deck like a pilot house. Its operator, the radioman, can raise and lower it at will, and from its location—aft on the starboard side—he can take bearings without interrupting the operation of planes as they land or depart. The roof of his house, when he is "up," forms part of the deck of the flying platform when he is "down."

Below in the radio room the ship has a regulation Naval 2-kilowatt spark-set for ordinary traffic work; but there is also a 300-watt tube transmitter, consisting of six 50-kilowatt tubes. This set is adaptable for use either as a radiotelephone or as a telegraph apparatus with I C W (interrupted continuous wave) or C W (continuous wave). For communication with the aircraft in the vicinity of the mother ship, either on the sea or in the air, the 300-kilowatt set is used. This is to insure direct and instantaneous communication.

Another feature of this unique vessel is the plane elevators, which raise and lower planes from the storage hold below, and the top of the elevators forming part of the ship's deck when they are "down" like the radio-house roof. Fore and aft are the catapults for launching the planes, as well as the arresting gear for stopping them when they land. Most of the usual "top side" equipment of an ordinary ship is below the flying deck: for example, the pilot house, which is well forward, port and starboard jibcranes for lifting seaplanes from the water, the four 5-inch rifles, and deck houses. Her two funnels project from her sides toward the stern, where they may be turned upward, aft, or downward to keep the smoke from the upper deck.

Great results are expected from the "Langley," the first aircraft carrier of the Navy, and many advanced experiments in radio communication with aircraft are planned. The lessons learned in radio and practical aeronautical operation at sea will be incorporated in the new aircraft carriers which the Navy will build out of two battle-cruisers scrapped by the Armament Conference.

Adding a Tube-Amplifier to a Crystal-Detector Set

MANY amateurs wonder if it is possible to use a one-step amplifier with a crystal set. When one is a crystal receiver and the other a tube amplifier, it would appear to the fan that it is impossible to use them together. However, experienced raidomen have proved that it can be done. According to the accompanying diagram, if the amateur purchases the necessary equipment and hooks up the material according to the circuit he will discover that satisfactory results will be obtained. The amateur must not get overexcited and think that

this is a regenerative set. It is *not!* Nevertheless, with this in view, reliable signals should be secured. One drawback will be the proper upkeep of a good point on the crystal; and if this is obtained with the proper voltages on filament and plate, signals should be heard easily. The operation has already been explained; the various wave lengths are obtained by varying the frequency of the circuits. The alternating current obtained from the distant transmitting station is impressed on the detector of the receiving set.

Constructing a Radio-Frequency Regenerator

By C. White, Associate A. I. E. E.

RADIO-FREQUENCY regeneration is, perhaps, a very misleading and unknown thing to many; but, in reality, it is nothing more than accomplishing a double purpose with a single operation. We are just beginning to grasp the full realization of what may be done by means of regeneration and radio-frequency amplification. The recent invention of Major Armstrong reveals that it is possible to accomplish critical or superregeneration by means of special circuits which, literally speaking, keep the tube from misbehaving. Therefore, we can say that our development in the radio field consists in not only discovering new things but in perfecting our old apparatus so that certain previous troubles are cured. Such is the case of applying radio-frequency and regeneration to the same circuit.

The circuit illustrated in Figure 1 is quite different from the ordinary radio-frequency amplification hook-up. The first very apparent dissimilarity is the use of a tuned plate-circuit that is regenerative; the second is the employment of a crystal detector instead of the ordinary bulb type of detector. The reason for the first change is that we can obtain a slight regenerative effect with a tuned plate type of radio-frequency amplifier; but it must be remembered that good results are obtainable only when the mutual coupling is kept extremely low. If, however, it is attempted to operate the set with a critical coupling between the tickler and the secondary there will develop a serious distortion of the sound waves which will very materially hamper the true reception of music, although the volume will be greater than when the coupling is maintained at a low value. From the electrical standpoint, we are not actually regenerating our signals, but we are so altering the constants of the tuning circuit that the effective resistance, or impedance, of that circuit to the incoming wave will be extremely low, thereby improving reception from a long distance.

The virtue that the crystal detector is practically noiseless in operation explains fully the only basic reason for its use in the construction of this outfit. The one disadvantage of the crystal has been the trouble one experiences in trying to find the sensitive spot, but with one stage of radio frequency it is quite easy to get a good adjustment. However, since we are going to employ one stage of audio-frequency amplification, the total vol-

ume emitted by the detector will be sufficient under all normal conditions. While the bulb detector is by far the more efficient in operation, still the quality of the sound received through a crystal detector is much more natural. A bulb detector can, however, be substituted for the crystal; but the amateur must remember that serious howling may develop, due to extremely critical reaction owing to the fact that the detector tube reacts on the grid of the radio-frequency amplifying tube through the mutual inductance between the secondary and the regen-

though not absolutely necessary, allows a more flexible control and greatly augments sharp tuning. All three coils should be constructed similarly and mounted so that the mutual coupling can be varied. The middle coil, or secondary, should be stationary; and the tickler and the primary should swing in and out from it. If it is so desired, the amateur can purchase coils similar to the ones just described, already mounted, for a reasonable sum, from any radio supply store. The condensers C-1 and C-2 are variable condensers of the 23-plate type, while a grid leak of one megohm and a grid leak condenser of 0.00025 microfarads will suffice. If it is desired to make the outfit capable of extremely critical tuning, I would recommend that either a 43-plate type condenser with a built-in vernier attachment, or a three-plate vernier condenser, shunted around the 23-plate types, be used.

I would like to call the amateur's attention to this fact: If a high value

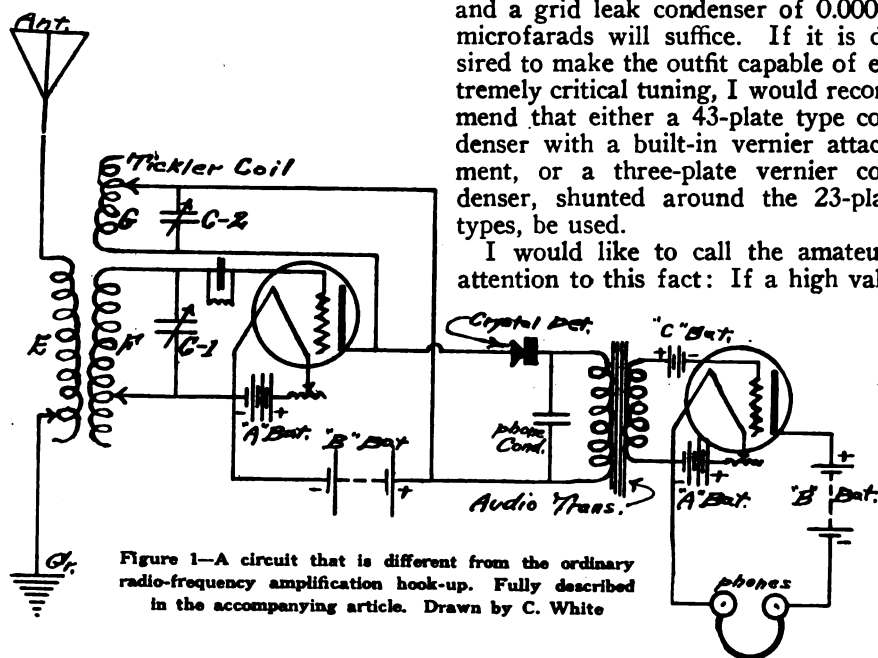


Figure 1—A circuit that is different from the ordinary radio-frequency amplification hook-up. Fully described in the accompanying article. Drawn by C. White

erative tickler element. To avoid all possible trouble of this nature, I would suggest that the amateur stick to the crystal detector in using the particular type of the hook-up explained in this article.

Relative to the actual construction of this outfit, I would advise that the unit E, F, G be made up of three pancake type of inductances mounted in a manner similar to the mounting of three honeycomb coils. Spider-web inductances can be made up easily by cutting out a form about five inches in diameter and dividing it so as to have seven, nine, or eleven spokes. Using a circle, two inches in diameter as a hub of the wheel, the novice should cut out the spokes. Using this form he should wind on about fifty turns. Some may find it more convenient and expedient to put on more turns and tap the same every ten turns; but this added refinement,

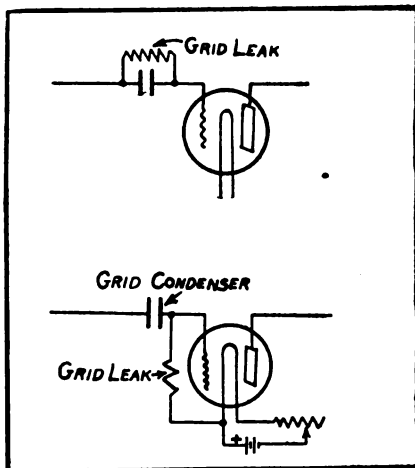
of B-battery voltage be used with the audio-frequency amplifier tube and a small C battery having a variable voltage from two to ten be employed in the grid circuit of the tube as shown in the diagram, he will find that the net resultant amplification will be many times greater than if he had used the customary 45 volts with a U-V 201 type of bulb. Therefore, I heartily recommend that the novice get the maximum use out of his bulbs for amplifying purposes by having a potential of at least ninety volts applied to the plate circuit. In addition to the scientific qualities of this receiver, the price is much lower than any other type of long-distance receiver. This is true because there are no expensive variometers and variocouplers to be purchased. It is possible to make up this outfit for \$15 if the amateur does not wish to use a panel type of mounting.

The Radio Primer

Weekly A B C of Radio for the Beginner, in which Elementary Facts and Principles Are Fully and Tersely Explained

What is the grid leak?

WHEN waves enter the tuner from the aerial, the grid is affected with an alternation of positive and negative waves. The flow of electrons from the filament is helped when the grid is positive, but is hindered, or prevented, when the grid is negative. For our purposes, it can be considered that, when the grid is posi-



Upper diagram—Vacuum tube with grid leak shunted around the grid condenser. Lower diagram—Grid leak shunted around the filament and grid.

tive, the little charges of electricity exchange places with the negative charges flying from the filament in the form of electrons. But when the grid is harboring only negative electricity, it is held a prisoner. There is no place for these charges to go.

The little ups and downs of the radio waves, however, come in thick and fast, and the grid endeavors to take care of them. It has no trouble in getting rid of the positive halves because they flow over to the filament; but the negative halves remain where they are. Soon these negative charges are crowding the grid. As soon as the wave train ceases—and before the next wave train appears—the grid gets rid of these negative charges by making them leak through the most convenient hole. The grid leak is for this purpose. It takes care of the negative charges on the grid. Unless this is done, the action of the tube as a detector would be unsatisfactory if not impossible.

* * *

Can a grid leak be placed anywhere in the circuit, or is there a special place for this to go?

The grid leak has its own place in the circuit and must go there to func-

By Lynn Brooks

tion properly. If placed elsewhere in the circuit, it would not function and would render the whole set inoperative.

* * *

What effect will the grid have on the action of the tube?

Current is normally flowing from the positive pole of the B battery to the plate across the filament and from this point through the telephone receivers. If it were not for the grid, this current would not produce any sound whatsoever in the telephone receivers. But the grid is keeping time changing from positive to negative and keeping pace with the alternations of the incoming signals.

* * *

What happens to this flow when the grid is negative?

We must remember that the electrons are also negative. The electrons coming from the filament are repelled for the instant. When this happens the current flowing through the telephone receivers from the B Battery is interrupted. Since the flow of electrons depends, in turn, on the current. It is easy to see how this current is interrupted by the changing charges on the grid. When the grid is made positive, the electrons are attached and the space current between the plate and the filament becomes a good conductor.

* * *

Does it make any difference if a C battery is used on any type tube used in the circuit of the grid element of the tube?

The C battery has played some important parts; but is not needed in the present type regenerative circuit. It has been used successfully in Major Armstrong's superregenerative circuit.

* * *

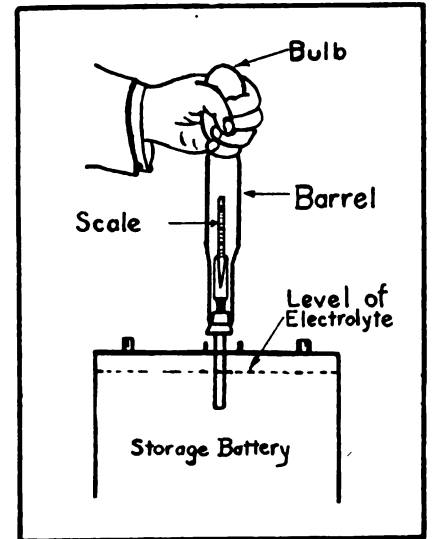
What voltage generally is employed on the filament of the vacuum tubes in general use?

The voltage used for lighting the filament of the vacuum used to-day is secured by a storage battery. Sometimes the dry cell is used, but it will be found that this method of lighting filament tubes is an expensive proposition. Stick to the storage battery until something better is invented.

* * *

What instruments are needed for the care of storage batteries?

Storage batteries need great care.



The condition of a storage battery is determined by the specific gravity of the acid solution. An instrument, called the "hydrometer," is used, as shown in this diagram, to test density of specific gravity.

If neglected they will go to ruin. A D-C voltmeter or hydrometer are two instruments that will enable the radioman to keep in touch with the condition of his storage battery. The accompanying illustration shows how the hydrometer is used. These hydrometers may be purchased in most any radio or electrical or automobile shop.

* * *

How does the tube function?

The vacuum tube of to-day has three elements. The grid is connected to what is known as the "input" circuit of the tube. The radio currents pour in through this circuit from the antennae. Since these currents are alternating, the little grid between the plate and the filament will be positive one moment and negative the next. In this respect, it will be kept busy changing its charge thousands of times every second.

* * *

Is it necessary to use storage batteries for filament lighting of vacuum tubes when working with a transmitter employing tubes?

When using vacuum tubes for the transmission of radiotelegraphy and radio telephony, it is not essential to have the filaments heated by battery current as it is when using tubes for receiving, as the use of low commercial-frequencies at the transmitting station does not effect the reception of signals at the receiving station. Filament-heating transformers have been developed for filament heating.

Why the Open Antenna Is Best for the Radio Listener

By C. D. Wagoner

THE radio art suffers, as does all new arts, from "too many ways of doing the same thing," and in no feature does this appear more than in the type of antenna used. The "radio pages" of the newspapers, the semi-technical press, even the higher-grade publications, teem with suggestions as to using the electric-light wires, the telephone leads, barbed-wire fences, wires strung around picture molding and the like, for picking up broadcast signals. It is no wonder that the newcomer in this fascinating field is bewildered to the point of not knowing what to choose from this chaotic array.

Let us consider for a moment the reason for all this. The unfortunate fact appears that, practically, every conductor known may be used to receive signals, because the signal sent out from any transmitter sets up currents in every piece of metal it encounters, such as the metal structure of buildings and bridges, the rails of railroad tracks, and, of course, every electric light, telegraph, and telephone wire that exists above ground or even below ground. Thus it is that our problem is not in finding a conductor to pick up signals for us, but rather in choosing a good one.

Now the fundamental laws governing the best form of receiving antenna were worked out long ago, particularly in popular form by Dr. Austin of the United States Navy. They are simple, indeed. Here they are, expressed in nontechnical language:

1. The higher the receiving antenna, the stronger the signal.
2. The "height" of an antenna is the distance above ground of its "middle point."
3. For any particular wave-length, there is a best over-all length for the antenna.

In addition, a few other simple rules may be added, such as:

4. The antenna should be as far away as possible from other wires, particularly grounded ones.
5. If it is necessary to cross other wires, run as nearly as possible at right angles to these, and as far as you can above them.

With all these rules in mind, and with other considerations which have been proven by practice, let us consider the best form of antenna for the radio novice to install in order to receive broadcast.

First of all, use a *single wire* antenna. This, at least, is just as good as a four-wire antenna, or cage antenna, and in many cases will prove a little better. The *material* of the wire does not matter much. It may be bare or insulated, it makes absolutely no difference which. Copper, phosphor bronze, or brass, may be used; even galvanized iron can be used without

much loss. Of course, it is advisable to use a good strong wire, such as phosphor bronze, so it will not break under strain. It is further recommended that this wire be used whenever possible. Every retail radio store carries this stranded aerial wire, so it is always easy to get.

In regard to the "height" part of the antenna. The *ideal* antenna would be one erected straight up and down, such as a wire suspended from a very tall flagpole. This is because the "middle point" of this wire is higher above ground than would be the case if the wire were inclined, or bent in an L shape. But, unfortunately, few of us have masts 200 feet high, and so some compromise must be sought. The answer is this:

A. Run your wire from your radio room straight up into the air, AS HIGH AS YOU CAN; and then,

B. Run the rest of the antenna approximately horizontally, to a point as high as you can find.

You will then have as good an an-

tenna as you could wish, so far as the question of *height* is concerned.

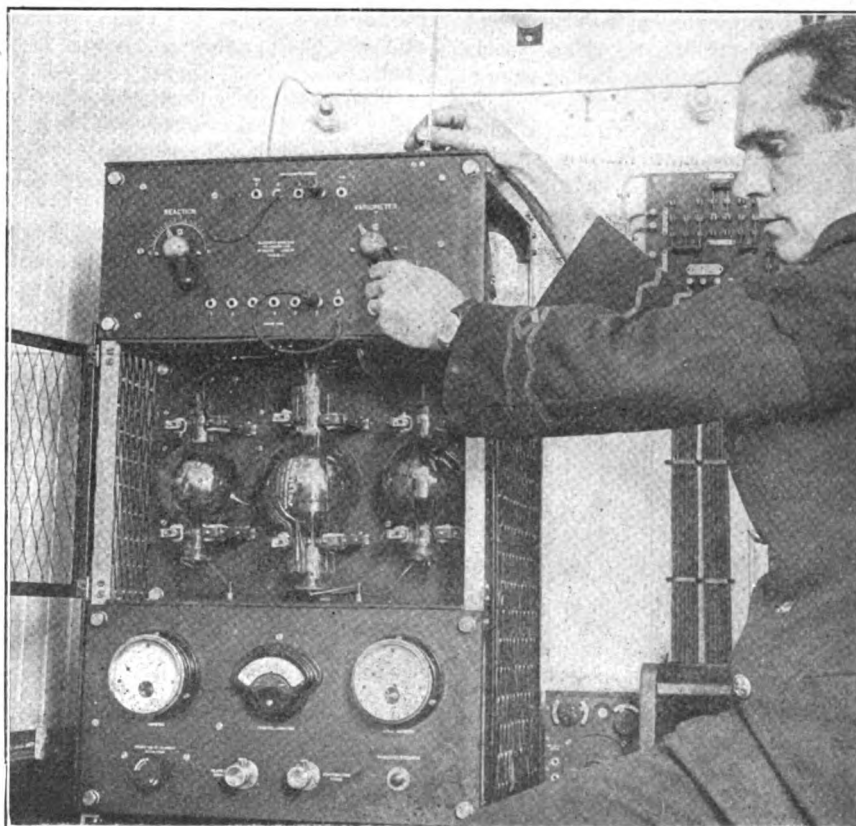
This antenna is called, for obvious reasons, the "inverted L" type.

If you run the upper part of the L horizontally, then the height of the middle of your wire is the height of the wire above ground. But if the far end of this wire happens to be higher than the near end, you have raised the middle point, and your antenna will receive signals slightly better. On the other hand, if you have to run the antenna "slanting downwards," you have lowered the middle point and the antenna will not receive so well. So try to have both ends of the "horizontal" part of the antenna as high as possible. If you find it possible to make one end higher than the other, by all means do so.

If the far end of the antenna happens to be a tree—as in many cases is the case—remember that during heavy winds the tree will sway greatly. This is likely to break your wire. One way

(Continued on following page.)

Radio Room of "Majestic" the World's Largest Transatlantic Liner



(C. Kadel & Herbert News Photos.)

The steamer "Majestic," of the White Star line, takes particular pride in her radio room. The equipment is of the best, and the room has one of the choice positions on the big boat. The photograph shows the second-in-charge radio operator, L. H. Tamplin, at the C-W panel used for long-distance sending.

(Continued from preceding page)
to overcome this is to attach a pulley to the tree and bring a rope, or wire, from your end insulator over this pulley to a weight, so this weight can rise and fall with the movements of the tree.

Another thing to remember is this: Do not allow the actual antenna-wire to come within seven feet or so of the tree branches. If very near the branches, they might touch during stormy weather, and thus "ground" the antenna; and, also, it is well to keep your antenna some distance away from any other conductor—even a very poor one like a tree. You know that even a *tree* may be used as a receiving antenna, if you don't want to receive very far and if you are contented with a very weak signal.

As to *insulation*. Although the voltage on the receiving antenna is very small, the energy is also very small and every bit of it must be retained. Therefore, you should insulate the receiving antenna well. In dry weather, even a rope is good enough; but let a few drops of rain fall, and the antenna insulated in this manner becomes absolutely useless. Insulators, small ones, probably of porcelain or good composition, should be used. Electric-light knobs, sufficiently large—two inches in diameter at the end—are fairly good, if you cannot get the type developed by the radio concerns who have had long experience in the business.

So put in an insulator at the far end of your antenna, and another where it is supported at the near end, probably by your house. Also, where the wire comes *into* your house, a porcelain tube should be used. Inside the house, where rain ordinarily does not come, insulation is not so important, but it does no harm to run your wires on porcelain knobs even there.

The length of the antenna depends on the wave length one wishes to receive, and it is assumed here that the present broadcast wave of 360 meters is the one in question. Now, there is no special length which *must* be used, but there is a length which is, all things considered, the best overall value. That length is 160 to 180 feet, from the far end of the horizontal portion back to the near end, and down the vertical portion to the receiver itself.

Now, if you use much greater lengths, you will get much louder signals, but you will find it impossible to "tune out" interference from other stations. If, on the other hand, you use much shorter length, you will get even greater freedom from interference than if you use the standard length of 160 feet; but on the other hand you will get a rather weak signal. All things considered, then, 160 feet is the best value for you to use.

A great many people have the idea that if they put up a four-wire antenna, with each wire of the four 40 feet long, they will get the desired effect. Nothing could be farther from the fact. If a four-wire antenna is put up for receiving—a foolish thing to do in any case—*each wire* should be 160 feet long, just the same.

When a wire picks up a radio signal from space, it means that it has "drained the ether" at that point of just so much energy. You can form a mental picture of the waves flowing by, like water waves on a river, and here and there a whirlpool drawing the water down to a reservoir below. So, in the vicinity of a wire which is picking up signals, the ether is "drained dry," and any other wire which is nearby has little energy striking it which it can receive. Thus it is that an antenna inside, or alongside of, a steel building receives very little signal. Therefore, erect your antenna as far away as possible from any other wires, particularly grounded ones. Tin roofs, electric signs, gutters, all are very bad. Several cases have been noted where an antenna was behind a tin-roofed building, and slightly below the level of the roof, and the signals coming from a certain station, striking the tin roof first, were diverted so that the antenna got practically nothing at all. Raising the antenna on two small sticks, so that it was six feet above the level of the roof, brought in roaring signals. A similar experience was found in the case of a huge electric-light sign. Just get the idea that the metal mass casts "a radio shadow," and get your antenna up out of the shade.

There are other forms of electricity other than radio waves, as you will find if you put up an antenna parallel, to and near to your electric-light wires, particularly if alternating current is used. On attempting to listen in on the radio receiver, a deafening, low-pitch, roar will be heard, this being the sixty-cycle current induced in your wire from the neighboring electric-light network. This can be minimized—not entirely removed, unfortunately—by running your wire at right angles to the power wire, and, also, by keeping it as far as possible above it. The same applies to telephone wires, though they will give much less trouble. Ordinarily, you will be bothered in this case only when "Central" rings someone.

We can summarize the situation thusly:

For the best possible receiving antenna for 360 meter broadcast reception, make your antenna according to these simple rules:

- A. Use a single wire only.
- B. Run the wire in the form of an inverted L.
- C. Keep both ends of the horizontal part of the L as high as you can. If one end can be made higher than the other, go ahead and do it.

D. Insulate the antenna well at all points where you support it.

E. Make the total length of your wire, from radio set to far end, not more than 180 feet long or less than 160 feet.

F. Keep the antenna wire as far away as you can from tin roofs, grounded wires, gutters and the like. In any case, be sure to have the antenna **HIGHER** than these.

G. Run the antenna at right angles to any power wires, and as near as you can at right angles to the telephone wires. If you have to choose between the two, pay most attention to the power wires.

If there are any high-tension wires—that is, over 220 volts—near your home, it is absolutely up to you to treat these with the greatest respect. The best advice is not to cross these at all, but if you cannot put up an antenna without doing this, take the greatest care to have plenty of dry rope between you and the antenna wire when you are hauling it up and use heavy wire, well-installed, so as to be sure that your antenna will not break and fall across the power wire.

If you cannot get a length of 160 feet by running up as far as you can (50 feet is about the best average height that the ordinary house or barn will provide) and then running *straight out* with a horizontal stretch, it will be better than nothing to run out horizontally as far as you can, and then make a turn in your line of direction for the remainder of the length. This is true only if you do not turn more than a right angle from the line. If you run across, say, 50 feet to the only tree in the vicinity, and then 60 feet more, at right angles, to some other support, you will have a fair antenna. But do not make the mistake of turning back in the same direction as you started—that does no good at all. See Figure 2.

One of the most persistent errors people make is in believing that the receiving antenna has to run in some definite direction in order to pick up a certain station. Nothing could be further from the truth. Suppose you are some 50 miles from a station—WGY, for instance—and that this station is due north from you. You can run your receiving antenna north, south, east, or west, or any position in between—the signal will come in equally well in any position, as far as the angle itself is concerned. Of course, in one position it might be screened by a gutter, and not screened at all in some other direction; but that is not the point. The point is, that *direction* of the antenna means nothing at all in reception.

The reason that this misunderstanding exists is simply because a little knowledge is just as dangerous in radio as in other things. If the horizontal part of the antenna is *very long*, a hundred times longer than the height, under these conditions the antenna is strongly directional; that is, it receives signals very strongly when

(Continued on following page)

(Continued from preceding page)
they come from one direction and very weak when they come from some other direction. But where the length is, say, 110 feet, and the height 50 feet, a ratio of 2 to 1, the directive effect is absolutely unnoticeable. Run your antenna the direction that gives you the most "open view," unobstructed, toward your favorite broadcasting station, or in the direction of some convenient tall tree that enables you to get the much-desired 160 feet total length, or in the direction that crosses the electric-light line at right angles. All these considerations mean a great deal to you—the consideration of what angle your antenna makes with the line running toward the broadcasting station means nothing at all.

From the foregoing instructions—how to erect the best possible form of receiving antenna—it is hoped that everyone who installs a radio set will strive to forget the swarm of "freak" antennas, ranging from kites, trees and electric light wires, through picture-molding wires, bed springs, and on umbrella ribs, down to wires buried in the earth. Where no other wire is available, it is, at times, necessary to resort to these makeshifts, particularly in military circles; but the novice need not go to these extremes, and should not. They will all work, after a fashion, and if you are an amateur, rather than a radio listener, by all means try them all and be honest with yourself as to the results you observe, but this is written for those who want a radio set for the information it gives them, not what they can do to torture it. So I repeat, forget the freaks and put up a standard type according to the best known engineering principles.

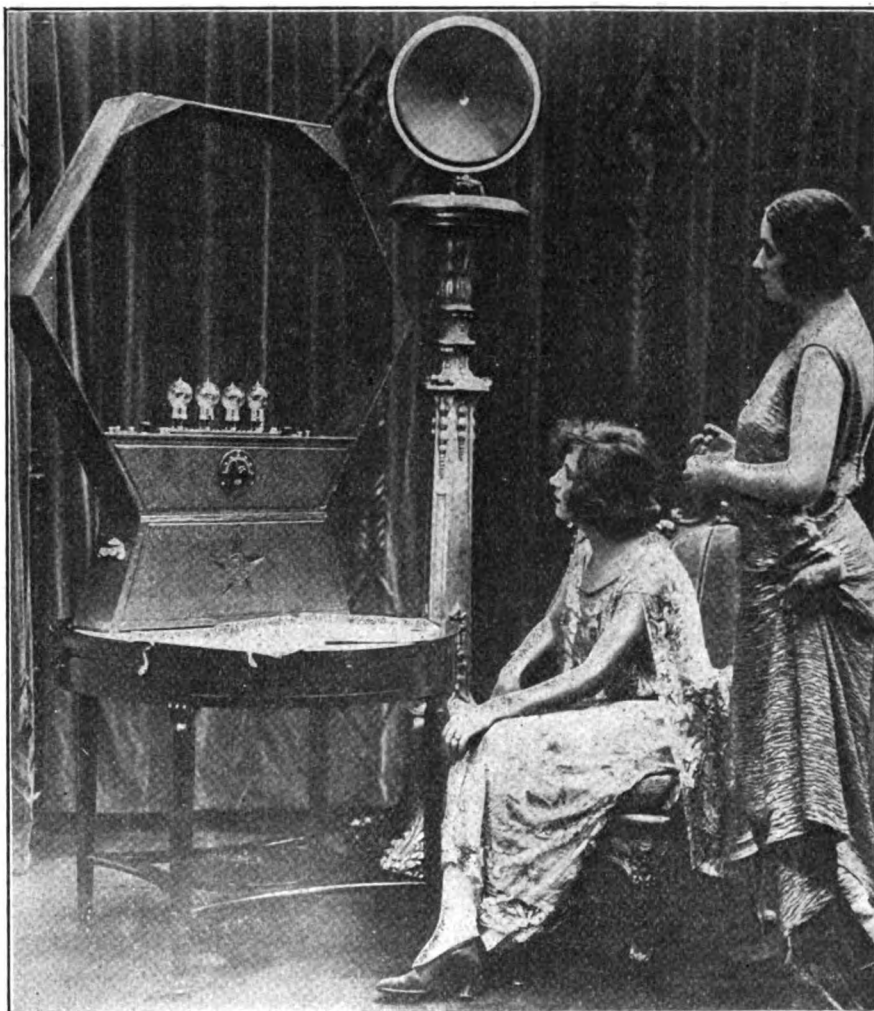
There is, however, another form of antenna which is desirable under some conditions, and which is perfectly correct technically. This is the so-called loop-antenna, which consists of a few turns of wire wound on a frame of some sort. This is really nothing more than a huge receiving coil. In fact, your receiver coils themselves will sometimes pick signals from a powerful station nearby.

The advantage of the loop antenna is that it is very strongly directive. If it is pointed so that its plane points toward the station you want to hear, this station can be picked up, while other stations in a direction at right angles to this cannot be heard at all.

Another advantage of this antenna is that it receives somewhat less atmospheric disturbances than an ordinary open-wire antenna, relative to the strength of signal picked up. This is called the signal-to-static ratio.

However, there is one factor to be carefully borne in mind, and that is, an ordinary loop antenna is much less sensitive than a good open-wire antenna. In round numbers, if you have

Radio Keeps Customers Happy



(C. Kadel & Herbert News Photos.)

In the fashion salon of Welly Soeurs, Paris, France, the radiophone is in daily use for the amusement of both the mannequins who exhibit the styles and the customers. Following the lead set by America, radio is fast becoming popular in Europe. In this particular case, it is said to be the means of bringing many customers to the costumer's shop.

an ordinary antenna, 40 feet in the air, and a 4-foot loop, the latter receives about one one-hundredth as much signal as the former. You have to make up for this by adding *amplification* in your receiving system. This is not a treatise on amplifiers. It is intended to tie down the facts: A loop antenna requires 3 radio-frequency amplifiers added to the receiver system, before the signal is as loud as on an ordinary wire antenna 40 feet high without amplifiers.

The loop antenna, of course, consists of more than one turn, and the more turns the louder the signal it picks up. But there is a limit to the number you can use, and this is a definite limit, not a mere "undesirable limit" as in the case of the open wire antenna and its length of 160 feet. For 360-meter work, a 4-foot loop may have about 10 turns and no more.

There are definite reasons for adopting a loop antenna under certain conditions. In the congested city districts—in apartments, for instance—it is

often out of the question to erect open antennas. Sometimes the landlord flatly forbids it. Here, a loop antenna may save the day. A factor that makes this possible is, that there is a broadcasting station, to-day, in every large city, so that city dwellers have "lots of signal" to work with and can make use of loops without adding many amplifiers.

Again, it may happen that there is an interfering station that bothers you greatly when you try to receive your favorite concert. If it happens that this interfering station is at right angles to the broadcast station you want, a loop antenna will be very useful for you.

It is very probable that some of the sets of the future will be fitted with loop antennas as a part of the system, the receiver and other parts being designed especially for this type of working. When this is done, radio novices will do well to make use of the loop for their work when it will actually do good.

Broadcasting Stations of United States and Canada

Complete to Date of Going to Press

UNITED STATES

KDKA—Westinghouse Co., East Pittsburgh, Pa.
 KDPM—Westinghouse Electric & Mfg. Co., Cleveland, Ohio.
 KDZT—Seattle Radio Association, Seattle, Wash.
 KFAN—The Electric Shop, Moscow, Idaho.
 KFAP—Standard Publishing Co., Butte, Mont.
 KFAQ—City of San Jose, San Jose, Calif.
 KFAR—Studio Lighting Service Co. (O. K. Olsen), Hollywood, Calif., 1645 Hudson Avenue.
 KFAS—Reno Motor Supply Co., Reno, Nev.
 KFAT—S. T. Donohue, Eugene, Oreg., 681 Willamette Street.
 KFAU—Boise High School, independent school district of Boise City, Boise, Idaho.
 KFAV—Cooke & Chapman, Venice, Calif.
 KFAW—The Radio Den, Santa Ana, Calif.
 KFBA—Ramey & Bryant Radio Co., Lewiston, Idaho.
 KFBB—F. A. Buttrey & Co., Havre, Mont.
 KFBC—W. K. Asbill, San Diego, Calif., 5838 Cliff Place.
 KFBD—Clarence V. Welch, Hanford, Calif., 315 North Dooty Street.
 KFBE—Reuben H. Horn, San Luis Obispo, Calif.
 KFBF—Butte School of Telegraph (F. H. Smith), Butte, Mont.
 KFBG—First Presbyterian Church, Tacoma, Wash.
 WAAD—Ohio Mechanics Institute, Cincinnati, Ohio.
 WAJT—Kelly-Vawter Jewelry Co., Marshall, Mo.
 WAJU—Yankton College, Yankton, S. D.
 WBAP—The Star-Telegram, Wortham-Carter Pub. Co., Ft. Worth, Texas.
 WBAZ—Times-Despatch Pub. Co., Richmond, Va.
 WCAB—Newburgh News Print & Pub. Co., Newburgh, N. Y.
 WCAC—John Fink, Jewelry Co., Fort Smith, Ark.
 WCAD—St. Lawrence University, Canton, N. Y. (Only weather.)
 WCAE—Kaufman & Bear Co., Pittsburgh, W. Pa.
 WCAG—Daily States Pub. Co., New Orleans, La.
 WCAV—J. C. Dice Electric Co., Little Rock, Ark.
 WCAW—Quincy Herald and Quincy Electric & Supply Co., Quincy, Ill.
 WCAZ—University of Vermont, Burlington, Vt.
 WCAZ—Kesselmen O'Driscoll Co., Milwaukee, Wisc.
 WCAZ—Robert E. Compton & Co., Quincy Whig Journal, Quincy, Ill.
 WHAG—University of Cincinnati, Cincinnati, Ohio.
 WHAH—John T. Griffin, Joplin, Mo., 112 West Sixth Street.
 WHAI—Radio Equipment & Mfg. Co., Davenport, Iowa.
 WHAJ—Bluefield Daily Telegraph and E. K. Kitts, Bluefield, W. Va.
 WHAK—Roberts Hardware Co., Clarksburg, W. Va.
 WHAL—Phillips Jeffrey & Derby, Lansing, Mich.
 WHAM—University of Rochester, Rochester, N. Y.
 WHAN—Southwestern Radio Co., Wichita, Kans.
 WHAO—Frederic A. Hill, Savannah, Ga.
 WHAP—Dewey L. Otta, Decatur, Ill., 659 West Eldorado Street.
 WHAQ—Semmes Motor Co., Washington, D. C.
 WHAR—Paramount Radio & Electric Co., Atlantic City, N. J.
 WHAS—Courier-Journal and Louisville Times, Louisville, Ky.
 WHAT—Yale Democrat-Yale Telephone Co., Yale, Okla.
 WHAU—Corinth Radio Supply Co., Corinth, Miss.
 WHAV—Wilmington Electrical Specialty Co., Wilmington, Del.
 WHAW—Pierce Electrical Co., Tampa, Fla.
 WHAX—Holyoke Street Ry. Co., Holyoke, Mass.
 WHAY—Huntington Press, Huntington, Ind.

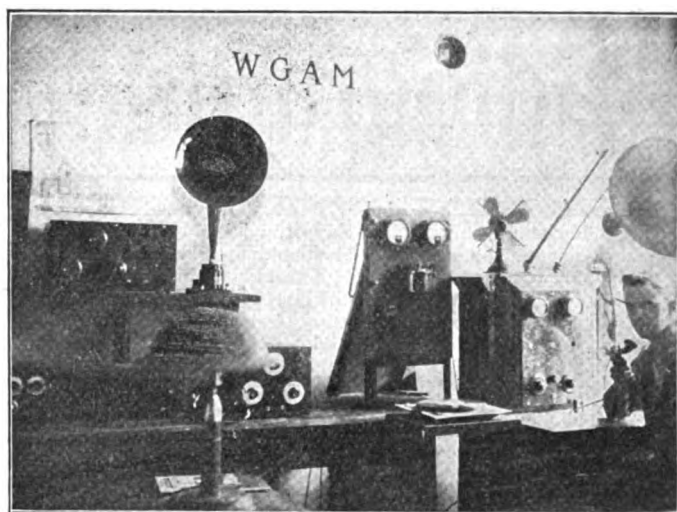
WHAZ—Rensselaer Polytechnic Institute, Troy, N. Y.
 WIAA—Waupaca Civic and Commerce Association, Waupaca, Wis.
 WIAB—Joslyn Automobile Co., Rockford, Ill.
 WIAC—Galveston Tribune, Galveston, Tex.
 WIAD—Ocean City Yacht Club, Ocean City, N. J.
 WIAE—Mrs. Robert E. Zimmerman, Vinton, Iowa.
 WIAF—Gustav A. De Cortin, New Orleans, La., 139 North Alexander Street.
 WIAG—Matthews Electrical Supply Co., Birmingham, Ala.
 WIAH—Continental Radio & Mfg. Co., Newton, Iowa.
 WIAI—Heer Stores Co., Springfield, Mo.
 WIAJ—Fox River Valley Radio Supply Co., Neenah, Wis.
 WIAK—Journal-Stockman Co., Omaha, Nebr.
 WIAL—Standard Service Co., Norwood, Ohio.
 WIAN—Chronicle & News Publishing Co., Allentown, Pa.
 WIAO—School of Engineering of Milwaukee and Wisconsin News, Milwaukee, Wis.
 WIAP—Radio Development Corp., Springfield, Mass.
 WIAQ—Chronicle Publishing Co., Marion, Ind.
 WIAR—J. A. Rudy & Sons, Paducah, Ky.
 WIAS—Burlington Hawkeye & Home Electric Co., Burlington, Iowa.
 WIAT—Leon T. Noel, Tarkio, Mo.
 WIAU—American Trust and Savings Bank, Le Mars, Iowa.
 WIAV—New York Radio Laboratories, Binghamton, N. Y.
 WIAW—Saginaw Radio & Electric Co., Saginaw, Mich.
 WIAX—Capitol Radio Co. (Paul C. Rohwer), Lincoln, Nebr.
 WIAY—Woodward & Lothrop, Washington, D. C.
 WJAB—American Radio Co., Lincoln, Nebr.
 WJAC—Redell Co., Joplin, Mo.
 WJAD—Jackson's Radio Engineering Laboratories, Waco, Tex.
 WJAE—Texas Radio Syndicate, San Antonio, Tex.
 WJAF—Munsey Press, Munsey, Ind.
 WJAG—Norfolk Daily News (Huse Publishing Co.), Norfolk, Nebr.
 WJAH—Central Park Amusement Co., Rockford, Ill.
 WJAJ—Y. M. C. A., Dayton, Ohio.
 WJAK—White Radio Laboratory, Stockdale, Ohio.
 WJAL—Victor Radio Corp., Portland, Me.
 WJAM—D. M. Perham, Cedar Rapids, Iowa.
 WJAN—Peoria Star & Peoria Radio Sales Co., Peoria, Ill.
 WJAP—Kelly-Duluth Co., Duluth, Minn.
 WJAQ—Copper Publications, Topeka, Kansas.
 WJAR—The Outlet Co., Providence, R. I.
 WJAS—Pittsburgh Radio Supply House, Pittsburgh.
 WJAX—D. M. Perham, Cedar Rapids, Iowa.
 WJAZ—Chicago Radio Laboratory, Chicago.
 WDA—Ward-Belmont School, Nashville, Tenn.
 WDAB—M. C. Summer & Son, Portsmouth, Ohio.
 WDAC—Illinois Watch Co., Springfield, Ill. (Weather only.)
 WDAD—William Louis Harrison, Central Kansas Radio Supply, Linsbourn, Kansas.
 WDAE—Tampa Daily Times, Tampa, Fla.
 WDAF—Kansas City Star, Kansas City, Mo.
 WDAJ—J. Laurence Martin, Amarillo, Texas.
 WDAI—Hughes Electrical Corp., Syracuse, N. Y.
 WDAJ—Atlanta & West Point R. R. Co., College Park, Ga.
 WDAK—Mine & Smelter Supply Co., El Paso, Texas.
 WDAL—"Florida Times Union," Jacksonville, Florida.
 WDAM—Western Electric Co., New York, N. Y.
 WDAN—Glenwood Radio Corp., Shreveport, La.
 WDAO—Automotive Electric Co., Dallas, Texas.
 WDAP—Midwest Radio Central Inc., Chicago.

WDAQ—Hartman Riker Elec. Co., Brownsville, Pa.
 WDAW—Lit Broe., Philadelphia.
 WDAS—Samuel A. Waite, Worcester, Mass.
 WDAT—Delta Electric Co., Worcester, Mass.
 WDAU—Slocum & Kilbourne, New Bedford, Mass.
 WDAV—"Muskegon Daily Phoenix," Muskegon, Okla.
 WDAW—Georgia Railway and Power Co., Atlanta, Ga.
 WDAZ—First National Bank, Centerville, Iowa.
 WDAY—Kenneth M. Hance, Fargo, N. D.
 WEAA—Fallain & Lathrop, Flint, Mich.
 WEAB—Standard Radio Equipment Co., Fort Dodge, Iowa.
 WEAC—Baines Electric Service Co., Terre Haute, Ind.
 WEAD—Northwest Kansas Radio Supply Co., Atwood, Kansas.
 WEAF—Western Electric Co., N. Y.
 WEAG—Nichols-Hemelino-Bassett, Edgewood, R. I.
 WEAH—Wichita Board of Trade and Landus Radio Co., Wichita, Kansas.
 WEAI—Cornell University, Ithaca, N. Y.
 WEAK—Julius B. Abercrombie, St. Joseph, Mo.
 WEAM—North Plainfield, N. J.
 WEAN—Shepard Co., Providence, R. I.
 WMAB—Radio Supply Co., Oklahoma City, Okla.
 WMAC—F. Edward Page, Fernwood, Cantonville, N. Y.
 WMAF—Round Hills Radio Corp., Dartmouth, Mass.
 WMAJ—Drovers Telegram Co., Kansas City, Mo.
 WNAC—Shepard Stores, Boston, Mass.
 WOAI—Southern Equipment Co., San Antonio, Tex.
 KDZA—"Arizona Daily Star," Tuscon, Arizona.
 KDZB—Frank E. Siefert, Bakersville, Cal.
 KDZD—W. R. Mitchell, Los Angeles, Cal.
 KDZE—The Rhodes Co., Seattle, Washington.
 KDZF—Automobile Club of Southern California, Los Angeles.
 KDZG—Cyrus-Peirce Co., San Francisco, Cal.
 KDZH—"Fresno Evening Herald," Fresno, Cal.
 KDZI—Electric Supply Co., Wenatchee, Wash.
 KDZJ—Excelsior Radio Co., Eugene, Oregon.
 KDZL—Rocky Mountain Radio Corp., Ogden, Utah.
 KDZM—E. A. Hollingworth, Centralia, Wash.
 KDZK—Nevada Machine & Electric Co., Reno, Nev.
 KDZQ—William D. Pyle, Denver, Colo.
 KDZR—Newbery Elec. Corp., Los Angeles, Calif.
 KDZP—Bellingham Publishing Co., Bellingham, Wash.
 KDZT—Seattle Radio Association, Seattle, Wash.
 KDZV—Cope & Cornwell Co., Salt Lake City, Utah.
 WKAA—Republican Times and H. F. Paar, Cedar Rapids, Ia.
 WKAC—Star Publishing Co., Lincoln, Nebr.
 WKAF—W. S. Radio Supply Co., Wichita Falls, Tex.
 WKAD—Charles Loeff, East Providence, R. I.
 WKAG—Edwin T. Bruce, M. D., Louisville, Ky.
 WKAH—Planet Radio Co., West Palm Beach, Fla.
 WKAJ—Fargo Plumbing & Heating Co., Fargo, N. D.
 WKAK—Okfuskee County News, Okemah, Okla.
 WKAL—Gray & Gray, Orange, Tex.
 WKAM—Adam Breede, "Daily Tribune," Hastings, Neb.
 WKAN—Alabama Radio Mfg. Co., Montgomery, Ala.
 WKAP—Flint, Dutee Wilcox, Cranston, R. I.
 WKAQ—Radio Corporation of Porto Rico, San Juan, P. R.
 WKAR—Michigan Agriculture College, East Lansing, Mich.
 WKAS—L. E. Lines Music Co., Springfield, Mo.
 WKAT—Frankfort Morning Times, Frankfort, Ind.
 WKAV—Laconia Radio Club, Laconia, N. H.
 WKAW—Turner Cycle Co., Beloit, Wis.
 WKAX—Wm. A. MacFarlane, Bridgeport, Conn.
 WKAY—Benau College, Janesville, Ga.
 WKAZ—Landaus Music and Jewelry Co., Wilkes-Barre, Pa.
 KDYC—Herald Publishing Co., Klamath Falls, Ore.
 KDYS—The Tribune, Inc., Great Falls, Mont.

(Continued from preceding page)

KDYW—Smith-Hughes & Co., Phoenix, Ariz.
 KDYX—Star Bulletin Publishing Co., Honolulu, T. H.
 KDYY—Rocky Mt. Radio Corp., Denver, Colo.
 WBAC—Republican Publishing Co., Hamilton, Ohio.
 WBAQ—Myron L. Harmon, Y. M. C. A., South Bend, Indiana.
 WBAV—The Erner & Hopkins Co., Columbus, Ohio.
 WBAW—Marietta College, Marietta, Ohio.
 W^{AX}—John H. Stenger, Wilkes-Barre, Pa.
 WBAY—American Telephone & Telegraph Co., New York.
 WGAM—Orangeburg, S. C.
 WGAX—Radio Electric Co., Washington, D. C.
 WHAW—Pierce Electric Co., Tampa, Fla.
 WLAB—George F. Grossman, Carrollton, Mo.
 WLAC—North Carolina State College, Raleigh, N. C.
 WLAD—Arvanette Radio Supply Co., Hastings, Neb.
 WLAJ—Johnson Radio Co., Lincoln, Neb.
 WLAG—Cutting and Washington Radio Corp., Minneapolis.
 WLAH—Samuel Woodworth, Syracuse, N. Y.
 WLAJ—Waco Electrical Supply Co., Waco, Tex.
 WLAJ—Vermont Farm Machine Co., Bellows Falls, Vt.
 WLAL—Tulsa Radio Co., Tulsa, Okla.
 WLAM—Morrow Radio Co., Springfield, Ohio.
 WLAN—Putnam Hardware Co., Houlton, Mo.
 WLAO—Anthracite Radio Shop, Scranton, Pa.
 WLAP—W. V. Jordon, Louisville, Ky.
 WLAQ—A. E. Shilling, Kalamazoo, Mich.
 WLAR—Mickel Music Co., Marshalltown, Iowa.
 WLAS—Hutchinson Radio Co., Hutchinson, Kan.
 WLAT—Charles G. Bosch Co., Burlington, Iowa.
 WLAX—Putnam Electric Co., Greencastle, Ind.
 WMAH—General Supply Co., Lincoln, Nebraska.
 WMAM—Beaumont Radio Equipment Co., Beaumont, Texas.
 WNAL—R. J. Rockwell, Omaha, Nebraska.
 WAL—McCook Army Station, Dayton.
 WBA—Marshall-Gerken Co., Toledo, Ohio.
 WBZ—Westinghouse Co., Springfield, Mass.
 WCL—Philadelphia
 WCJ—A. C. Gilbert Co., New Haven, Conn.
 WCX—Detroit Free Press, Detroit, Mich.
 WDM—Church of the Convent, Washington, D. C.
 WDT—Ship Owners Radio Co., New York City.
 WDY—Radio Corp. of Amer., Roselle Park, N. J.
 WDW—Radio Construction Co., Washington, D. C.
 WGH—Light and Water Power Co., Montgomery, Ala.
 WGI—Amer. Radio & Research Corp., Medford Hillside, Mass.
 WGL—Thomas J. Howlett, Philadelphia.
 WGM—Georgia Railway & Power Co., Atlanta, Ga. (Atlanta Constitution.)
 WGY—General Elec. Co., Schenectady, N. Y.
 WHA—University of Wisconsin, Madison, Wis.
 WHK—Warren R. Cox, Cleveland.
 WHN—Brooklyn, N. Y.
 WHQ—Rochester Times, Rochester, N. Y.
 WHU—William B. Duck Co., Toledo, Ohio.
 WHW—Stuart W. Seeley, East Lansing, Mich.
 WFO—Riker Kumler Co., Dayton
 WJH—White and Boyer, Washington, D. C.
 WJK—Service Radio Equipment Co., Toledo, Ohio.
 WJX—De Forest Radio Co., New York City.
 WJZ—Westinghouse Co., Newark, N. J.
 WKB—Sweeney School Co., Kansas City, Mo.
 WLB—University of Minn., Minneapolis, Minn.
 WLK—Hamilton Mfg. Co., Indianapolis.
 WLQ—United States Army, Fairfield, Ohio.
 WLW—Crosley Manufacturing Co., Cincinnati.
 WMH—Precision Elec. Co., Cincinnati.
 WNO—Wireless Tel. Co. of Hudson County, N. J.
 WOC—Karlawa Radio Co., Rock Island, Ill.
 WOH—Hatfield Electric Co., Indianapolis.
 WOK—Pine Bluff Co., Pine Bluff, Ark.
 WOO—Western Radio Co., Kansas City, Mo.
 WOR—L. Bamberger & Co., Newark, N. J.
 WOS—Mo. State Marketing Bureau, Jefferson City, Mo.
 WOU—Metropolitan Utilities, Omaha, Neb.
 WOZ—Palladium Printing Co., Richmond, Ind.
 WOB—C. D. Tuska & Co., Hartford, Conn.
 WFB—Hamilton Elec. Co., Pittsburgh.
 WRK—Doron Bros. Elec. Co., Hamilton, Ohio.

The busy broadcasting station WGAM, Orangeburg, South Carolina, one of the best - equipped broadcasters in the South



WRL—Union College, Schenectady, N. Y.
 WRR—Dallas Texas, Dallas, Texas.
 WRW—Tarrytown Radio Research Co., Tarrytown, N. Y.
 WSZ—Marshall-Gerken Co., Toledo, Ohio.
 WVP—United States Army, New York City.
 WWJ—Detroit News Co., Detroit, Mich.
 WAAC—Tulane University, New Orleans, La.
 WBAD—Sterling Elec. Co., Minneapolis, Minn.
 WBAE—Bradley Institute, Peoria, Ill.
 WBAH—Dayton Co., Minneapolis, Minn.
 WBAM—B. Rennyson, New Orleans, La.
 1 XAD—Thomas Giffen, Pawtucket, R. I.
 2 IA—Jersey Review, Jersey City, N. J.
 2 XJ—American Tel. & Tel. Co., Deal Beach, N. J.
 4 CD—Carter Electric Co., Atlanta, Ga.
 5 ZU—State University, Austin, Texas.
 8 UX—Radioart Store, Akron, Ohio.
 8 YO—Ohio State University, Columbus.
 8 BYV—Columbus Spec. Co., Columbus.
 9 YY—State University, Lincoln, Neb.
 10 J—Robert F. Farnum, Pawtucket, R. I.
 KDN—Meyberg Co., San Francisco.
 KFC—Northern Radio & Elec. Co., Seattle, Wash.
 KFU—Precision Shop, Gridley, Cal.
 KGB—Edwin L. Lorden, San Francisco.
 KGC—Hamilton Mfg. Co., Hollywood, Cal.
 KGF—Pomona Fixture Co., Pomona, Cal.
 KHO—Louis Wasmer, Seattle, Wash.
 KIZ—Reynolds Radio Co., Denver, Colo.
 KJJ—Radio Shop, Sunnyvale, Cal.
 KJO—C. O. Gould, Stockton, Cal.
 KJR—Vincent I. Kraft, Seattle, Wash.
 KJS—Bible Institute, Los Angeles, Cal.
 KLB—J. J. Dunn & Co., Pasadena, Cal.
 KLP—Colin B. Kennedy, Los Altos, Cal.
 KLS—Warner Bros., Oakland, Cal.
 KLX—Tribune Pub. Co., Oakland, Cal.
 KNI—T. W. Smith, Eureka, California.
 KNX—Electric Lighting Supply Co., Los Angeles.
 KOG—Western Radio Co., Los Angeles.
 KOJ—University of Nevada, Reno, Nev.
 KOV—Doubleday Hill Electric Co., Pittsburgh.
 KQI—University of California, Berkeley, Cal.
 KQL—Arno A. Kluge, Los Angeles.
 KQW—Charles D. Herrold, San Jose, Cal.
 KTW—First Presbyterian Church, Seattle, Wash.
 KUO—Examiner Printing Co., San Francisco.
 KVQ—J. C. Hobrecht, Sacramento, Cal.
 KWG—Portable Wire'ess Co., Stockton, Cal.
 KYF—Thearle Music Co., San Diego, Cal.
 KYI—Bakersfield Californian, Bakersfield, Cal.
 KYJ—Leo Meyberg Co., Los Angeles.
 KYY—Radio Shop, San Francisco.
 KYW—Westinghouse Co., Chicago.
 KZC—Public Market and Dep't Stores, Seattle.
 KZM—Preston D. Allen, Oakland, Cal.
 KZN—Desert News, Salt Lake City, Utah.
 KZV—Wenatchee Battery & Motor Co., Wenatchee, Wash.
 KZY—A. P. Radio Supplies Co., Oakland, Cal.
 KFAY—W. J. Virgin Milling Co., Central Point, Oregon.
 KFBH—Thomas Musical Co., Marshfield, Oregon.
 KFBJ—Boise Radio Supply Co., Boise, Idaho.
 KFBK—Kimball-Upson Co., Sacramento, Calif.

KFBL—Leese Bros., Everett, Wash.
 KFBM—Cook & Foster, Astoria, Oregon.
 KFBN—Borch Radio Corp., Oakland, Cal.
 KFBQ—Savage Electro Co., Prescott, Ariz.
 KFCB—Nielsen Radio Supply Co., Phoenix, Ariz.
 KFCC—Auto Supply Co., Wallace, Idaho.
 KFCD—Salem Electric Co., Salem, Oregon.
 KFDB—John D. McKee, Lombard & Kearney, San Francisco, Cal.
 KPAV—Cooke & Chapman, Venice, California.

CANADA

CJCU—Manitoba Free Press, Winnipeg, Man.
 CHCA—Radio Corporation of Vancouver, Ltd., Vancouver, B. C.
 CFAC—Radio Corporation of Calgary, Ltd., Calgary, Alta.
 CKCK—G. Melrose Bell, Regina, Sask.
 CHCF—G. Melrose Bell, Winnipeg, Man.
 CJCE—Vancouver Sun, Vancouver, B. C.
 CKCD—Vancouver Daily Province, Vancouver.
 CKCE—Canadian Indepe. Tel. Co., Toronto, Ont.
 CFCF—Marconi Wireless-Telegraph Co., Montreal.
 CFCF—Star Publishing & Printing Co., Toronto.
 CHCB—Marconi Wireless-Telegraph Co., Toronto.
 CFCB—Marconi Wireless-Telegraph Co., Vancouver, B. C.
 CJNC—Tribune Newspaper Co., Winnipeg, Man.
 CJCD—T. Eaton Co., Ltd., Toronto, Ont.
 CKZC—Dalton Radio Eng. Co., Winnipeg, Man.
 CHYO—Northern Electric Co., Montreal, Que.
 CFCE—Marconi Wireless-Telegraph Co., Halifax.
 CHCB—Marconi Wireless-Telegraph Co., Toronto.
 CJBC—Dupuis Freres, Montreal, Que.
 CHVC—Metropolitan Motors, Toronto, Ont.
 CJCA—Edmonton Journal, Edmonton, Alta.
 CJCI—McLean, Holt & Co., Ltd., St. John, N. B.
 CHIC—J. R. Booth, Jr., Ottawa, Ont.
 CHCC—Western Radio Co., Calgary, Alta.
 CFYC—V. W. Odlum, Vancouver, B. C.
 CKAC—La Presse Pub. Co., Montreal, Que.
 CHBC—Albertan Pub. Co., Calgary, Alta.
 CFPC—International Radio Development Co., Fort Frances, Ont.
 CJGC—London Free Press Printing Co., London, Ont.
 CKOC—Wentworth Radio Supply Co., Hamilton, Ont.
 CJCN—Simons, Agnew Co., Toronto, Ont.
 CJCB—J. G. Bennett, Nelson, B. C.
 CJCS—Eastern Telephone & Telegraph Co., Halifax, N. S.
 CKQC—Radio Supply Co., London, Ont.
 CHCS—London Radio Shoppe, London, Ont.
 CJSC—The Evening Telegram, Toronto, Ont.
 CKCS—The Bell Telephone Co., Montreal, Que.
 CFTC—The Bell Telephone Co., Toronto, Ont.
 CJCF—The News Record, Ltd., Kitchener, Ont.
 KZCR—Jones Electric Co., St. John, N. B.
 CFCH—Abitibi Power & Paper Co., Iroquois Falls.
 CFCN—W. W. Grant Radio, Ltd., Calgary, Alta.
 CHCX—B. L. Silver, Montreal, P. Q.
 CFCI—Motor Products Corp., Walkerville, Ont.
 CKKC—Radio Equipment & Supply Co., Toronto.
 CKUC—Can. National Railways, Toronto, Ont.
 CHFC—John Millen & Sons, Ltd., Toronto, Ont.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

FIRST radio dramatic critic! "Banco," the new comedy by Clare Kummer and Alfred Savoir, which William Harris, Jr., is presenting at the Ritz Theatre, New York, is the first play to be reviewed by radio. The criticism was sent from WJZ, Newark. The new department is in charge of Miss Brainard, now dramatic critic in addition to her other duties as entertainer for the million or so radio devotees in the Eastern States. WJZ expects this new feature, to be presented weekly, will rival in popularity Bedtime Stories and other standard features.

A series of talks on "Thrift" will be delivered by prominent savings bankers from WJZ. The first speaker is Victor A. Lersner, comptroller of the Williamsburg Savings Bank, Brooklyn, and president of the New York Savings Bank Association, who will tell "How Savings Banks Help Homebuilders."

The new radio station in China calls for the construction of four wireless stations. One in Shanghai is to be larger than any now in existence in this country. Completion of this station will mean direct communication between the United States and China.

Radio inventions are keeping the United States Patent Office busy. Thousand of minds are at work on radio problems. Consequently the patent-office examiners who handle the radio applications have more work than they can conveniently take care of. The office is swamped. Nothing is being done to relieve the condition and the art is suffering as a result. It is about time the force of examiners on this particular job was more than doubled.

The extended fall program of WGY is now effective. There will be four programs a week—on Monday, Tuesday, Thursday and Friday evenings—with an extra program on Friday nights at 10.30, Eastern Standard time. The gentler members of the radio audience will be recognized daily at 2 P. M., when short talks expressly for women will be broadcast.

Lieut.-Colonel A. S. Rowan, U. S. A., who carried the famous "Message to Garcia," twenty-five years ago, when the United States was fighting for Cuban liberty, has been rewarded with a special Congressional medal. Today, perhaps, such a message as that which made Colonel Rowan famous would be sent by radio.

C. W. Horn, formerly in charge of the Westinghouse Radio Service Department, has been appointed to take charge of all radio operations of that company in place of L. R. Krum, who has resigned to become manager of the Erner Hopkins Electric Co. of Columbus, Ohio. Mr. Horn has been interested in radio for the past thirteen years and knows every phase of radio development. His experience on ships has been from the time very few vessels were equipped with radio, until the recent years when every vessel sailing the seas has its radio equipment.

Following a satisfactory radio test Lieutenant Walter Hinton, American aviator flying from New York to Rio Janeiro, has started on another leg of his flight. His seaplane "Sampaio Correia II," is working perfectly, the new engines recently installed functioning in good order.

Many cities of this country are turning toward radio as a convenient medium for license-fee payments. Cleveland has passed an ordinance requiring a 50-cent fee and an examination of the installation by city inspectors. Newark is considering a fee of \$1, and other cities are taking up the idea. Amateur operators look with great disfavor on such schemes, for the Board of Fire Underwriters take care of the electrical safety of the installation, while the Government licenses and regulations control adequately the transmitting apparatus.

Protest has been made in the House of Commons to defeat the plan of Postmaster-General Kellaway against granting to a combine of instrument makers for two years the right of wireless broadcasting in England, and a monopoly of the sale of receiving instruments. The plan, if adopted, will exclude American and other foreign-made wireless apparatus. Captain Wedgewood Benn, Member of Parliament, said broadcasting should be considered as a supplement to newspapers. He declared it marked the biggest development in the dissemination

of information since the invention of the printing press. It was not right, he argued, that the development of radio broadcasting should be left in the hands of a combine.

Broadcasting station WOR is to have a short story contest. Anyone may enter this contest. The stories may be on any subject, the only condition being that they should be read in not less than ten minutes nor more than twenty minutes. The contest will close October 30. The prize-winning story is to be read by its author from the WOR broadcasting station. The title of the story and the name of the author will be printed in the radio program and also announced by radio. The judges are to be selected from men and women of Newark interested in literature. All manuscripts should be addressed to J. E. K., care of L. Bamberger & Co., Newark, N. J. The prize-winning story will be read from WOR on November 14.

Secretary of State Hughes returned aboard the battleship Maryland from Rio de Janeiro, where he attended the opening of the Brazilian Centennial Exposition. He declined to discuss the Turkish war, but said that he had been kept in touch, in a wonderful way, by radio, with the affairs of his office, while at sea.

Lord Hambleton as an "Announcer" at Marconi House, London



(C. International Newsreel Photos)

England's first "radio musicales" have met with great appreciation by thousands who have turned to this form of entertainment. A radio program is broadcast from the Marconi House, London, to hospitals equipped with receiving sets, so that patients may enjoy the music. Lord Hambleton is photographed at the microphone of a radio-transmitter asking all listeners to aid the hospitals. This microphone carries the voice vibrations to the radio telephone-transmitter, where it is then hurled into space

Radio and the Woman

By
Crystal D. Tector

THE average reader may wonder that a woman will take more than passing interest in such an apparently prosaic thing as police broadcasting; but when I read of the wonderful transmitting that had been installed for the police department of our big city of New York, I simply had to be the first of my sex to give it the onceover. Well, there is nothing in all the world just like it; and I really believe that radio will do more to suppress crime than any other element that has been brought to the service of humanity.

* * *

In the first place, it is the one thing that will put the fear of God into the heart of the bandit, the pick-pocket, the hold-up man, and all others of their criminal ilk who have been having a long and hearty laugh at the law's expense. It is going to be impossible, in the near future, as Police Commissioner Enright declares, for any criminal to get beyond radio's clutches. Taking the personal element into consideration, the average criminal may outwit the police; he may slip through their clutches; he may even turn his weapons of destruction on officers of the law and kill them.

* * *

But radio he cannot escape; neither can he wreak its destruction. Its penetrating force is faster than the criminal's fleeting. In no way can he outstrip it. There is no hiding from it. He may—and I doubt if he can—make his way to the ends of the earth; but the wonder waves of the ether will ferret him out. There is no place too small for them to penetrate—no corner too dark for their unrelenting eyes.

* * *

They told us that prohibition would empty the jails and the penitentiaries. I have my doubts. But I do most sincerely believe that radio, within the next decade, will prove to so many hardened criminals that the life they try to lead is so hopeless, they will turn to better things. Watch and see if I am not right.

* * *

I have been asked to give my opinion on the quality of the broadcasting programs of to-day; also, what I think of the proposed payment of royalties on copyrighted music that is being sent over the ether. While I am discussing more serious things, I may say that, in my opinion, we are receiving unusually good programs from all the broadcasting stations, considering the great amount of material that is being sent out. I know how easy it is to criticize and tear down; how difficult to construct. And whenever I hear adverse criticism regarding people or concerns that are trying their best to please, I always put myself in the place of the criticized and ask if I could do any better.

* * *

That the broadcast programs have improved cannot be denied. They are at least one hundred per cent better than those of last spring. The selections are more varied and interesting; and the method of sending them so that the various stations will not conflict is a great step forward.

* * *

The operator of one of the biggest broadcasters in the East told me the other day that every station is trying hard to make still further improvements and to arrange programs that will be still more varied and attractive. Thousands of letters offering all manner of suggestions are being received by every broadcasting station, and these letters are not being taken lightly. Every worth-while suggestion is given the attention it deserves. And I know that an effort is being made to secure better artists.

* * *

There is no doubt that the matter of royalties is—or will be—satisfactorily adjusted. I am told that, in another column of this issue of RADIO WORLD, the matter is presented from its latest news angle. The big broadcasting companies are not going to be niggardly regarding royalties. They want to be fair and generous. The only problem to be solved is how the royalties shall be arranged. That was one of the greatest complexities that beset the moving-picture industry.

* * *

You will gather from all this that I am very much of an optimist so far as radio is concerned. Of that there can be no doubt. I am doubly optimistic. I believe in radio as one of the greatest blessings that ever came to humanity, and from a two-fold point of view; firstly, as a great commercial advantage; secondly, as the greatest form of entertainment that the world has ever known.

* * *

There is absolutely no limit to the entertainment that radio will bring us and there is no possible limit to which that entertainment may be carried. He of the remote hamlet and the sailor on the high seas will some day sit close to the city folk and hear some unborn Caruso sing. And when the next President of the United

How a Singer Sends Her Voice Over the Ether



Miss Estelle Taylor, soprano of "Thorns and Blossoms," is photographed singing for radio. Her voice is directed at the horn which connects with a microphone transmitter. In turn, the microphone delivers her voice to the radio transmitter which throws it on the air. The mechanism of the microphone is similar to that of the telephone transmitter. The horn assists in picking up the music of the piano, and blends it with the singer's voice. It is all very simple, but the great wonder of it is how this music is carried many thousands of miles without a flaw.

States is elected, that news will reach the remotest perlieus of the South Sea Islands almost as soon as it is known in Chicago.

* * *

Miss Mary Hope, Atlanta, Georgia, writes to ask if I will help her to solve several hook-ups for a prize contest. Well, Miss Mary, that hardly would be fair. Why not go to it on your very own. You will be better satisfied in the long run. But, send me the hook-ups and let me see what I can do with them.

* * *

Mrs. H. J. S., Elmira, New York: If you are in doubt regarding your set, write our technical editor. He will give you the most expert advice and will publish a diagram, if that is necessary, to show you how to set things right.

* * *

Carrie P. Y., Pendleton, Oregon: It is impossible to say how many women are employed in the factories turning out radio apparatus in this country. I do not believe that this has been made public as yet—I have been too busy with other radio matters to find out. However, there must be a great many. I understand that women are particularly adapted to certain branches of radio manufacturing.

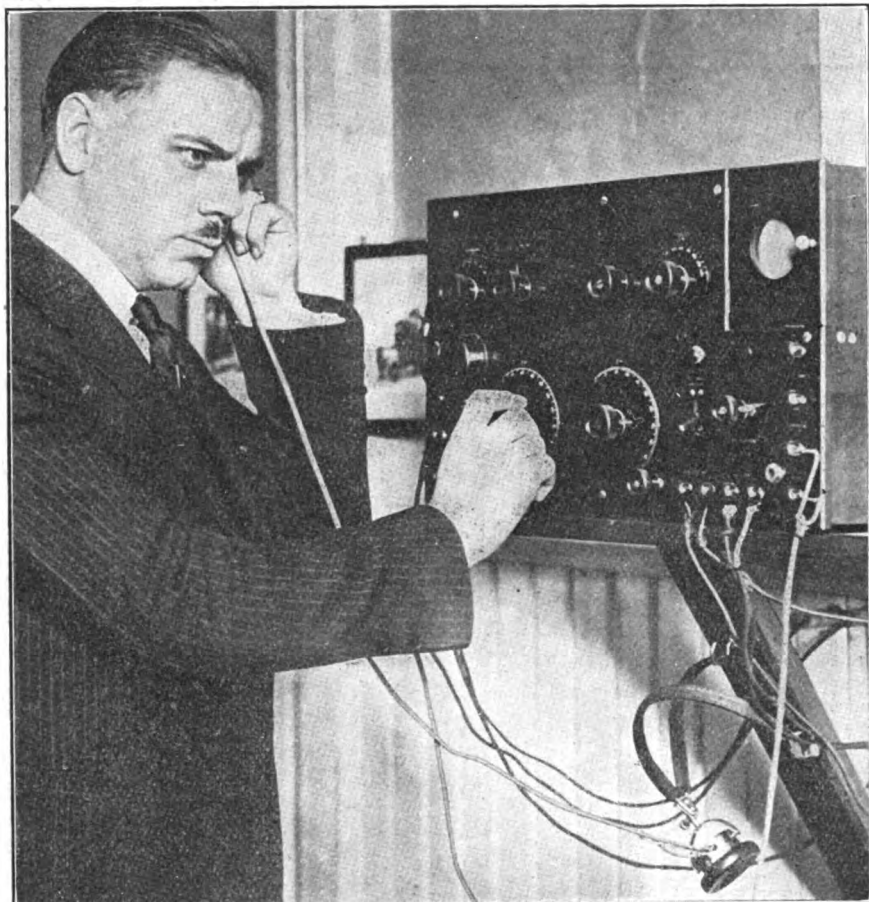
* * *

Miss Carrie F., Montgomery, Alabama writes me that she caught station WAFYZ, and wants to know what it is. No such place, my dear. Some mistake somewhere. There are no stations with five call letters.

* * *

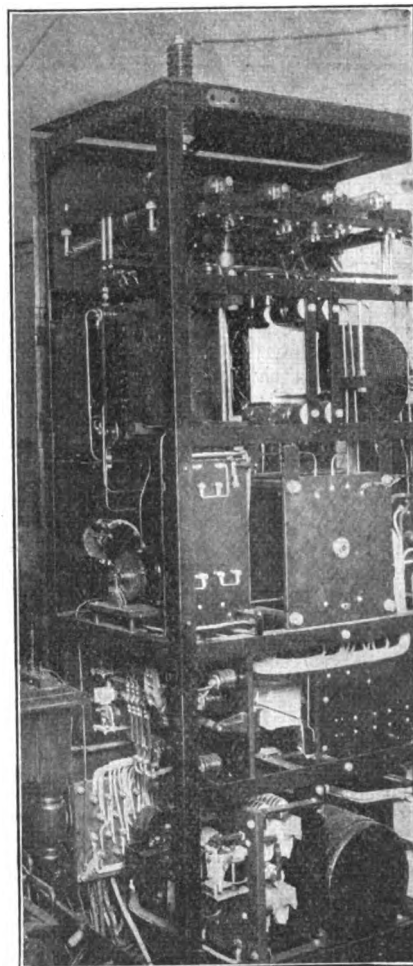
A St. Louis girl writes that a friend has presented her with one of those miniature sets you read about. Hers is in a case made to resemble a prayer book. I wrote her that her young man is one of those bashful things who hasn't the courage to ask her if she goes to church. Thinks he'll find out anyhow.

The Week's Important Radio Even



(C. Kadel & Herbert News Photos.)

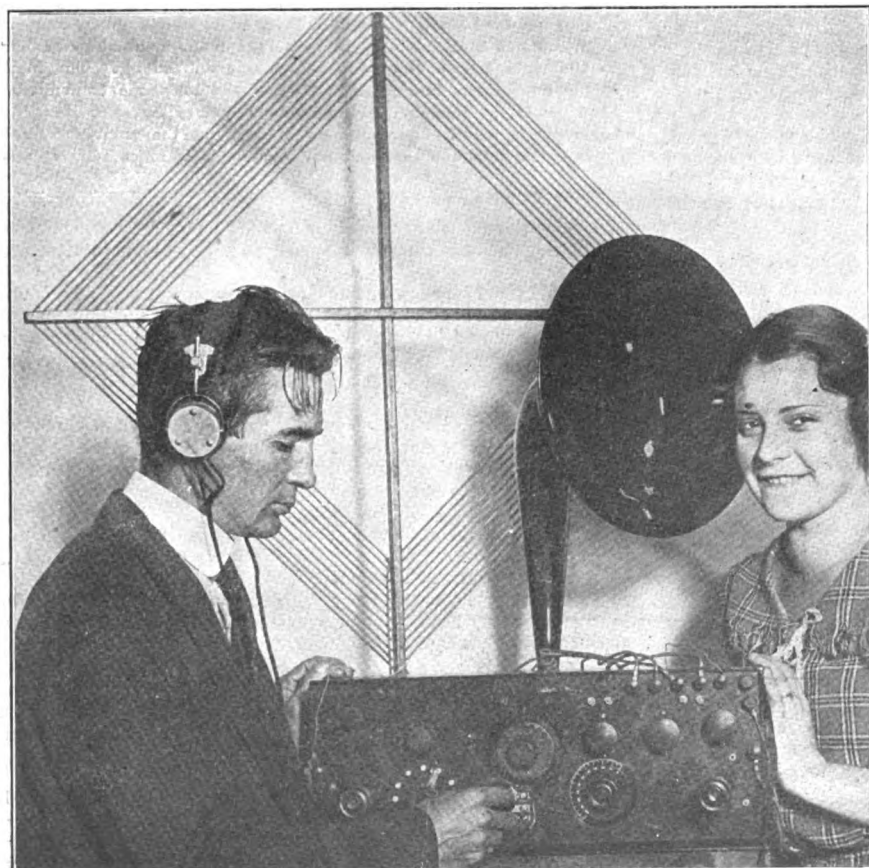
Here is a man with a new job! He is a radio critic. His duty is to check up and keep tabs on all the broadcasting from WJZ, Newark, N. J.



We seldom to see ju apparatus station loc actual ma the huma dreds of n of the ra complete which app graph to by the I ment, Wa principal broadcasti crop rep vast impa who need

Ann Penn way's pop stars (rig fan. No says, radi light. Sh in her ho antenna graph w Penningt gives a placing of speaker s to

(C. Kadel & Herbert News Photos.)



(C. Underwood & Underwood, N. Y.)

Paul Coates, Chicago radio amateur, and Miss Beulah Milburn, also a fan. Mr. Coates recently caused some ripple in radio circles with a superregenerative circuit built by himself. With a three-foot loop, he tuned in Newark, Schenectady, Atlanta and Kansas City.



(C. Kadel & Herbert News Photos.)

Radio amateurs have waited long for a lighting of the filaments of their tube lights have a supply of alternating cur been to adapt this current to the light kept charged, and most every radioman for such work." The accompanying pho at Columbia University, with a set in makes use of the house current for li check up the voltage. The coils which are indicated by 2. The receiving set vaquum tubes used as amplifiers. s home. These bulbs are used here to aid force for filament use. Toy transform the voltage down to that recommended 60-cycle hum was heard in the phones.

nts Picked up by Busy Photographers

...an opportunity
...what the chief
...of a broadcasting
...is; that is, the
...military that hurle
...a voice over hun-
...into the homes
...of listeners. This
...transmitting set,
...shown in the photo-
...to left, is operated
...at the Office Depart-
...ment, D. C. Its
...program is the
...of weather and
...which are of
...to the farmer
...each reports on
...a minute.



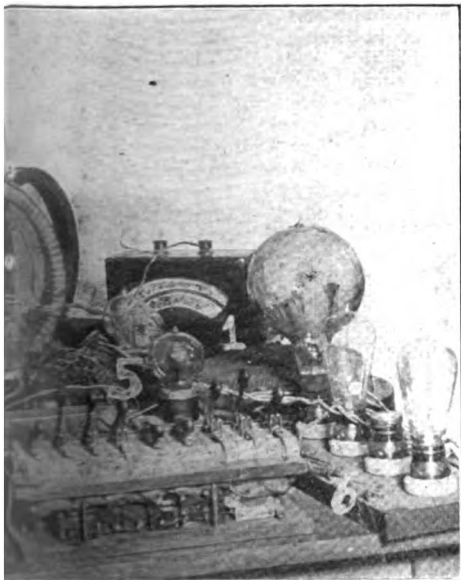
...night, one of Broad-
...musical-comedy
...is also a radio
...to dancing, she
...is her greatest de-
...shed a set installed
...in, but erected the
...itself. The photo-
...taken in Miss
...in living room. It
...stupid idea of the
...receiver and loud-
...not to take up
...much room.

(Herbert News Photos.)

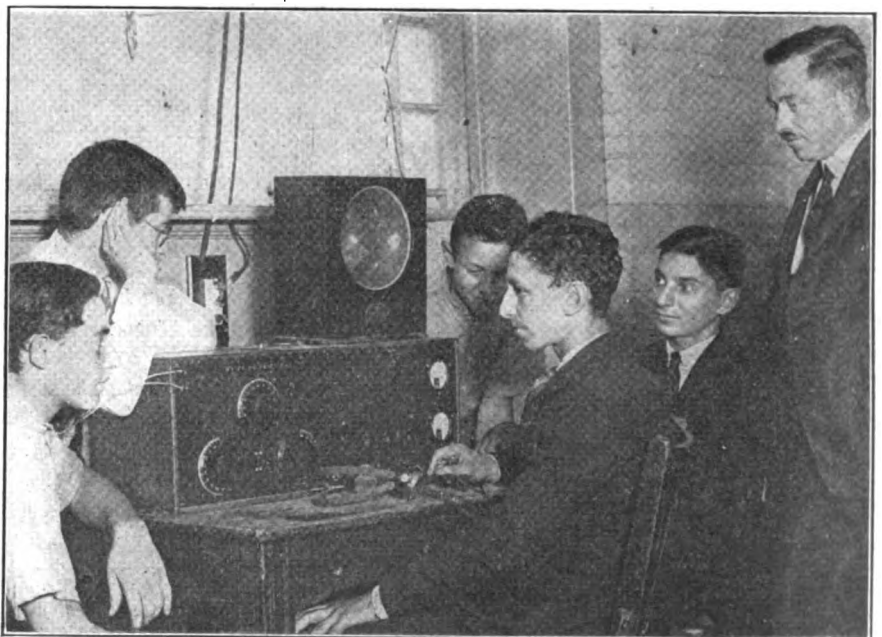


(International News-reel Photo)

The radio operator at Marconi House, London, broadcasting information that he is receiving from airplane pilots during a flight around the British Isles. The flight was one of the most sensational ever "staged" in Europe, a score of "boats" contesting. Each was equipped with radio and kept in touch with the transmitting apparatus in the photograph.



...tes that would remove the trouble attending the
...Since most houses that are wired for electric
...t of 60-cycles frequency, the main problem has
...of vacuum tubes. The storage battery must be
...is this question: "Can I utilize the house current
...graph shows Mr. J. C. Aceves, electrical engineer
...which he has eliminated the storage battery. He
...ing his tubes. 1 is an A-C voltmeter used to
...by the important part in this particular circuit
...beams at 3. 4 are the detector tubes, and 5 the
...ordinary electric bulbs in general use in the
...circuit in reducing the voltage to the required
...have been employed for this purpose; to step
...tubes, but the method failed because a strong
...th Mr. Aceves's method this hum was eliminated
...itely.



(C. Kadel & Herbert News Photos.)

Realizing the entertaining value of the radiophone, officers of the Hebrew Orphan Asylum, New York, installed an outfit for the benefit of the eleven hundred orphans there. With this regenerative set and two stages of amplification, results are highly satisfactory.

MICROSTAT VERNIER RHEOSTAT

The most sensitive filament control and quickest, easiest tuned. This microstat has ten times the possibility of exact filament adjustment as over the ordinary wire rheostat.

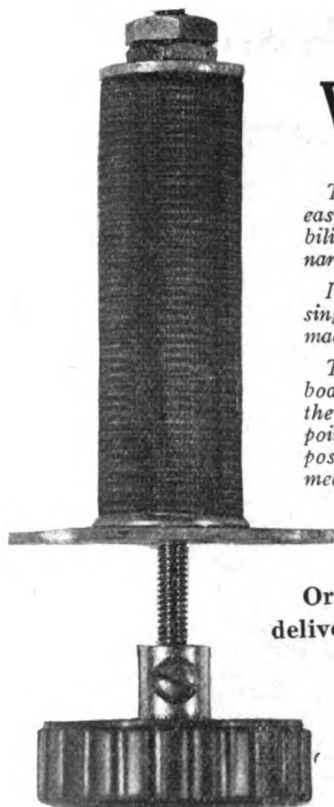
It eliminates grating and interfering noises, has single knob adjustment and is far more durable being made of better material with greater care.

This microstat takes up less room on the radio board, is neat and compact. The exact calibrations of the microstat are due to the gradual entering of two points into the resistance material of our own composition which gives us exacting and most minute measurement of current to the filament as the operator brings the two points together or separates them through the screw handle.

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MICROSTAT COMPANY
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Dealers, write for quantity prices



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Equip your set with the famous dry cell tube

Use Your Present Socket

Wiring changes are unnecessary when you use the

**SUNECO
TUBE
ADAPTER**

Patent Applied For



**TO
USE**

Place tube in adapter, put adapter in socket. The tube circuit is automatically adjusted to conform to set.

\$1.50 each

Sun Equipment Company

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New York, N. Y.

Broadcasters Will Pay Royalties for Copyrighted Music

MORE than one million dollars per year additional revenue is expected to enrich the coffers of the American Society of Composers, Authors and Publishers, says "The Clipper," New York, when final arrangements are completed between the society and various radio broadcasting-stations that perform copyrighted music for profit, take out performing rights licenses and pay an equitable fee for such rights.

The most definite step taken by the society to license the radio stations was on Wednesday, September 20, when a conference was held at the A. S. C. & P.'s rooms, between various radio representatives and organizations interested in copyright and the rights of such copyright owners. All of the representatives of the leading radio interests acknowledged the rights of copyright owners to collect a fee when their works were performed for profit, and the suggestion by E. C. Mills, chairman of the executive board of the Music Publishers' Protective Association, who presided at the conference, that \$5 per day be a minimum fee for each station, graduating up to a larger fee, was favorably received by those representing the important radio corporations. At this rate, the tremendous amount that will be paid the society by the radio stations will easily reach the million-dollar mark.

Many interesting questions were brought up at the conference, the stenographic report of which covers more than 100 pages and copies of which will be available to those interested as soon as they can be printed and bound. Most of the questions that arose were made by the radio men for points of information, and practically all of them were answered by E. C. Mills, who was later warmly congratulated.

Those present at the conference were: American Society of Composers, Authors and Publishers—Nathan Burkan, general counsel, and J. C. Rosenthal, general manager. Author's League of America—Mr. Williams, president, and Eric Schuler, vice-president. Music Industries Chamber of Commerce—Alfred L. Smith, general manager. Music Publishers' Association of the United States—George Fischer, president, and Alfred L. Smith, secretary. Department of Commerce, United States of America—Arthur Batcheller, Radio Inspector of Second District. American Telephone and Telegraph Co.—A. H. Griswold, S. L. Ross and C. H. Fuller. Radio Corporation of America—J. C. White, and Ira J. Adams, counsel. General Electric Company—H. E. Dunham, counsel, and M. P. Rice, in charge of WSY station. Westinghouse Electric & Manufacturing Company—William E. Easton, vice-president; Calvert Townley, assistant to the president, and C. B. Popenoe, of WJZ broadcasting station. G. Shirmer, Inc.—O. G. Sonneck, National Radio Chamber of Commerce—Mr. Lewis, secretary. Music Publishers' Protective Association—E. C. Mills, chairman of the executive board, presiding at the conference.

Radioisms

A RADIO Beginner is a man who spends \$90 on parts to build a \$19 set.

A Radio Fan is a man who believes that God made the air for broadcasting.

An Amateur is a man who is convinced that the devil invented broadcasting merely to fill the atmosphere with noise to smother the sweet sounds of the dah-de-dah.

The Dah-de-dah is a peculiar bird who is never satisfied with QRK, but is ever looking with longing eyes on DX. He abhors ORN, but manages to stand it, yet QRM, particularly from broadcasting stations, brings tears of anger to his eyes.—"The Globe," New York.

California Leads in Broadcasting Stations

Service Continues in All but One State

By Washington R. Service

BBROADCASTING still continues in all but one State in the United States, notwithstanding pessimistic reports from some quarters that this service, which is likened to a fad, is falling off and likely to collapse. On September 21, there were 510 active broadcasting stations, according to a survey by the Radio Section of its limited commercial stations, operating on 360 meters.

The list of broadcasting stations published on pages 12 and 13 of this issue of RADIO WORLD is a complete record of licensed stations in the United States and Canada, alphabetically arranged. It has been brought up to date—every station officially reported from Washington received up to the time of going to press is included. All new stations are published in RADIO WORLD from week to week, as soon as received from Washington.

California still leads with 66 stations sending entertainment, news, and information; Ohio is second with 34; and New York third, having 28 stations. Wyoming brings up the rear, without a single station. Every other State of the Union has one or more transmitting stations carrying entertainment in some form.

Class B Applications

Several applications from larger broadcasting stations for the class-B license, permitting the use of the 400-meter wave, have been received by the Department of Commerce, but to date only two have been authorized to transmit on this wave. They are the "St. Louis Post Dispatch" and the Westinghouse Station, Chicago. The officials in charge of the licensing of radio stations do not anticipate that more than a dozen applications for the class-B license will be received, as only the most powerful stations carrying high-class entertainment regularly may hope to qualify.

Four New Licenses

During the past week, four licenses were issued for regular 360 meter broadcasting stations, as follows:

WLAX—Greencastle Community Broadcasting Station (Putnam Electric Company), Greencastle, Indiana.

WLAS—Hutchinson Grain Radio Co., Hutchinson, Kansas.

WPAN—Levy Bros., Dry Goods Co., Houston, Texas.

WMAG—The Tucker Electric Co., Liberal, Kansas.

The list by States is as follows:

Number of Broadcasting Stations by States on September 21, 1922

California	66
Ohio	34
New York	28
Pennsylvania	27
Texas	25
Washington	23
Missouri	22
Illinois	20
Iowa	20
Nebraska	17
Oregon	15
Kansas	15
Minnesota	12
Indiana	12
Massachusetts	12
Michigan	11
New Jersey	11
Louisiana	10
Wisconsin	10
Florida	9
District of Columbia	8
Oklahoma	8
Georgia	7
Arkansas	6
Colorado	6
Arizona	5
Connecticut	5
Idaho	5
Rhode Island	5
West Virginia	5
Alabama	4
Maine	4
Utah	4
Kentucky	4
Montana	4
Maryland	3
North Carolina	3
South Dakota	3
Tennessee	3
Nevada	2
New Mexico	2
North Dakota	2
Porto Rico	2
South Carolina	2
Hawaii	2
Vermont	2
Virginia	2
Delaware	1
Mississippi	1
New Hampshire	1
Wyoming	0
Total	510

MAGNAVOX
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and Education
to the
Farm



*How Science has bridged
with wireless the miles
between city and country*

NOW to the health and independence of farm life, you can add the large city's most envied advantage—access to wholesome, inspiring entertainment.

Within the past few months more than half a million radio receiving sets have been installed by amateurs, mostly to hear the daily programs of Concert and Dance Music, Vaudeville, Speeches, Sermons, etc., broadcasted from central stations in all parts of the country.

Without a Magnavox Radio no wireless receiving set is complete. It makes it possible to hear all that is in the air as if it were being played by your phonograph.

Any radio dealer will demonstrate for you, or write to us for descriptive booklet and name of nearest dealer.

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Radio brings it
MAGNAVOX
tells it

Volume 1 of RADIO WORLD Now Complete

Our supply of back numbers of RADIO WORLD (Nos. 1 to 26) is limited. We will take orders for the first volume until the supply is exhausted. If you want these numbers, or want your subscription to start with any special number, let us know.

RADIO WORLD CO., 1493 Broadway, New York City

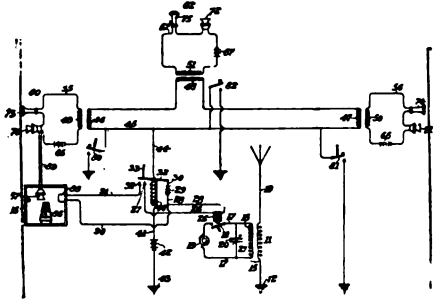
Radio Patents

John Hays Hammond, Jr's., New System for Transmitting Radio Waves

No. 1,425,523. Patented August 15, 1922.
 Patentes, John Hays Hammond, Jr.,
 Gloucester, Massachusetts.

JOHAN HAYS HAMMOND, JR., one of the most prolific inventors in the radio field, has added another patent to his long list. It is an improved system for transmitting electradiant energy; particularly where a control station, and one or more auxiliary control stations, is operated. In this new system means is provided for informing the operator at any one of the auxiliary stations as to the responsiveness of the central station.

A particular embodiment of this invention comprises an antenna or open aerial circuit, which includes an inductance and which is grounded through the



Diagrammatic representation of a transmission system constructed in accordance with Mr. Hammond's invention.

inductance. The inductance forms the secondary of a transformer which includes a primary inductance which is in a circuit controlled by a normally open switch and arranged to be energized by a high-frequency electric alternator. A variable condenser is connected in a well-known manner to form with the primary inductance, a closed oscillatory circuit, which is preferably tuned to the natural frequency of oscillation of the open aerial circuit.

The normally open switch is arranged to be controlled by an electromagnet, one end of the winding of which is connected by a conductor to a fixed terminal. The other end of the winding of the magnet is connected by a conductor to one pole of a battery the other pole of which is connected by conductor to a switch which is arranged to swing into and out of engagement with the fixed terminal, and which is normally held open by a spring.

For controlling the normally open switch either from a central station or from anyone of a plurality of auxiliary stations, an electromagnet is suitably arranged.

* * *

For Testing Transmitters or Receivers

No. 1,426,897. Patented, August 22, 1922. Patentes: Harold D. Arnold and John P. Minton, East Orange, New Jersey.

THIS invention relates to a method of and system for testing the comparative efficiency of telephone transmitters or receivers, and for testing the component parts thereof, such as their diaphragms and also the granular carbon employed in the transmitter.

The invention makes use of a source

of sound; for example, a telephone receiver, which acoustically operates the apparatus under test, that is, the transmitter, or receiver, or component parts thereof. A source of energy is connected to the receiver and the alternating-current energy produced thereby in the apparatus under test is measured and compared with the results obtained when other apparatus is tested under like conditions. In this way it may be determined if the element tested—transmitter, receiver, diaphragm, or granular carbon, measures up to the chosen standard of efficiency.

It is well known that telephone currents produced by speaking into a transmitter are very complex and may be considered as made up of currents of various frequencies, extending over the acoustic range. It is desirable in testing telephone devices to duplicate actual

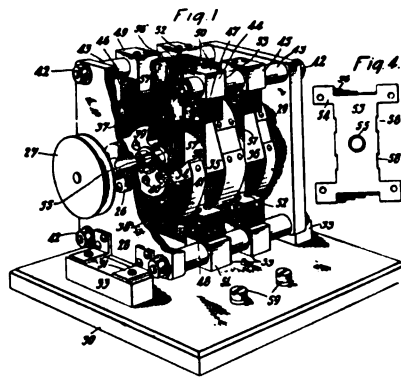


Figure 1 shows a perspective view with parts broken away, of the variable inductance; figure 2 shows, diagrammatically, a testing system that may be used; figure 3 indicates diagrammatically a wave filter; and figure 4 is a plan view of a coil supporting plate forming a part of the inductance shown in figure 1.

working conditions as nearly as possible, while obviating the necessity of actually employing currents produced by the voice. To this end the invention provides a special form of generator for energizing the receiver which actuates the element under test. This generator supplies current which continuously and cyclically varies in frequency over the important part of the voice frequency range, thereby testing the apparatus at all those frequencies which are most important in speech.

* * *

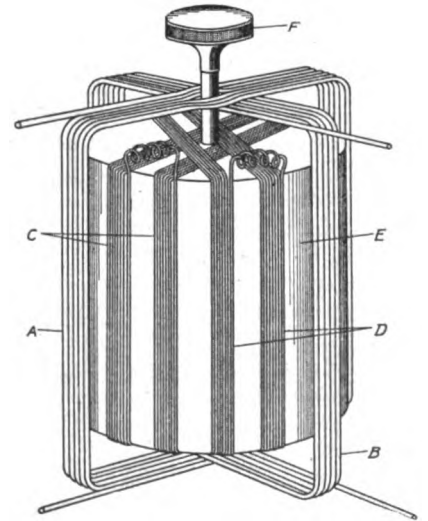
To Aid Direction Finding

No. 1,425,137. Patented, August 27, 1922. Patentes: George Maurice Wright, Lyngrove, Chesterfield, England.

IN the "aperiodic aerial" system of direction finding, using two fixed aeri- als and a radiogoniometer, it is necessary to

make the coupling between the tuned search-coil circuit and the aerial circuits as tight as possible. This condition is desirable firstly in order to minimize the loss in signal strength due to the method of tuning; and, secondly, to increase the ratio of signal strength to stray effects which tend to distort the ideal polar diagram of the system.

A radiogoniometer usually consists of windings disposed on two co-axial cylinders, the inner cylinder carrying the search coil winding and being capable of rotation. In order to make the coupling between field and search-coil windings as large as possible, it is necessary to make the cylinder carrying the search coil of as large a diameter as possible in order to bring the windings close together. The magnetic field inside the outer winding is, however, not uniform but is more intense in the neighborhood of the conductors themselves. Consequently, as the search coil is rotated, the



A radiogoniometer comprising two stationary coils in planes at substantially right angles, and a rotatable search-coil comprising two windings in planes at an acute angle with each other.

law of coupling between it and each field winding does not follow the sine law required theoretically and errors are produced.

In the positions of symmetry, i. e. when the plane of the search coil either coincides with that of either aerial coil or lies midway between the two, no error will exist. Consequently the error curve takes the form of a cyclic variation making four complete cycles per revolution of the search coil and if one aerial coil is parallel to the 0-180 degree line of the scale pointer system, then the points of zero error will be 0, 45, 90, 135, etc., and the points of maximum error about 22½, 67½, etc.

According to my invention I construct a radiogoniometer having a double search coil with its two windings in planes making an angle of substantially 45 degrees.

The coils may be connected in series. In this case the total E. M. F. induced in the winding by the currents in the two aeri- als is given by the algebraic sum of the E. M. F.'s in the individual coils. And though the difference of each E. M. F. from the ideal case may be quite considerable, yet since the differences are of opposite sign they cancel out and the radiogoniometer will read correctly in all positions of the search coil.

52 Weeks for \$6.00

Complete Year File of RADIO WORLD
 Copies of Radio World No. 1

If you did not get a copy of Radio World No. 1, send us \$6.00 and we will send you this paper for one year, and start it with our first issue, which will be mailed you as soon as possible after receipt of order.

The "COPPER GIANT" "B" Battery
IS GUARANTEED FOR TWO YEARS
 in ANY receiving set, because it does not deteriorate while standing idle. This is a very large battery designed for stationary or semi-portable installations where absolute reliability over a period of years is the first consideration. Standard voltages—22, 50 and 100. Any voltage made to order. Write for illustrations.
J. A. RITTER, Lansdowne, Pa.

BUILD YOUR OWN
 Complete 50c. instruction book for 20c. only on radio reception and how to make eight classes of crystal and vacuum tube receiving sets. Wonderful information makes you understand radio. With every order we send free our price list of parts prepared especially for the several sets described. Buy direct from factory and save many dollars. Both instruction book and price list sent on receipt of 20c. only. Money back if not pleased.
RADIO PARTS MFG. CO.
 Dept. 15, Park Pl. W., Detroit, Mich.

MILLBRO RADIO SUPPLY
 187 Seventh Avenue New York City
NOVO B BATTERIES
 Medium Variable, \$1.00; Large Variable, \$1.50. Exide Storage Batteries, 80 ampere hours, \$19.75.
 Full Line of Radio Parts at Extremely Low Prices

NOVO "B" BATTERIES FOR RADIO
 22½-45 & 105 VOLTS

NOISELESS DEPENDABLE GUARANTEED
ASK YOUR DEALER
NOVO MANUFACTURING CO.
 424-438 W. 33rd ST. NEW YORK
531 SO. DEARBORN ST., CHICAGO.

The Advice of An Expert



THIS sign on the clean plate-glass window of a radio shop means that a competent radio expert is in charge within, who will gladly give you the benefit of his broad experience in selecting just the radio equipment to suit your purse and purpose.

"It Pays to Buy at the Sorsinc Store"

Mr. Dealer:—If you are a progressive merchant, you may display the Sorsinc sign. Let us tell you how.
 Ship Owners Radio Service, Inc. New York
 80 Washington Street
 Wholesale Distributors

Eight Radio Stations for Alaska

Also, Five New Radio Beacons for Lighthouses Attest Government's Liberality

EIGHT new radio stations have been opened in Alaska and five new radio beacon-stations have been added to lighthouses.

The opening of the Alaska stations means the introduction of radio broadcasting in Uncle Sam's northern territory on a large scale. The geography and limited population of the territory make the general use of radio receiving sets somewhat difficult of achievement, but government officials suggest that the stations may be used in connection with community radio-sets installed in town halls or mining camp central buildings for the enjoyment of inhabitants in these various localities. The stations have been opened at Alitak, Akutan, Libbyville, Funter, Naknek, Chisik Island, Snag Point and Koggiung.

The installation of radio beacon stations in lighthouses is another step forward in installing radiophones in isolated spots. The new installations are primarily for code signals, but can be adapted to radiophone receiving-sets. The new installations are being made at Boston, Nantucket, Cape Charles, Columbia River, and Puget Sound.

If financial appropriations permit similar equipment will be installed at Delaware Bay Lighthouse, Los Angeles, and Blunts Reef. These are in addition to the two new radio beacons at Diamond Shoal, Cape Hatteras, and the San Francisco Light Vessel. Three radio beacons have been in operation in New York harbor for over a year: Ambrose, Fire Island and Sea Girt.

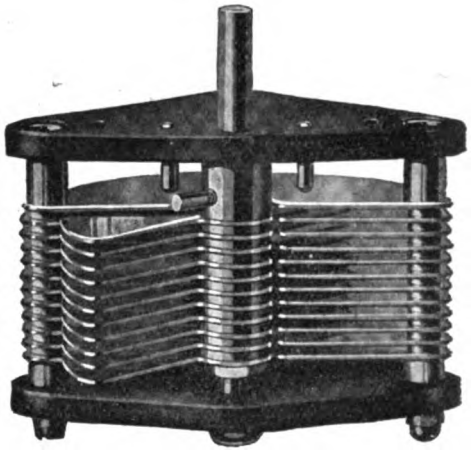
Army Air Service Broadcasts

TWO stations of the United States Army Air Service have made decided hits with the radio fans by broadcasting on a small scale—"entering the newest field of indoor sports," they term this public service.

The 91st Observation Squadron, stationed at Eugene, Oregon, on Forest Fire Patrol duty, is using the radio station at its flying field during spare time to entertain neighbors within a good radius and has met with marked success. There is no other station of any size in that locality broadcasting, so they are putting on a program chiefly of phonograph music and short talks on forest fire fighting and prevention, with occasional entertainment of other kinds. It is their intention to build a regular broadcasting room in order that they can carry music by a local orchestra. Great enthusiasm is said to be shown by local fans who listen in at home or attend the loud-speaker concerts held in the city park on special nights.

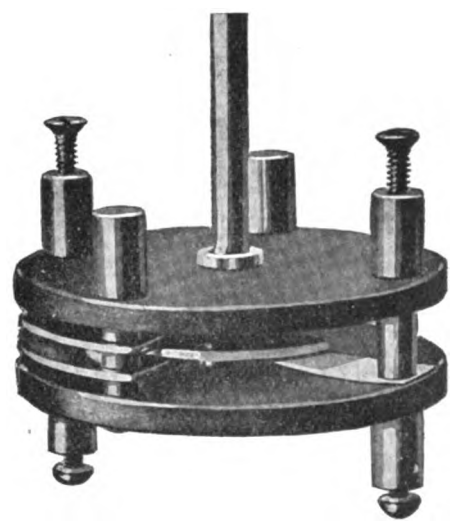
Brooks Field, at San Antonio, Texas, also has an "amateur" broadcasting station where the officers and men of the aerial squadrons put on a varied musical program. his created considerable interest in the surrounding territory, according to letters received by Lieutenant McGregor, of the Field Communication Department. The post jazz band, augmented by piano, saxophone and cornet solos, furnishes the latest music nightly. The slogan, "Own your own radiophone," has come to be very common thereabouts.

"RADIO" VARIABLE CONDENSERS



These condensers are the Standard of Quality. Carefully tested, inspected, balanced and adjusted to give maximum satisfaction.

- 3 plate Vernier \$1.50
- 23 plate 4.00
- 43 plate 5.00



Sent prepaid on receipt of price. Special discounts to Radio Clubs.

Jobbers and Dealers write or wire for the biggest proposition in Radio—TODAY!

FREDERICK H. PRUDEN INCORPORATED
LERNER BUILDING
 993 Bergen Ave.
JERSEY CITY, N. J.

Subscribe for RADIO WORLD. \$6.00 a year, \$3.00 six months, \$1.50 three months.

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

Is America on Threshold of New Inflation?

THE expansion of business in the United States since the first of the year has been so rapid as to raise the question as to whether it was going too fast for the future good of the country—particularly as to whether the rest of the world was ready for so much prosperity in America, writes John Oakwood, in "Forbes Magazine."

Since the first of the year there has been a marked increase of commercial and industrial activity in the United States, reflected in rising prices and expansion in credit and Federal Reserve currency. This development of activity has been retarded by the coal and rail strikes.

Accompanying the expansion in domestic business there has been an expansion in the evident ability of the world to buy and sell from and to the United States, coupled with the ability to command a large volume of credit here; as to Europe in particular, there has also been a strengthening of her position to do business with the United States, and also to command a considerable volume of credit here.

As to the future, there is good evidence that world conditions justify the expectation of a rising volume of sound business activity and prosperity for the United States, but halting business in several of the nations of Europe and unsatisfactory credit conditions in them serve warning against any expectation of a boom.

Therefore, business expansion in the United States, since the first of the year has perhaps been a bit too fast for the world, and the industrial and commercial slowing up caused by the strikes may not all be lost time.

Radio Goods that Stand the Test

Manufacturers, send a sample of your goods to our Technical Editor, Fred. Charles Ehlert, 9908 Pleasant Street, Queens, Long Island, N. Y. It will be carefully tested and returned. If your goods satisfy our experts, RADIO WORLD'S endorsement will be published in our merchandise department without charge or obligation of any kind on your part. This is a free service on the part of RADIO WORLD, calling for no expense whatsoever on the part of the manufacturer, except the sending of a sample of his goods.

Vacuum-Tube Socket

Manufactured by Teleradio Eng. Corp.,
484 Broome Street, New York, N. Y.

A VACUUM-TUBE socket of standard make. It takes very little room on the back of the panel board. The holder, which is made of polished aluminum, holds the standard tube manufactured by various concerns. The base, which is of a composition insulating material, holds four contact posts. Spring contacts are used to make direct connection with the prongs of the tube.

* * *

Aerial Plug

Manufactured by G. M. Jost, 1 Union
Square, New York, N. Y.

THIS is a plug of simple and rugged construction. It consists of a housing of insulating material, having a blinding post on either side, with a condenser. The condensers employed are particularly of good construction. The whole unit is so assembled as to make a rigid, compact, and efficient con-

How Old Is News?

A month or two after it happens—is that news? Think of putting away your Sunday newspaper and letting it age from four to six weeks before reading it.

Radio is the most rapidly moving industry to-day. More new ideas, inventions—new patents—are coming to the front each week in radio than in any other field.

Yet some people are still reading a monthly radio paper when they could read (and at less cost) RADIO WORLD, the national illustrated weekly, and get their radio news the week it happens instead of from four to six weeks afterwards.

Some business men are still paying four times the cost of an advertisement in RADIO WORLD, the weekly, and inserting their advertising in monthly radio-publications, jammed between a hundred or more pages of similar radio "ads."

RADIO WORLD, published four or five times each month, is not as bulky as a monthly. Each advertisement is next to interesting text matter, so that it is seen, remembered, and brings results.

Gentlemen, to-day it's the WEEKLY that pays advertisers best. RADIO WORLD is the Saturday Evening Post of radio.

It's the best advertising buy in the radio field with its seventy thousand fan-readers, besides having more dealer-readers than any radio-dealer publication.

Put RADIO WORLD on your advertising schedule. There is no duplicate circulation in this weekly—as it's the only national illustrated radio WEEKLY.

denser. The average capacities were approximately .0003 mfd. When testing for receiving, the plug gave very good results whether the current was turned on or off. At a distance of 40 miles from a broadcasting station using a two-stage amplifier regenerative set, receiver gave satisfactory results. The plug was not so efficient when the crystal receiver was used. A screw plug is provided so that the unit may be connected to any lighting socket in the home.

Radio Exports for July Total \$385,861

RADIO-EQUIPMENT exports from the United States, during July, were valued at \$385,861 and totaled 225,475 pounds in bulk. Most of the apparatus went to England, where \$139,027 worth was forwarded. Cuba was second, importing \$42,415 worth.

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Miracle Radio Co., 1312 Main St., Dallas, Tex.

West Side Electric Protective Co., Manhattan, \$5,000; J. Capohl, W. G. Wheeler. (Attorney, B. F. Hamilton, 825 Eighth Ave., N. Y.)

Gillen & Timmins, Lynbrook, electrical work, \$5,000; P. and J. H. Gillen, L. J. Timmins. (Attorney, D. Haar, 299 Broadway, N. Y.)

Federal Radio Sales Co., 1011 Elm St., Dallas, Tex.

Oak Cliff Radio Co., Tenth and Jefferson Sts., Dallas, Tex.

The Marconi International Code Co., New York City, has been dissolved.

The Dubilier Condenser Co., New York, has changed its corporate name to William Dubilier Co.

New York Aerial Concert Corp., radio sales agents and distributors, \$20,000. (Attorneys, Nugent & Nugent, 230 Madison Ave., N. Y.)

Muskegon Radio & Specialty Co., 419 Lake Shore Drive, Muskegon, Mich.

Radio Equipment Agency, 1315 Main St., Dallas, Tex.

Crown Radio Manufacturing Corporation, Manhattan, \$5,000; D. C. Josephson, A. S. Levy. (Attorney, M. Schwebel, 233 Broadway, N. Y.)

Electric Co., Manhattan, \$10,000; E. J. Bell, S. A. Spalding, J. V. Booth. (Attorney, W. F. Timme, 350 Madison Ave., N. Y.)

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and exhibitions. Keep us posted by mailing full information.

ANNUAL SHOW OF THE ST. LOUIS RADIO ASSOCIATION, St. Louis, Mo., October 4 to 7, inclusive.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 4 to 22. U. J. Hermann, managing director, 549 McCormick Building.

CINCINNATI RADIO-AND-ELECTRICAL EXPOSITION, Music Hall, Cincinnati, O., October 2 to 7, inclusive.

TRI-STATE TOBACCO GROWERS' RADIO SHOW, Covington, Ohio, October 21 to 23, inclusive.

NEW YORK ELECTRICAL AND INDUSTRIAL EXPOSITION, Grand Central Palace, New York City, October 7 to 14, inclusive.

NEWARK'S SECOND ANNUAL RADIO SHOW, Robert Treat Hotel, Newark, N. J., October 4, 5, 6 and 7.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31, inclusive. Direction American Radio Exposition Company, 120 Broadway.

BOSTON RADIO EXPOSITION, AND NEW ENGLAND AMATEUR CONVENTION, Mechanics Building, Boston, October 30 to November 4, inclusive.

SPRINGFIELD RADIO EXPOSITION, Springfield Auditorium, Springfield, Mass., October 3 to 7, inclusive.

SOUTHERN CALIFORNIA RADIO SHOW. Combined exhibition of the Southern California Broadcasting Association, the Southern California Radio Association, and the Southern California Radio Trade Association. Los Angeles, October 9 to 14 inclusive.

PHILADELPHIA RADIO SHOW, October 3 to 7, inclusive.

INTERNATIONAL RADIO SHOW, Madison Square Garden, New York City, November 20 to 25, inclusive. E. C. Buchignani, director of publicity.

Shall Foreign-Made Vacuum Tubes Be Admitted Free of Duty?

THE report from Washington that Senator Joseph S. Frelinghuysen, of New Jersey, has introduced an amendment to the McCumber-Fordney tariff bill, now before Congress, placing foreign-made vacuum tubes on the free list, created quite a stir in radio-manufacturing circles in this country. Senator Frelinghuysen was prompted, probably, by the report that reports made to him indicate that there appears to be an underproduction of this important radio article in this country—a stand in which he is upheld by many dealers, as several of the appended letters will attest. If there is to be an effort to corner tubes in America, there will be many who will not oppose Senator Frelinghuysen's measure, particularly as Great Britain announces that she has granted patents on a new tube which will equal anything manufactured elsewhere in the world.

On the other hand, the proposed Frelinghuysen amendment is opposed by many American manufacturers and dealers who believe that the American article is so superior to any made in Europe, especially those manufactured in Germany and which, it is expected, will be exported to this country in large quantities, that, should any underselling of the American product be permitted, radio, in general, would suffer.

American tube manufacturers are endeavoring to put on the market only the best possible radio goods. They are endeavoring to produce apparatus that will give the radio enthusiast an outfit that cannot be criticized, so that when he purchases an entire set, or individual parts, he will realize that he is buying tested, standardized merchandise and that he can rely on it as if he were purchasing a phonograph or an automobile.

In view of the possibility of foreign tubes being brought to this country free of duty and competing with the home-manufactured article, RADIO WORLD sought the views of American dealers, whose letters are published herewith:

Would Put Us Out of Business

By J. E. Allison, Secretary, Moorhead Laboratories, San Francisco.

RADIO vacuum-tubes should not be admitted to the United States duty free, for the reason that the production costs in Europe, to-day, are at a low cost

—lower than ever before. Tubes can be manufactured there, shipped here, and distributed with profit, if admitted free of duty, at a price that would paralyze our domestic industry.

Speaking for the Moorhead Laboratories, its plant is equipped with special machinery, devised and built at a heavy cost for the production of vacuum-tubes only, and not suitable for the manufacture of other products. Admitting vacuum tubes to the United States duty free will simply put us out of business.

A tariff, which would force the imported tube to a selling price equal to our own, is due to the men who have devoted much time and money to the evolution and manufacture of the radio tube.

* * *

British Tubes Superior

By M. F. Klicpera, President-Treasurer, Klitzen Radio Mfg. Co., Racine, Wis.

WE feel that vacuum tubes of a foreign nature should be admitted into this country duty free. We understand that most of these tubes are manufactured in England and France, and to our knowledge we know nothing very definite about the German tubes.

However, the British tubes have proven so superior and successful to the American made tubes and also of the extremely low prices at which they are sold, has led us to believe it to be very beneficial to radio trade if these tubes were admitted free. This admission would, no doubt, reflect very strongly on the present prices of vacuum tubes as manufactured in this country.

We firmly believe the prices asked for tubes are beyond reason, and, therefore, a cheaper and better tube would be very heartily welcomed by the radio fraternity without question.

* * *

Foreign Tubes Should Be Admitted

By Paul F. Johnson, Altadena Radio Laboratory, Pasadena, Cal.

WITH the tube situation as it is, we would be in favor of Senator Frelinghuysen's amendment to the tariff bill to admit vacuum tubes free of duty. We do not know anything about tubes coming from Germany but from our knowledge of other things made in England, we believe that the English tubes are undoubtedly good and would be glad to have a chance to try them out in this country.

We believe that the Radio Corporation and General Electric Company are holding up the public on vacuum tubes, selling them at retail prices of \$5 and \$6.50 for tubes that probably do not cost them over 15 cents to make, and which they could sell wholesale at a price of 30 cents or 40 cents and make a big profit. Also, in spite of the fact that they have had all summer to catch up on their orders, we are still short of tubes out here on the Pacific Coast; and when the fall rush starts in, unless a big quantity of tubes arrives pretty quickly, there is going to be just as bad a shortage here as there was last spring. We have been trying all summer to get tubes that were ordered six to

eight months ago and have succeeded in getting only a very small quantity.

If foreign tubes were admitted free of duty, we believe the General Electric Company would have to get a hump on themselves and also put the price down to a reasonable figure.

* * *

Would Benefit User

By P. C. Leffel, Manager, Radio Equipment Company, Springfield, Ohio

WE would like to see the amendment to the tariff bill go through admitting free vacuum tubes, although imported from Germany. It would benefit the user as well as the dealer, from our standpoint of view.

* * *

Detrimental to Radio

By J. C. Hobrecht, J. C. Hobrecht Co., Sacramento, Cal.

IT is the writer's opinion that this (admitting vacuum tubes free of duty) would be absolutely detrimental to the development of radio in this country. The men who have worked to develop American tubes and are putting them on the market are entitled to protection, and in a case of an emergency they are the only ones the country can depend upon. Consequently you can register my opinion as heartily opposed to admitting any tubes duty free.

* * *

There Will Never Be Another Tube Shortage

By an American Tube Manufacturer.

ASK the readers of RADIO WORLD to help support the radio industry of America by writing their particular Senator that the tariff bill should levy a duty on all foreign made radio equipment. You can specifically call their attention to the proposed amendment which would mean that foreign made vacuum tubes would be admitted to the United States duty free. You can appeal to their fairness in supporting the radio industry of this country.

Another point is that purchasers of foreign made equipment will be at a decided disadvantage as regards service or spare parts. I grant that some products are entirely satisfactory when made in foreign countries, but anything as complicated as radio should be manufactured at home to give the best service from all standpoints.

STANDARD HEADSET

2,500 OHM

Guaranteed to be equal of any phone on the market listing at \$8.00 **\$5.75**

Dealers and jobbers write.

Standard Electric Sales Co.
845 Broad Street Newark, N. J.

AGENTS

Wanted in every city and town to sell radio apparatus. Good commissions. A few stocking agencies open to reliable parties.

DELANCEY, FELCH & COMPANY
13 Meeting St. Pawtucket, Rhode Island

RADIO Easily Learned

Be a Radio Expert. Make big money. Win success in this new, uncrowded field. Trained men needed.

\$1,800 TO \$6,000 a year easily earned. I will train you quickly at home, in your spare time, to construct, install, operate, repair, maintain and sell radio outfits. Short course, low cost, easy terms, money back guarantee. Write for "Radio Facts" FREE. Engineer Mohaupt, American Electrical Association, Dept. D-2, 4513 Ravenswood Av., Chicago, Ill.

Naval Transmitting Sets for Sale

THREE hundred and ninety-six radio transmitting-sets are being offered for sale by the United States Navy Central Sales Office by sealed bids. These radio transmitting-sets are of short-range type, C W-396, with vacuum tubes man-

ufactured by the Western Electric Company for use on submarine-chasers during the World War.

This apparatus is said to be reliable for radiotelephone communication within a distance of ten miles, but numerous instances have been noted where the sets have been used for distances up to 300 miles at sea. In the hands of competent operators, under favorable weather conditions, they should have a reliable land range of 50 miles.

Purchasers of sets have the right to operate them for any purpose, except where a charge is made, under the Department of Commerce Regulations.

For CORRECT RADIO MAILING LISTS Use THE POCKET LIST

of Radio Manufacturers, Jobbers and Dealers in the United States and Canada. Issued Quarterly—January, April, July and October. October, 1932, issue corrected to September 15th, 1932. Classified under three different headings—Manufacturers, Jobbers and Dealers—and alphabetically arranged by states, cities and towns and names of firms. Containing approximately 15,000 names and addresses.

We have been exceptionally careful to see to it that every Manufacturer, Jobber and Dealer is listed and, under the PROPER CLASSIFICATION. Most mailing list concerns charge more than \$100 for a list of this kind and, as a rule, those supplied are far from being correct. Compare this list with any other, and you will find it to be the very best obtainable anywhere at any price.

October issue ready for distribution September 25th. Price \$5.00 per copy, or \$10.00 per year (four issues, including monthly supplements which keep the list absolutely correct and up to date at all times). October edition limited. Send your order with remittance today.

F. D. PICKENS, 1821 CARRINGTON STREET JANESVILLE, WISCONSIN

A Unique Radio Experience

EDITOR, Radio World: Recently there occurred in the little town of Fairdale, North Dakota, an incident which may be of interest to your readers; and one, which, so far as I know, is unique.

One day, when turning the tuning knob of a small set (tube detector with two-stage amplifier) the operator was surprised to hear telephone conversation over a telephone wire that ran about ten feet below the aerial. Thoroughly surprised, he tore off his head piece and went to his own telephone where he called up the party he had heard and found that the words he heard had just been spoken.

He had the tuning "somewhere in the shortest wave-lengths," when he heard the voices, but has been unable to duplicate the feat. Has anyone else had a similar experience?—Albert Lundberg, Fairdale, North Dakota.

Current Articles on Radio Listed

RADIO enthusiasts who are anxious to keep in touch with current literature on radio developments and news will be able to do so by consulting the list of radio references prepared by the Bureau of Standards and issued monthly in the "Radio Service Bulletin" of the Department of Commerce, Washington, D. C. The list is divided into the following topics: Radio Communication, Principles, Measurement and Standardization, Apparatus and Equipment, Communication Systems, Applications, Stations and Management, Manufacturing, and kindred subjects.

Fire-Prevention Data by Radio

DURING Fire Prevention Week, October 2-9, officials of the National Board of Fire Underwriters have requested broadcasting stations to cooperate in a campaign to stop fires and to generally educate the public in fire prevention. Several broadcasters have already offered their aid. Data concerning fire fighting and fire prevention is being sent to the radio stations, for distribution, by radio.

Park Receiving Stations

WIAY, WOODWARD & LATHROP'S a popular broadcasting station of Washington, D. C., has expanded its service to the public by installing loud speakers in several of the Capital's parks. Hundreds of people assemble on Saturday nights to listen to concerts. Entertainment by radio is thus furnished to many people who do not have receiving sets, and has the advantage of keeping them out in the air while the radio service is on.

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

"TUNING IN" TO THE RIGHT TUNE IS VERY SIMPLE WHEN YOUR CONNECTIONS ARE SOLDERED WITH THE NEW "POST SOLDERING IRON"

(The Iron with the Platinum Heating Unit). Removable Soldering Tip



1/2 Actual Size
LIST \$6.00

Designed especially to cover every requirement for delicate work. The smallest practical, efficient instrument on the market. Attaches to any socket. Universal current. Fully guaranteed. From your dealer, jobber or write

POST ELECTRIC COMPANY

38 EAST 42ND STREET, Div. 508 NEW YORK

A TUNER THAT MEETS PRESENT STANDARDS

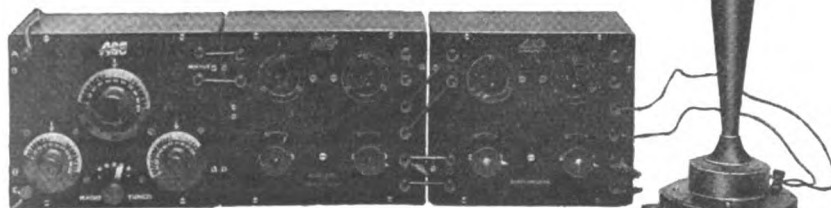
The new A B C Tuner No. 5750, illustrated below, has been designed by Professor J. H. Morecroft of Columbia University to fit the A B C Radio Units System.

Embodying the most recent developments, this tuner offers a service in the reception of broadcasted programs which sets a new standard of quality and economy.

Write for latest catalogue of A B C Standardized Radio Units and name of nearest dealer.

Jewett Manufacturing Corp.

342 Madison Ave. (Dept. G.10), New York



ABC Radio Tuner No. 5750

ABC Detector and One-Step Amplifier No. 5815

ABC Two-Step Amplifier No. 5814

ABC Loud-Speaker No. 5580

VARIOMETERS AND VARIOCOUPERS UNWIRED

Variometer—2 mahogany stators, 1 1/4" x 4 1/4", Mahogany rotor, winding form and brass hardware, \$1.50 per set.

Variocoupler—Bakelite tube 4" x 3" rotor ball and all brass hardware, \$1.50 per set.

Please include 10 cents per set for postage.

ARROW WIRE & RADIO COMPANY
103 Seventh Avenue New York City

IMPORTED DETECTOR TUBE, \$2.75

Manufacturers' Guarantee 1000 Burning Hours
This is a real \$5.00 value

43 Plate Condensers .001 Mfd.....	\$1.95
23 Plate Condensers .0005 Mfd.....	\$1.45
Jefferson Transformers.....	\$2.95
4,000 Ohm French Phones.....	\$5.00
\$5.00 Vario-Coupler.....	\$2.75
Two-Slide Tuning Coils.....	\$1.75

Mail Orders Filled Promptly
Send for Complete List of Specials

J. J. KELLEHER
14 UNION SQ. EAST
NEW YORK CITY
Phone Stuy. 9536

FEDERAL \$5 PHONES

53-W. 2200 OHM

We are clearing out our stock and will send one anywhere postpaid upon receipt of five dollars. In lots of ten or more \$4.50 each, F. O. B. New York City. Send remittance with order. Immediate shipment.

J. H. & C. S. ODELL COMPANY
Established 1859
407-409 WEST 42ND STREET
NEW YORK CITY

THE GOODMAN



PATENT PENDING

The Nickest Short Wave Tuner on the Market
Only \$6.00 & PP on 1 lb.
Send for pamphlet. Order through your dealer.

L. W. GOODMAN
DREXEL HILL, PA.

Dr. Miller, of Chicago, writes: "My perfectly good variometers and vario-coupler now go into the discard."

Improve Your Crystal Set

Solid Gold Contact Cat Whiskers. Will Not Corrode, Rust or Oxidize. Will last a lifetime. Try one and see how the quality of your reception is improved. Price each.....\$1.00

Special "EDMAR" Mounted Crystals. If it isn't the best you ever used, return it and we will refund the money. Price each.....75c

4-inch Fiber Spider-Web Disks. Set of three.....90c

Aluminum Plate Variable Air Condensers. Sold Knock-Down Only (Without Knob or Dial):

43-Plate.....	\$2.25
23-Plate.....	\$1.45
13-Plate.....	\$1.00
3-Plate (Vernier).....	90c

Order Direct From Us. Sent Postpaid to You.

The Eddy-Marsh Company
65 Westmaster St. Providence, R. I.

Foreign Inquiries for Radio Apparatus

INQUIRIES are being received at the offices of American Commercial Attache McQueen, Santiago, Chile, regarding the development of radio telephony in the United States. It seems probable that, before long, serious consideration will be given to the exploitation in Chile of this new development. Legislation is now contemplated there based on the laws of the United States, and although it does not provide specifically for broadcasting stations by private enterprises it is possible that this service will be available through the leasing of government-owned stations during times of peace.

If American manufacturers interested in the Chilean market will send catalogues and other descriptive literature to the office of the commercial attache at Santiago, the Department of Commerce states, this literature will be placed at the disposal of all persons inquiring for this type of apparatus. Trade opportunities, during the past week, include inquiries from Czecho-Slovakia as to radio transmission stations. From the Philippine Islands comes a call for information on radio apparatus in general.

American radio exports during July totaled 225,475 pounds of apparatus, valued at \$385,861, which shows that some American exporters are taking advantage of trade opportunities.

Radio Thief Caught by Set in Motor-Car

ONE night last month, the home of Daniel F. Murphy, Cleveland, Ohio, was burglarized and a large part of the equipment of his radio station stolen. Among the loot was a high-powered sending set.

Several days later radio operators in Cleveland heard a new station with powerful apparatus sending out messages. The new station had no call number, was not licensed, and could not be located.

Believing it was operated by the thief who robbed him, Murphy, an electrician, set out to find it. He installed a receiving set on an automobile and night after night toured the city, tuning the set to the pitch of the unknown operator. When the messages grew faint, he changed the direction of the car.

Finally repeated circling of a particular block failed to show any point where the messages could be heard more plainly than at another.

Eric Kutz, 18 years old, lived in this block. He had become the pride of the neighborhood with his new wireless set. Persons came to his home every day to see the set. As fellow radio fans, Mr. Murphy and his friends also visited the house. There they recognized the stolen apparatus.

Radio Courtesy

WOR overstayed their time last Monday evening, thanking WJZ for the latter's courtesy in permitting them to encroach on five or ten minutes of the RCA's schedule. The thanks were sent over the air by WOR's fair announcer with an almost ironic politeness that called to mind the way Carpentier and Dempsey shook hands before the battle.—2 PI, in "The Globe"

Another Epitaph

Sad the tale of mild Ben Meyer, Who tried to fix a call-bell wire; Tapped high voltage to his sorrow; They're grounding Ben, at ten tomorrow. —"Science and Invention."

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

GOING—and Going Fast

We have only a few left and they are going fast, but while they last we will continue to sell them at the reduced price.

VT 1 Detector and Amplifier.....\$7.50
VT 2 Detector and Amplifier.....\$8.00

The above tubes are the genuine army J's and F's, respectively.

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By Mail, 5c.

LIBERTY RADIO CO.
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"Quality Radio Priced Right"

3 Plate Variable Condensers.....	\$1.50
Mirad Vario-couplers.....	2.75
3000 Ohm Double Head Phones.....	6.00
1500 Ohm Single Head Phone.....	3.00

(Money back guarantee.)

Mirad 23 Plate Condenser.....	3.95
Mirad 43 Plate Variable Condenser.....	4.95
Mirad Detector Unit.....	30.00
Mirad Two-Step Amplifier.....	30.00

Postage Paid

Dealers' Sample of Above 25% OFF

Miracle Radio Mfg. Co.
INTERURBAN BLDG., DALLAS, TEXAS

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18th Floor, 220 W. 42nd St., next to Amsterdam Theatre

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11	.00025		\$2.50	\$2.00
21	.0005		\$3.25	\$2.50
43	.001		\$3.90	\$2.90

Lott's Better Radio Condenser Co.
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Includes Loud Speaker

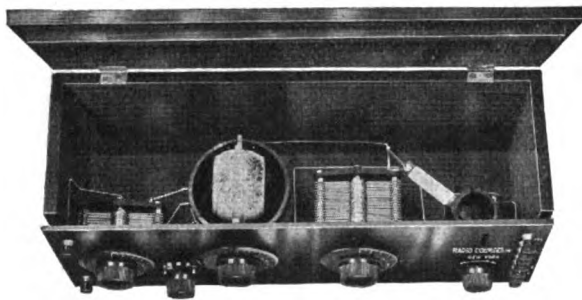
Trutone has been pronounced the best on the market by experts. It has a clear true tone. Every radio fan should try Trutone and compare it with others.

If YOU don't find Trutone the best, your money will be refunded. It is sold on a ten-day trial money-back guarantee. If not carried by your dealer write us.

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(Panel size: 7" x 18")

Super-sharp tuning due to double tuned circuit. All parts of highest quality. Of type that usually sells for double the price. Supplied in Assembly Form—panel drilled and engraved and fastened to handsome mahogany finished cabinet; all parts packed in cabinet; all wires cut, bent and turned

ready for soldering. Complete, as illustrated and described, with blue prints and instructions, at \$27.50. Send check or money order for immediate shipment.

DEALERS & DISTRIBUTORS:
Write for attractive proposition on this sure-selling set, parts and books.

LIST:
\$27.50
Complete Assembly

RADIO COURSES, Inc. (Dept. 11), 552 Seventh Avenue, New York

Points to Remember When Buying Parts

So many thousands of small manufacturing firms sprang into being last winter when the radio excitement was at its height that all of us—fan, amateur and professional—are reaping the sad rewards, says "The Globe," New York. But because of their inexperience the greatest loss falls on the radio fans, particularly those who are just becoming interested in the subject. To this latter class the following points will be of assistance in selecting sets and parts:

Trade only at reputable stores. Buy only reputable goods, preferably those having the name of the maker on them.

Insist on having every part tested before leaving the store. In the case of tubes this means more than merely attaching the proper prongs to a six-volt battery to see that the filament is intact. It means that the tubes should be tried out in a set that is actually in operation.

Arrange with the seller that any parts found unsatisfactory may be exchanged or the amount paid refunded. All stores with a solid backing will readily agree to this.

Don't shop with a dollar in your hand. Watch the quality of the goods. Cheap goods give cheap results, first, last, always. Pay a little more and get the tubes, phones, tuning units and other accessories that have made a name for themselves.

It is dangerous to pay too little for complete sets. Cheap transformers are useless. Poor design is fatal. Disorderly arrangement of parts is sure to prove disappointing. If you buy a complete set, buy one with a confidence that tells you that you will never have to open the cabinet unless you so desire.

Buy a set that you can eventually expand into your ideal outfit, whatever that may be.

And lastly—when you shop—take some one along who knows the game from aerial to variometer. If you do that you can have no regrets.

Ether Wave's Journey to Mars

EDITOR, RADIO WORLD: I wish to call your attention to a slight discrepancy in an article entitled "Radio Travels to Mars," in the September 16th issue of RADIO WORLD. To quote from the article: "Every ether wave that leaves the earth touches Mars a few months later." Radio waves travel at the rate of 186,000 miles per second. As there are 2,592,000 seconds in one month (30 days), if it took even that long for a wave to reach Mars, that planet would be placed at the tremendous distance of 482,112,000,000 miles from the earth. As a matter of fact, Mars is, approximately, 44,000,000 miles away, and would be reached by a radio wave in a trifle over four minutes. A wave reaches the moon, which is 240,000 miles away, in about 1 1/4 seconds. The wave reaches Neptune, the most distant of all the planets, in less than four hours.

I noticed in the same issue of RADIO WORLD an article based upon the work of our own school on this station; and as we all like publicity, I was very much interested.—Henry Hall, Squadron III, Naval Air Station, Pensacola, Florida.

A Radio Necessity!

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

ALL MOULDED



List, \$6.00

All parts Moulded of High Dielectric Material. Accurate Tuning Assured. All Hardware Highly Polished Nickel. Positive Contact in Bearing Shafts.

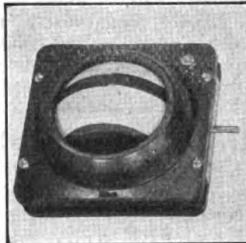
IN FACT THE BEST MADE

F. R. S. RADIO CORP.

Manufacturers

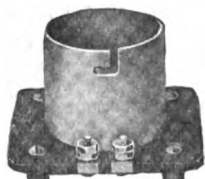
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The Teleradio Tube Socket
Whose handsome design is adapted for table or panel mounting. Of shell-drawn aluminum. All parts perfectly insulated—legs are not current-carrying. Terminals plainly marked.

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2,000 Ohms, \$6.50

2,200 Ohms, \$7.50; 3,000 Ohms, \$9.00 Each

Teleradio Supersensitive Headsets equal the performance of phones selling at \$12.00 and \$15.00.

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Address Subscription Department, Radio World, 1493 Broadway, New York City, N. Y.

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Send us a list of your radio needs for our prices.

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With a SPIROLA CONCERT you can sell your headset—you won't need it even for tuning in the distant stations. SPIROLA CONCERT is so sensitive to weak signals that it is even better for this purpose than the ordinary headset—and everybody can share the fun of "picking up" new stations. We have picked up five hundred mile stations more than a thousand miles away in this manner, using two stages of audio amplification and the loud speaker alone.

We have heard a thousand mile station twelve hundred and fifty miles a way loud enough to hear clearly through several good sized rooms.

And at the same time SPIROLA CONCERT brings in the nearer stations with all the loudness you could wish



and as clear and natural as life itself.

Cabinet type with a special loud speaking unit built into it as an integral part—complete with cord, ready to hook in, in the same way as a headset. No exciting battery or extras required. Beautiful mahogany or dark oak finish, bronzed throat, at dealers or prepaid direct..... **\$12.50**

Guarantee—if you wish to return your SPIROLA for any reason whatsoever do so within ten days and your money will be immediately refunded.

L. H. Donnell Mfg. Co.
Dept. B, Box 70 Ann Arbor, Mich.

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

Radio Activity Booms Copper and Brass Business

LARGE demands are reported by manufacturers of copper wire, sheet, tube, and bar stock for copper in one form or another for use in radio apparatus. This statement, and the following, is taken from a bulletin issued by the Copper and Brass Research Association.

There is not a single instrument of a radio sending or receiving set but what requires copper, brass, or bronze in its construction. The high electrical conductivity of copper makes it absolutely essential for all switches and parts using wire to convey the delicate electrical impulses received from the air. Brass, because of the ease with which it can be machined, is largely used for binding posts, plugs, audion bulb bases, and the like. Where unusual strength is a requirement, phosphor or silicon bronze finds wide application.

Sheet copper and brass are used in construction of the adjustable condensers that assist in increasing the strength of the electrical impulses. From one to three condensers of ten to thirty plates each are necessary to the average amateur receiving station. The plates are semi-circular in shape, with a diameter of four to five inches and .025 inch thick.

Perhaps copper's greatest usefulness in radio telephony, however, is in antennae or aerials for intercepting the electrical impulses transmitted from one station to another. And probably in no other commercial application is copper called upon to stand up under such severe conditions as are found in antennae service. It must resist the corrosive action due to varying climatic conditions, and must have sufficient strength to withstand the strains due to wind pressure and its own weight when suspended in long spans.

Most radio engineers have come to agree that for short span aerials the most satisfactory material is No. 14 or No. 16 bare copper wire. Experiments conducted by the U. S. Bureau of Standards have led to the same conclusion. Furthermore, the slight difference in first cost is more than offset by copper's uniform, lasting service.

For large antenna, phosphor bronze stranded wire has given most satisfactory service, the best size being seven strands of No. 20 or 22, providing a larger copper service for catching the electrical waves in the ether. Another advantage of this kind of aerial lies in the fact that, due to its stranded construction, this form of aerial absorbs considerable stress before the metal itself begins to stretch.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

JUST OUT! 50 "VACUUM TUBE HOOK-UPS FOR RADIO RECEIVING CIRCUITS"

Largest collection of V. T. Diagrams applying to Radio Reception ever Published under one cover.

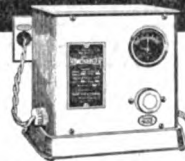
Contains Latest on Radio Frequency and Super-Regeneration
PRICE PREPAID \$1.00

W. A. DICKSON

400 E. Fort St. Detroit, Mich.

HOMCHARGE YOUR RADIO BATTERY for a Nickel

ENJOYABLE Radio Concerts and Maximum Receiving Range are obtained only when your battery is fully charged. The



RADIO HOMCHARGER DE LUXE charges your "A" or "B" battery over night. Silent and clean in operation—requires no watching—may be used right in your living room.

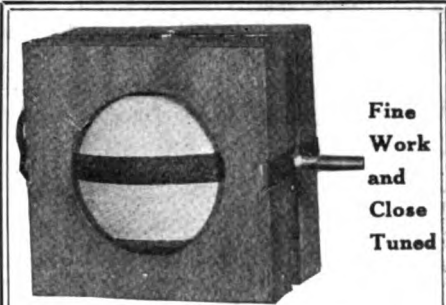
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Special Winding that will give you Pittsburgh, Schenectady, Kansas City and other stations, when assembled with our Variocoupler.

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Mounted, 36c.; Unmounted, 29c.; Postpaid

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No tubing or horn to distort delicate notes. Swells every sound into full richness!

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Radio Supplies

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Guaranteed 25-Mile Crystal Set **\$4**
Or Money Refunded PRICE.

Send fifty cents for 20 efficient blue-prints hook-ups.

Any Radio Set Made to Order or Repaired

Sunbeam Electric Co.
71 THIRD AVE. NEW YORK

Pictures and Facts About Armstrong Amplifier

Radio World has published a number of pictures, diagrams and descriptive articles regarding the New Armstrong Super-Regenerative Amplifier. The numbers containing this material are dated June 24, July 8, July 15, August 5 and September 16. They will be sent postpaid on receipt of 15 cents each, the five copies complete for 75 cents. Or you can subscribe, \$6.00 year; \$3.00, six months, and have your subscription start with the number dated June 24. RADIO WORLD CO., 1493 Broadway, New York.

Important Change in Second District Radio Schedule

A NEW schedule for broadcasters in the Second Radio District, New York, is now in effect. The new programme has been arranged to eliminate interference so far as is possible:

The management of WJZ had the privilege of broadcasting on 360 meters, sharing the time with the less powerful stations, or going in with the Class B, the most powerful stations in the Second District, and operating on 400 meters.

The Class A stations agreed to stand by on special occasions should WJZ, the Radio Corporation-Westinghouse station at Newark, N. J., want to broadcast concerts, such as the Stadium Concerts given by the Philharmonic Orchestra; play by play results of the World's Series, and the Saturday afternoon football, also, to permit WJZ to broadcast every evening.

Class A stations are: WWZ, John Wanamaker, New York; WBS, D. W. May, Newark, N. J.; WHN, Ridgewood Times, Ridgewood, L. I.; WRW, Koenig Bros., Tarrytown, N. Y.; WBAN, Wireless Telephone Company, Paterson, N. J.; WAAT, Jersey Review, Jersey City, N. J.; WAAM, I. R. Nelson Company, Newark; and WFAF, Shotton Electric Company, Poughkeepsie, N. Y.

WJZ will continue to operate on the 360 meter wave length. As usual, the bedtime stories will be broadcast every evening from 7 to 7:30 P. M. by WJZ. This station will then stand by for an hour on Monday, Thursday and Friday and Saturday evenings and for an hour and a half on Tuesday and Wednesday evenings for the other members of Class A stations.

Class B stations of the Second District, New York, are supposed to keep up a continuous daytime and evening programme on 400 meters.

At present the programmes for Class B stations are not complete. Class B members are: WOR, Bamberger & Co., Newark, N. J.; WGY, General Electric Company, Schenectady, N. Y.; WHAZ, Rensselaer Polytechnic School; WBAY, American Telephone and Telegraph Company, New York.

The proposed arrangement will provide continuous entertainment on two separate and distinct wave lengths from 8 A. M. until 11 P. M.; and 400 meters, sometimes, until midnight.

Radio Operator Lost! Will Radio Find Him?

J. RAY ATKINS, a radio operator, last heard from a year and a half ago on board the steamer "Bellemina," on the New York-Argentine run, is sought by his mother, Mrs. J. R. Atkins, Box 253, Midlothian, Texas. In the hope that some of his brother operators may know where the missing young man is, or that he may be located by means of radio itself through broadcasting, the Department of commerce is asking that his story be carried in both the press and in the ether.

Junius Ray Atkins served as a sergeant, first class, in Company A, 111th Field Signal Battalion of the 36th Division, during the World War. He returned to this country on June 4, 1919, and was discharged at Camp Mills. On July 14, 1919, he secured a first-grade radio operator's license, which expired in August, 1921, but was not renewed. Later, he was a ship wireless operator. He is twenty-three years old and a native of Midlothian, Texas, where his father is principal of the high school.

Subscribe for Radio World, \$6.00 a year, \$3.00 six months, \$1.50 three months.

V-A-C-U-U-M-T-U-B-E-R-E-P-A-I-R-I-N-G
A C U U M T U B E R E P A I R I N G

Save on 1.50 Detectors | Save on 3.00 Amplifiers

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Detectors and Amplifiers repaired for \$3.50.

The repaired tubes, we warrant, will give you the same absolute satisfaction that you would expect to receive from new tubes.

We are now in a position to give guarantee for prompt deliveries with satisfactory results. A reasonable trial will confirm our reliability.

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Variometers	\$2.00
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CRYSTAL SET \$4

"THE LITTLE WONDER"
\$2.50 UNMOUNTED

Wonder in name and a wonder in performance. Cannot be equalled for the price. Catches distinctly everything within 25 miles.

Send for FREE catalog, describing our "Little Wonder" set and listing radio supplies.

Radi-O-Plate Panels. All sizes cut to order.

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DRIVE 100 TACKS AND SAVE \$25.00

Ford Roadster Top Re-covering \$5.20. Touring \$4.95, and \$9.95. Chevrolet, Dodge or Maxwell \$11.95. All other 5 passenger cars \$10.50 with side glass lights. Regular Side Curtains \$4.95 up. Special Winter Side Curtains that open with doors \$11.95 up. Ford Seat Covers \$2.15 up. Ford Cushions \$5.75. All goods same as our advertisement. Quality the best and guaranteed to fit. Printed instructions given how to apply. Send for samples. Prices above include delivery at your door. AUTO EQUIPMENT CO., 37 Canal Street, Cincinnati, O.



ANNOUNCEMENT

Products will be ready for the trade about October 15th, 1922.

Discounts very attractive to jobbers and dealers. Watch for our future advertisements.

Radio Products Corp. of America
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Manufacturers Haddonfield New Jersey

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THEIR "B-P" SET
(Patent Applied For)

NEEDS NO AERIAL

PRICE, \$35.00

Complete Except "A" Battery, \$52.00
Write for Proposition.

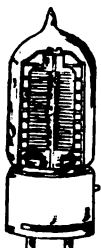
"NOTICE"

An error in price on our Radio Receiver Watch Fob

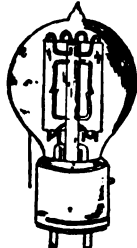
was made in issue of Sept. 16th. We shall refund to each one who remitted, the difference. The price should have read 50c each, no stamps.

Immediate Deliveries at New Price.

RADIO NOVELTY CO.
BIG MOOSE, N. Y.



V-T 1 at \$8.54 "J" Tube



V-T 2 at \$9.45 "E" Tube

These are the Tubes for which so many are inquiring and that are still difficult to find anywhere. There being very few of these tubes on the market, and after present supply is exhausted, more will not be available at any price, as they are to be made exclusively for the U. S. Government.

FULL LINE OF SUPPLIES. LOWEST PRICES ON STANDARD MERCHANDISE. GET OUR PRICES BEFORE PLACING YOUR ORDERS.

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RADIO WORLD

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FROM PUBLICATION OFFICE,
1493 BROADWAY, NEW YORK, N. Y.
BY HENNESSY RADIO PUBLICATIONS CORPORATION

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M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary

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FRED S. CLARK, Manager,
1493 Broadway, New York

ASSOCIATE EDITORS:

Robert Mackay Fred. Chas. Hilst

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Fifteen cents a copy. \$6.00 a year. \$2.00 for six months. \$1.50 for three months.

Add \$1.00 a year extra for postage to Canada and foreign countries.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

Advertising rates on request.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE:

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

New Office Building to Be Wired for Radio

FOR the first time in the history of Pacific-coast office-building construction, a 15-story skyscraper in San Francisco, erected by a navigation company, will be wired throughout for radiophone installation, says "Popular Mechanics." Tenants wishing to put in a receiving set will only have to "plug in" to a wall socket, as for a desk lamp, to be connected with the antenna on the roof and receive broadcasting programs from stations in San Francisco and vicinity. Not only will the new building be completely wired as a convenience to tenants who are radiophone enthusiasts, but the company intends to install a powerful sending and receiving set, with which it is expected it will be possible to give orders to the captains of the company's nine freight and passenger ships, which maintain a weekly service between San Francisco and the Hawaiian Islands.

British Radio Situation

BRITISH manufacturers appear determined to keep the products of Yankee manufacturers out of their country, says "The Mail," New York. No one will suffer thereby except the English public. They will be denied reasonably priced apparatus that will perform more efficiently than the products of their own manufacturers. We have been manufacturing amateur apparatus for many years and the experience we have gained not only makes it possible to produce reliable apparatus at reasonable prices, but puts our production at a point where it will take foreign competitors many years to reach. England, however, is going to do much better than we have done on one thing. Their broadcasting will be done systematically from the very start. Who wouldn't start systematically after having had the opportunity of witnessing the terrible mess we have made of broadcasting? However, we can overlook our blunders, since they were characteristically Yankee.

INTRODUCTORY SALE

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Call and Look Over Our Most Complete Stock of Radio Equipment

It WILL PAY to BUY NOW

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- Kellogg, extra fine, 9% on 5.00
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- Fine moulded type for rheostat \$0.50
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- Best grade nickel, with brass nut, 10c. doz.
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EXIDE STORAGE BATTERIES
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This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified advs., if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4794.)

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EARN \$110 to \$250 Monthly, expenses paid, as Railway Traffic Inspector. Position guaranteed after 3 months' spare time study or money refunded. Excellent opportunities. Write for Free Booklet G-151. Stand. Business Training Inst., Buffalo, N. Y.

THE LOOP'S THE THING. The coming aerial, most simple and inexpensive of all when our blue prints and specifications of the two better types are followed. Sent postpaid for \$1.00. No stamps. McGehee Development Co., Box 1337, El Paso Texas.

CASH FOR OLD GOLD. Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magneto Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 337 Hippodrome Bldg., Cleveland, Ohio.

FREE with each \$15.00 Western Electric Head-set, one UV 200 Detector tube. We handle everything in Radio. NEWBURGH RADIO SHOP, 236 Broadway, Newburgh, New York.

Are you familiar with all the radio symbols used in the various hook-ups published in Radio World? If not, secure a copy of Radio World No. 26, dated Sept. 23. In this issue was a complete table of all important symbols used in radio construction and testing. Send 15 cents for a copy, or \$6.00 per year, and have subscription start with that issue. RADIO WORLD, 1493 Broadway, New York City, N. Y.

HOOKUPS: Over 100 blueprints to select from at 10c. each. Send dollar for trial order. Radio Supply Co., Box 192, Pueblo, Colo.

PATENTS—Electrical cases a specialty. Pre-war charges. B. P. Fishburne, Registered Patent Lawyer, 386 McGill Bldg., Washington, D. C.

Manufacturers of Rogers Radio Receivers and Rogers Receiving Radiometers. Rogers Radio Company, 5133 Woodworth Street, Pittsburgh, Pa.

TO THE TRADE—Fixed Phone and Grid Condensers. Write for price list and sample, SALKEY RADIO CO., 2378 Eighth Ave., New York City.

Weekly paper wants circulation and subscription manager with ideas and experience. Address by letter, R. W., room 326, 1493 Broadway, New York City.

MOULDED COMPOSITION binding posts, 8c. each; 90c. dozen. Fixed phone and grid condensers, 15c. each. No stamps. F. A. Keeler, 912 Harrison Ave., Boston, Mass.

50-V.T. HOOK-UPS. Largest collection of diagrams for radio receiving circuits published. Includes latest in radio frequency and super-regeneration. Loose-leaf form complete with binder. Prompt deliveries. Postpaid, one dollar. W. A. Dickson, 409 East Fort St., Detroit, Mich.

FOR SALE—Regenerative sets with detector. Complete with tube and B Battery, \$35.00. With one stage, \$50.00, complete with tubes and batteries. Satisfaction guaranteed. Edward Bittner, Schuyler, Nebraska.

Exchange jolly interesting letters through our Club! Stamp appreciated. Betty Lee, 4254 Broadway, New York City.

\$1.00 RADIO FREQUENCY TRANSFORMERS—Hear distant stations. Designed to fit any standard socket. Three sizes, 160-500M; 500-1000M; 1000-2000M. Complete set of parts and full directions for assembling, postpaid, \$1.00. 3 for \$2.75; 6 for \$5.00. Arkenberg Agency, 702M, World Bldg., New York City.

DO YOU USE A CRYSTAL DETECTOR? ARE YOU MAKING A CRYSTAL RECEIVER? Increase the efficiency of your crystal detector 1,000 per cent by using a "PT" Ultra-Sensitive Contact. Of special gauge and alloy. Makes and holds a quick, ultra-sensitive, stable adjustment. Using galena, you may pound panel or table without disturbing sensitivity in slightest. Proved practical on shipboard by an old-time Marconi operator. Using a "PT" Contact on galena, Arlington (NAA) was brought in clear at 3,300 miles (below the Equator); and Arlington came in loud at 2,200 miles (off Dutch Guiana). In both instances, nearby ships using vacuum tubes were unable even to hear NAA. As to stability, Cape May (WCY) was worked over 1,000 miles, sending right through crystal with 2 KW spark, without affecting detector's adjustment. Replace your old insensitive unstable contact with one which will hold its adjustment in addition to giving louder signals and music. Indispensable for pocket sets and crystal detector-bulb amplifier outfits. A novice can install. "PT" Ultra-Sensitive Detector Contact, with instructions, twenty-five cents coin or M. O. "PT" CRYSTAL CONTACT CO., Box 1641, Boston 8, Massachusetts.

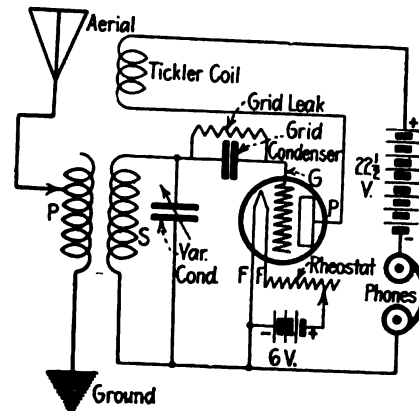
Answers to Readers

RECENTLY we installed a radio set about 20 feet from the power lines of a nearby railway. We have a 4-wire inverted L aerial. Each one of these wires is 50 feet long. We also tried an inside aerial, about 100 feet long, but are unable to stop the machine-gun effect coming from the power wires. Is any way by which this interference may be eliminated?—John Hoffman, Phoenix, Arizona.

The best way to achieve your object is to place the aerial at right angles to the power lines of the railroad. If this means that you are compelled to place the aerial so that it becomes anti-directional with the broadcasting stations, then we suggest that you make

a T-type aerial of your present system. A single-wire aerial would be far better than your 4-wire aerial.

I have a regenerative coil using a tickler. I do not experience any results. Please publish a hook-up of the connections.—James Wildflower, Toledo, Ohio.



Hook-up requested by James Wildflower, Toledo, Ohio.

A diagram is herewith shown of the proper connections for a regenerative set employing the tickler coil.

I have a short-wave regenerative set, including 2 variometers and 1 vario-coupler, using a radiotron UV 200 and UV 201 as an amplifier. I don't seem to hear any signals and believe something is wrong. Could you offer me any such suggestions to remedy my trouble?—Arthur Olsen, Brooklyn.

Assuming that all your connections are correct, it would seem that the trouble lies

in wrong polarity. Reverse your plate-B battery and see if any change develops. All you need to do is join the positive pole of the B battery to the plate of the tube. The negative terminal, of course, is joined back to the storage battery. If you do not get any results, simply reverse the negative of the B battery on the negative of the storage. Your trouble lies there.

Regarding the Armstrong superregenerative amplifier, are the honeycomb coils right for the millihenry choke coils and in what position should they be. Can duo-lateral coil, No. 400, be used for the coil L-4. What is the constant for the phone fixed condenser?—Morris Siegel, Mahopac, N. Y.

You may use the 400 turn duo-lateral coils for the 10 millihenries high-frequency choke. The coil you mention may be used. The capacity of this condenser should be .0025 mfd.

Should I use a soft tube or hard tube in the detector step of a two-stage amplifier? Where are stations WLAW and WEAM?—Michael Brody, Springfield, Mass.

Use a soft tube for the detector and hard tubes for the amplifiers. WEAM is located in North Plainfield, N. J. WLAW is the new police broadcasting station, New York City.

My aerial is a single wire, 85 feet long, having 35-foot lead-in. Is a single wire, 150 feet long, better than a two-wire, 75-foot aerial. With my present aerial, signals seem to come in loud from one direction. Why is this?—Arthur Swenson, Brooklyn, N. Y.

Would suggest that you erect the one-wire aerial, 150 feet long, in preference to the two-wire. The reason your signals come in loud from one direction proves that you have a directional antenna. This is accomplished by the end the lead-on is taken from. If you change your lead-in wire to the other end, then signals from that direction will come in loud.

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AMATEURS

Buy your parts and sets where the dealers buy. We are manufacturers and will sell you at wholesale prices.

	Our List Price
Federal Phones—2200....	\$8.00 \$6.50
Turney Phones—3000 Ohms	6.50 4.95
Klosner Vernier Rheostat	1.50 1.15
Porcelain Rheostat.....	1.20 .65
Thordarson Transformer....	4.50 3.85
Radio Frequency Transformer	3.00 2.25

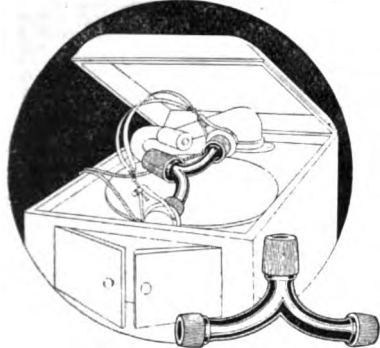
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Makes Your Phonograph a Radio Loud Speaker

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Adjust it in a minute.



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A New and Better Loud Speaker

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The PHONOTACH connects the receivers with the tone arm of your phonograph.

Utilizes the scientifically designed tone amplifier of the talking machine to secure mellowness and beauty of tone.

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The FAMOUS GREWOL FIXED DETECTOR

The GREWOL

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PRICE \$2.00

In using the

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you don't have to find the spot.

Think what this means!

THIS DETECTOR IS ALWAYS SET AND READY completely protected from dust.

Gives the best results.

If your dealer does not handle the Grewol send us \$2.00 and we will mail one to you.

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9 Central Ave. Newark, N. J.

Trying to "Raise" Us

AT WGI last night the radio program began with a Sleepytime Story. Next was "Banking," by Frederick W. Sleeper, and then came "Making Use of Last Year's Clothing," by Miss Harriet E. Ainsworth. If the radio fans listening in on WGI had a wakeful night after that, let them consult physicians, suggests the critical and observing F. P. A., in "The World," New York.

A Southern contemporary says it would like to hear broadcast the news of the execution of the "inventor of white socks." Perhaps he would be more satisfied if he saw the event.

The Houston "Post" has invented this joke:

"Why was it that George Washington never told a lie, Pa?"

Because he was never asked if he picked up a 1450-meter wave.

"If you would care to speak," the latter goes on, "or broadcast some of your material through the air—Enough. Here is some humorous material:

I read this poem into the air
And it was broadcast everywhere;
It didn't have much sense or wit,
But the Westinghouse people wouldn't pay for it.

A Sunday-supplement scribe on "The World," New York, brought his editor the following:

"Oh, mother, listen to the radio!" cried a small boy in the B. R. T. subway train. He had heard the voice from the electric announcer at the end of the car.

"The radio religious service will never be popular," the Washington "News" observes, "because the women can't see each others' hats."

And now, I suppose, aviators and submarine commanders and radio fans will bawl each other out in the new realms. What will happen when the day comes that we all carry an instrument in our pockets by which we can read everybody's thoughts? "So that's what you're thinking, is it?" a stranger may say to you—and punch you in the eye.—Bruno Lessing.

Farewell, Static!

GOOD-BY, static,
We speed you on your way.
So long, static;

We would not have you stay.
The summer's gone, the autumn's here;
No more your noises, many, queer,
Will break in on our evening cheer—
So on your way; move fast, old dear.

Good-by, static;
You sure have had your fun.
So long, static;

Your dirty work you've done.
You've spluttered, hissed, and filled our set
With wild, unearthly sounds, and yet
We'll miss you. Are we glad? Just let
Us say we are—you bet, YOU BET!

—H.

Buy Your Radio Receiving Set at Manufacturers' Cost

Buy your Radio Supplies at a large discount below the list or retail price. If a saving of \$15.00 to \$40.00 on a Radio Receiving Set or if a saving of 25% to 40% on Radio Supplies interests you, write or telegraph us today.

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521 Penn Ave. Wilkinsburg, Pa.

INSU-LITE PANELS

1/8 Fibre Size .01 per sq. in.
3/16 Fibre Size .015 per sq. in.
1/4 Fibre Size .02 per sq. in.

DEALERS: Write for discounts

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ELIMINATE STORAGE BATTERY by using the BRU. No. 4 SOCKET

The only Socket that takes the

DRY CELL TUBE

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Unconditional Guarantee.

WD-11 Tube \$8.00



Bruno Radio Corporation
152 West 14th Street, New York
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Distributors, Write for Discounts.

Latest broadcasting map, 15c. That is, a complete broadcasting map appeared in RADIO WORLD, No. 8, dated May 20 Mailed on receipt of 15c. Radio World Company, 1493 Broadway, New York City.



Hard Rubber Composition PANELS Conform to Navy Specifications

A High Resistance Panel, Guaranteed Not to Warp, and Drilled Cleanly Without a Burr. Highly Polished—Edges Ground to Size.

Standard sizes, 7x10x3/16, 7x12x3/16, 7x24x3/16, 10x12x3/16, and 12x14x3/16, in stock for immediate delivery. Orders for special sizes received in the morning, shipped the afternoon of the same day. Binding posts, dials, and knobs to match. We have a complete line of Coils, Variometers, Variocouplers, Sockets and Rheostats.

Largest Discounts.

Jobbers and Dealers! Write for proposition and Free Sample!

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Volume I of Radio World Now Complete
If you did not get copies of Radio World No. 1 to No. 26, send us \$3.00. Or we will send you this paper for one year, (\$6.00 for 52 issues) and start it with our first issue, which will be mailed you as soon as possible after receipt of order.



“Micon”

Tested Mica Condensers

now considered the highest type fixed mica condenser manufactured

ASSURE—

Absolute noiselessness

Clarity of tone

Accuracy

Constant fixed capacity

“MICONS for Supreme Radio Attainment”

Size	Price
.00025	\$.35
.0005	.35
.001	.40
.002	.40
.0025	.50
.005	.75
.01	1.50

All other capacities on request. Sizes .0005 and .005 are especially adapted for the new Armstrong Super-Regenerative Circuit.

Complete diagram of the Armstrong Super-Regenerative Circuit *free* with every purchase of MICONS.

At your dealers—otherwise send purchase price and the desired MICONS will be delivered without further charge.

Antenella



Does away entirely with antenna and all outside wiring, lightning arresters, switches and all other inconveniences.

ANTENELLA enables you to enjoy Radio pleasures in any room in your house. Place your receiving set anywhere and merely attach Antenella to any electric light socket. No current consumed.

AT YOUR DEALERS—\$2.00

If he can't supply you send purchase price and you will be supplied promptly without further charge.

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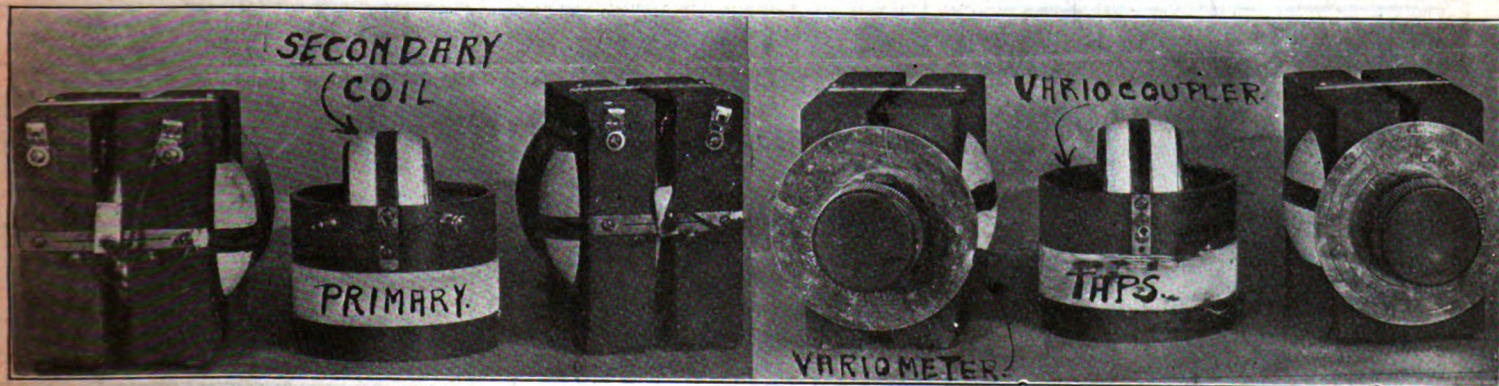
NEW YORK CITY

RADIO WORLD

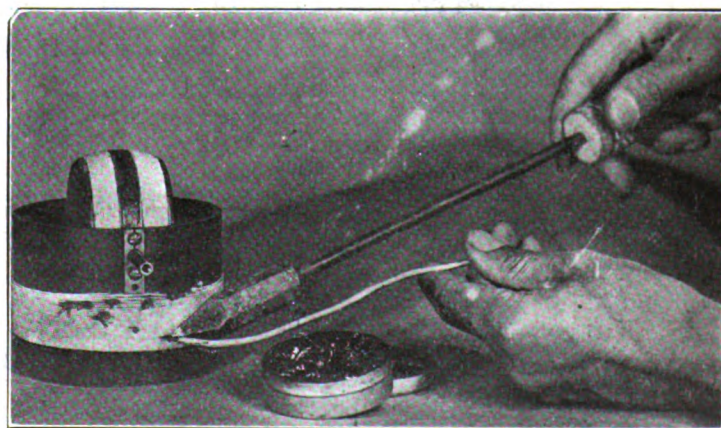
*I L L U S T R A T E D
P U B L I S H E D E V E R Y S E V E N D A Y S*

Necessary Parts for a Short-Wave Receiver

See page 13 for hook-up and description



RAUDIO has been surrounded by so much mystery that thousands of enthusiasts have been misinformed. The information gathered has led many to expect results from their receiving sets which should not have been anticipated. For this reason, the half-tones herewith presented show the necessary instruments the average amateur will need in making up a short-wave receiver. If assembled correctly this receiver should pick up broadcast matter over a considerable distance. It is the part of a set which makes up the Armstrong regenerative circuit. The upper half-tone shows a back and rear view of the parts needed, such as the two variometers and the tapped vario-coupler. The half-tone to the right is that of the vario-coupler, showing the method used in soldering the leads of the taps of the primary to the contact points, which are fastened to the outside panel. The regenerative receiver, using such variometers, has come into common use in the reception of both radiophone and radio-telegraph communication, and the added increase in strength of signals makes it possible for this type receiver to catch very weak signals from exceedingly far distances. In other forms of receivers, amplifying tubes are required to increase the loudness of the signals. A common type of regenerative receiver with a complete diagram using



these instruments is published on page 13 of this issue, together with an article entitled, "A Regenerative V.-T. Receiver for Short Waves," by Fred Chas. Ehlert.

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WITH EACH ORDER FOR ONE SYMPHONY CRYSTAL RECEIVING SET, AND ONE PAIR OF STANDARD PHONES 2500 OHMS, AN EXTRA SET OF PHONES WILL BE GIVEN FREE TO THE FIRST 100 PERSONS SENDING THEIR ORDERS

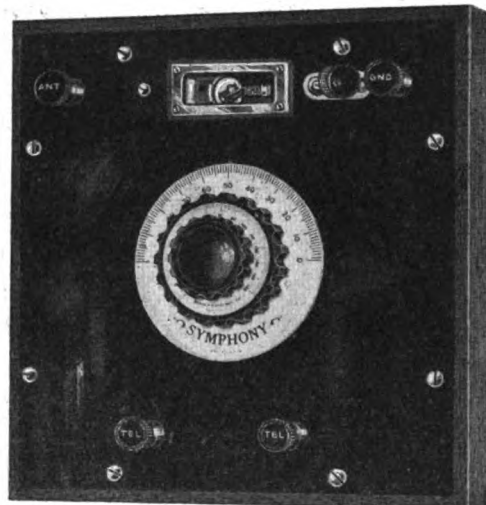


2500 Ohms

Retail Price \$5.75

THE REGULAR PRICE OF THIS OUTFIT IS:

Receiving Set	\$12.25
Standard 2500 Phones...	5.75
Total	\$18.00
One Set Phones Free...	5.75
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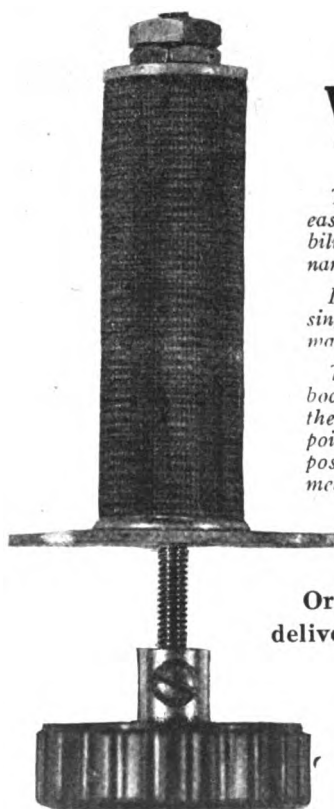


Retail Price \$12.25

YOU SAVE \$10.00 BY RECEIVING ONE SET OF PHONES FREE, ALL GUARANTEED. SEND ONE DOLLAR WITH ORDER, BALANCE WHEN POSTMAN DELIVERS AT YOUR DOOR.

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MICROSTAT VERNIER RHEOSTAT

The most sensitive filament control and quickest, easiest tuned. This microstat has ten times the possibility of exact filament adjustment as over the ordinary wire rheostat.

It eliminates grating and interfering noises, has single knob adjustment and is far more durable being made of better material with greater care.

This microstat takes up less room on the radio board, is neat and compact. The exact calibrations of the microstat are due to the gradual entering of two points into the resistance material of our own composition which gives us exacting and most minute measurement of current to the filament as the operator brings the two points together or separates them through the screw handle.

Order through your dealer or delivered to any part of U. S. **\$1.40**

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CONDENSITE DIAL

The dial that runs true.

Numerals engraved on bevel and knob so shaped that fingers do not hide them. Thin edge with clear graduation to make accurate reading easy. Enamelled set screw in metal insert. Will not warp or chip. Finish and enamel permanent. Low price with this quality possible only through quantity production.

Special dealer and jobber proposition. An opportunity.
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"SUNECO" ADAPTER

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Fits in socket for use of
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Insert tube in Adapter
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VOLUME TWO OF RADIO WORLD

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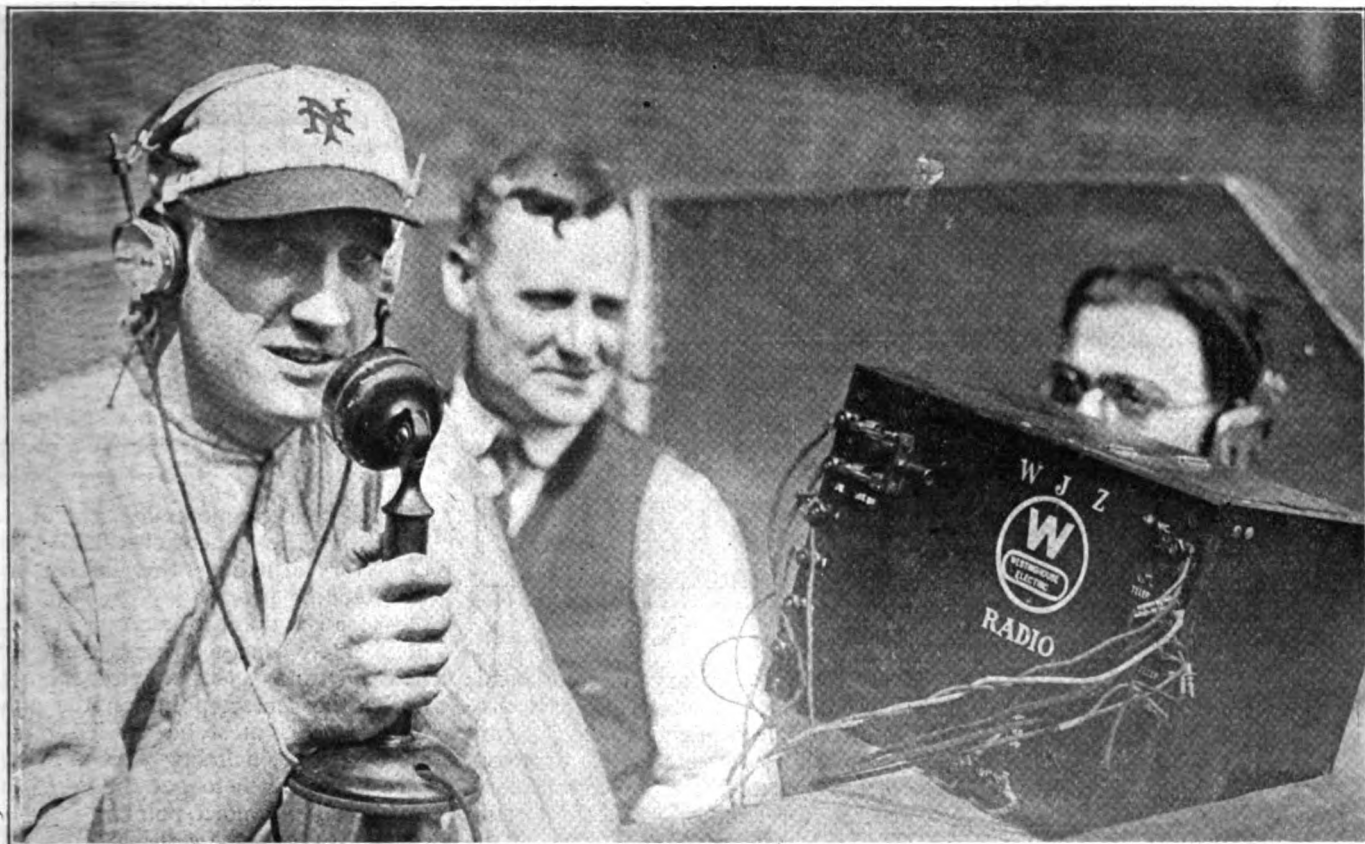
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Vol. II, No. 3. Whole No. 29.

October 14, 1922

15c. per copy, \$6.00 a year

Radio Adds Interest to World's Series



(C. Underwood & Underwood, N. Y.)

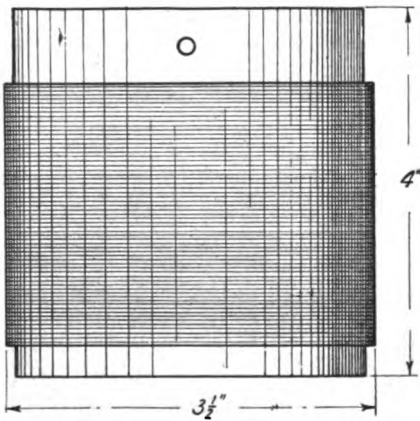
MORE people were in touch with the World's Series, at the Polo Grounds, New York City, this year than ever before in the history of the great American baseball classic—the one sporting event dear to the heart of every citizen. And radio was responsible, because, by radio, the news of each play made was immediately broadcast all over the American continent and far out to sea. Even in out-of-the-way hamlets, where, in other years, people had to await the arrival of a week-old newspaper, the news came through and each play was described almost as quickly as it was made. In the upper half-tone you will see George Kelly, first baseman of the Giants, trying out the transmitter by which the news was sent to WJZ, Newark, to be broadcast. The lower half-tone is a splendid view of the radio section of the press box, showing the baseball expert writer, and radio operator at work. A notable radio service was conducted by Grantland Rice, baseball expert of "The Tribune," New York. Through his paper, the games were broadcast, and, it is reported, the news was picked up as far north as Quebec. Though the weather was unusually warm for October, many feared that there would be an unusual amount of static interference; but, from all reports, the broadcasting came through unusually clear. WJZ has received many letters attesting this. It is reported that next season the Polo Grounds will be equipped with its own transmitting apparatus.



(C. Fotograms, N. Y.)

Using the Vario-coupler in a Short-Wave Regenerative Set

By George W. May, R. E.



Primary of the Vario-Coupler.

FOR receiving short-wave lengths up to 600 meters, the circuit employing the grid and plate variometers is the most popular. This circuit has been in use for a long time. Such a set will be found in nearly every amateur station. To the novice the different circuits used at present are more or less confusing, and it is hard to pick out the most satisfactory. For best results on most wave lengths, duo-lateral coils are hard to beat; but the set described in this article is best for short-wave lengths. For broadcasting, as it is operated at present, this circuit cannot be surpassed.

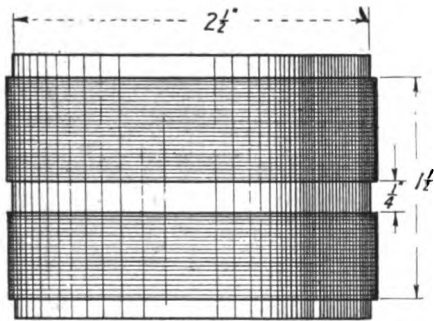
The parts may be purchased or may be built at home. Two variometers will be needed, also a vario-coupler. As variometers are cheap enough to buy we will only describe the making of the coupler and the wiring of the set.

The inductive tuner used in short-wave regenerative sets is sometimes called the vario-coupler. The distinctive features of the vario-coupler are the use of the rotor for the secondary, which is placed in the field of the primary, and the use of the untapped secondary-winding. The rotor, which is frequently in the shape of a ball, is made to revolve through 90 degrees to change the coupling between the primary and the secondary circuits.

The primary of the vario-coupler is made of a tube, or cardboard, about 3½ inches long and about 4 inches high. It is then wound with about 64 turns of No. 22 double cotton-covered wire in one layer. The winding is tapped every 10th turn starting from 1, 10, 20, 30, 40, 50, and then every 2 turns thereafter. This will give a tap for every 10 turns and every 2 turns. Thus there are 5 ten-

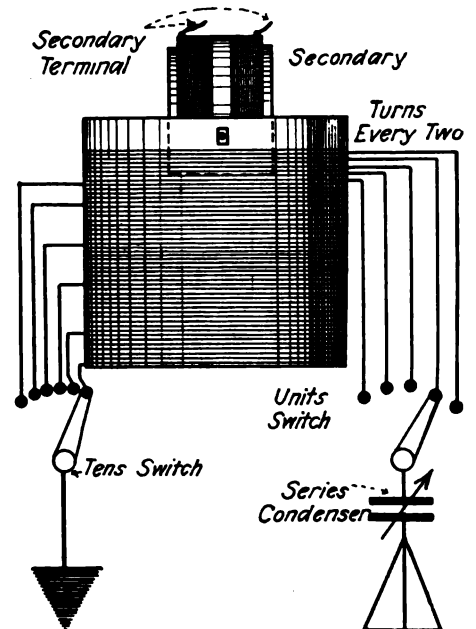
turns and 7 unit turns. The tapping wants to be diagonal along the tube to prevent short circuiting. It will be easier to make the connections of the primary to the taps on the panel. A ¼-inch hole is drilled about the secondary shaft-bearing. It should be ½-inch from the top, in such manner that it will be concentric to the primary and not rub against the sides.

The secondary consists of a piece of tubing about 1½ inches long and of such diameter as to allow it to rotate freely within the primary tube. A piece of tubing about 2½ inches long will do. It is wound with about 52 turns of No. 24 double cotton-covered wire in 2 equal sections separated by about ¼ inch. A ¼-inch shaft is



Secondary of the Vario-Coupler.

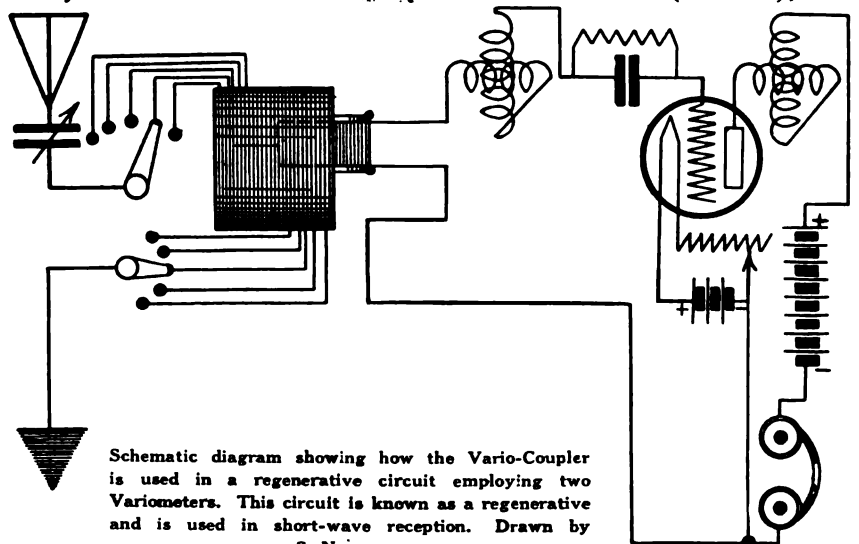
fitted to the secondary tube and made fast with lock nuts. The shaft projects through a hole and made to turn freely. Two flexible cords, or wires, are fastened to the secondary leads to provide for connection in the circuit. Enough slack must be allowed so the coil can rotate without injury of breaking the windings or leads from the secondary.



Schematic diagram of the top of the primary of the Vario-Coupler, Ground and Aerial connection.

This vario-coupler may be mounted on a bakelite panel with knobs and taps for adjusting the instruments. The tapping process is very simple, as the wire is wound to keep track of the number of turns. Bring each 10th turn out and solder a wire from the tap to the contact point on the panel. This process must be carried out on all the taps, including the unit taps, care being taken to get the right taps on the right contact points.

In wiring up the set, what is needed first is a piece of bakelite panel, two variometers, one grid leak and condenser, one tube (detector), one B-



Schematic diagram showing how the Vario-Coupler is used in a regenerative circuit employing two Variometers. This circuit is known as a regenerative and is used in short-wave reception. Drawn by S. Newman.

First Alaska Broadcaster Is WLAY

13 Class A Stations and 11 of the New Class B Stations Makes Grand Total of 534

THIRTEEN regular broadcasting licenses, now known as Class "A," were issued by the Department of Commerce during the week which ended September 30. Among them is the license for the first broadcasting station in Alaska, WLAY. This is the station of the Northern Commercial Company, located at Fairbanks, nearly in the center of that territory. It will broadcast a program of entertainment for the benefit of those living within a radius of about 500 miles.

The following are the Class A stations in this issue:

WLAV—Electric Shop, Inc., Pensacola, Fla.

WNAF—Enid Radio Distributing Co., Enid, Okla.

WOAA—Dr. Walter Hardy, Ardmore, Okla.

WLAZ—Hutton & Jones Electric Co., Warren, Ohio.

WOAE—Medland College, Fremont, Neb.

WLAY—Northern Commercial Company of Alaska, Fairbanks, Alaska.

WMAK—Norton Laboratories, Lockport, N. Y.

WNAD—Oklahoma Radio Eng. Co., Norman, Okla.

By Carl H. Butman

WNAB—Park City Daily News, Bowling Green, Ky.

WMAL—Trenton Hardware Co., Trenton, N. J.

WMAP—Utility Battery Service, Easton, Pa.

WLAW—New York Police Department, New York City.

WNAH—Wilkes Barre Radio Repair Shop, Wilkes Barre, Pa.

During the week which ended September 30, the Department of Commerce licensed 11 broadcasting stations in the new Class "B." This is the first issuance of the new licenses to the superbroadcasters, and celebrates the licensing of the first broadcasters a year ago. All of the stations licensed under the new regulations are old ones which have been listed under limited commercial stations engaged in broadcasting for some time. They comprise large stations which have qualified with the rigid requirements of the department and are now entitled to use the special 400-meter wave length assigned exclusively to these stations. Only high-class entertainment will be carried; mechanical music is forbidden. The stations

which remains in Class A, over 500, are permitted to broadcast "canned" music if they desire.

Among the B stations are the well-known calls of Westinghouse, General Electric, Western Electric, the A. T. & T. Company, and such papers as the "Detroit News," "St. Louis Post Dispatch" and "Dallas News."

The first Class B list follows:

WFAA—A. H. Belo & Co., "Dallas News," Dallas, Texas.

WBAY—American Telephone & Telegraph Co., New York.

WOR—Bamberger, L. & Co., Newark, N. J.

WWJ—Evening News Association, "Detroit News," Detroit, Mich.

WGY—General Electric Co., Schenectady, N. Y.

KSD—Pulitzer Publishing Co., St. Louis, Mo.

WHAZ—Rensselaer Polytechnic Institute, Troy, N. Y.

WOO—John Wanamaker, Philadelphia, Pa.

WEAF—Western Electric Co., York.

KYW—Westinghouse Electric and Mfg. Co., Chicago.

WCX—"Detroit Free Press," Detroit, Mich.

The grand total is now 534.

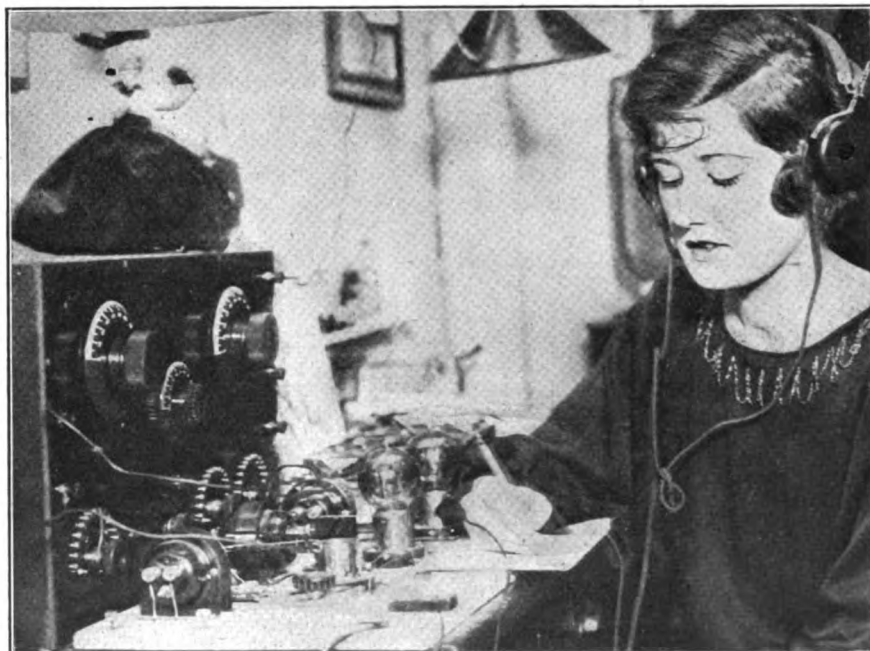
(Continued from preceding page)

battery (22 volts variable), one pair telephones, one storage battery, aerial and ground. The accompanying diagram shows the internal wiring of the set and should be so wired. One variometer is placed in the grid circuit and the other in the plate circuit. Arrange the panel in such a way that the tube, socket, and rheostat are located in one end and the vario-coupler in the middle, with the variometers, one on each side. Before attaching any of the wires, lay out the work carefully. Be particularly careful to keep all the wires as short as possible. Remember that every bit of wire added makes just so much more resistance to the set and will cut down the signal strength.

The lead wires from the primary taps to the contact taps on the panel should be covered with "spaghetti." This prevents howling and squealing if amplifiers should be added to the set.

By doing this it will also lessen the danger of getting the B-battery through the filament by short circuit from some of these wires.

"Two on the Aisle!" by Radio

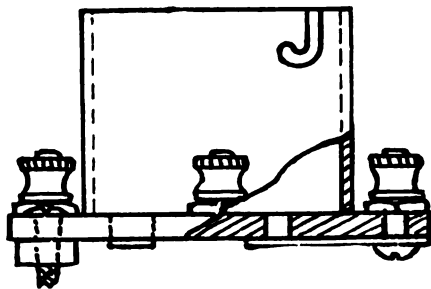


(C. Central News Photo Service)

Miss Lillian MacKenzie in the box office of the Globe Theatre, New York, where radio has been installed and reservations may be made by means of the receiving set. Passengers on incoming liners can comfortably engage seats for their first evening on Broadway, and isolated suburbanites may reserve tickets with ease.

Neat Home-Made Tube Socket

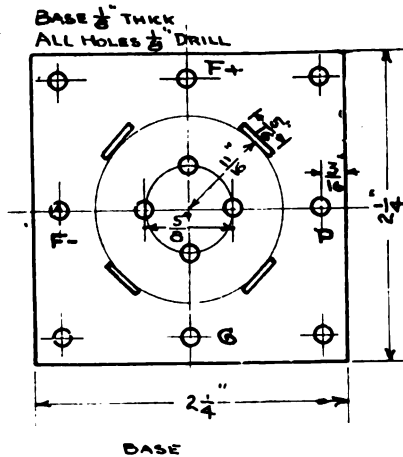
By Gordon S. Arthur



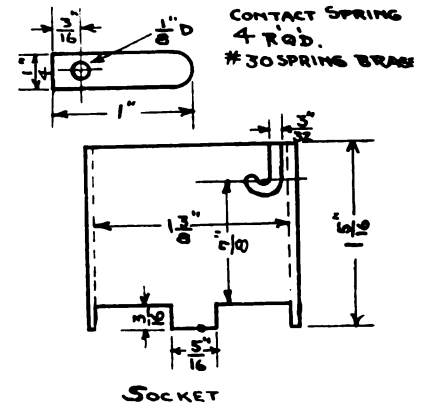
Assembly drawing (full size) emphasizing the neatness and compactness of this socket.

It happens frequently that defects in tube sockets drive many amateurs to making their own. Sometimes porcelain sockets crack and break, while bakelite, or hard rubber, softens and gets out of shape when subjected to the heat of C-W transmission. The drawings accompanying this article show the detailed construction of a neat and compact tube-socket. It has been made and operated successfully. The dimensions given provide sufficient clearance between the binding posts and the socket to prevent short circuits. Many amateurs may wish to enlarge the base so that there will be more room for making connections. This, of course, is permissible since it does not effect the important dimensions of fitting the tube base into the socket.

The cylindrical tubing that forms the upright of the complete socket may be of brass, aluminum, or any other metal that may be available.



BASE



SOCKET

Scale drawings for making tube socket described in this article.

It should be about 1/16 of an inch thick and 1 and 13/32 inside diameter. The contact fingers, of which 4 are required, must be of thin spring brass and cut accurately to dimensions. The base may be of hard wood, fiber, bakelite, hard rub-

ber, or any other insulator. Make it about 1/8 inch thick. The position of the slot in the tube must be so effected that when the bulb is in place the 4 little projecting lugs on the base of the bulb make contact with the proper contact-spring.

Radio Facts

THE reason that dials cannot be calibrated on wave lengths is because different users have to erect different types of aerials of different lengths, and all this affects the tuning of the receiver.

Always remember that when there is more than one tuned circuit, each circuit must be equally tuned to secure resonance or equilibrium. Many who have receiving sets containing two or more circuits simply put a loading coil in the primary circuit and then wonder why they do not get results.

A vacuum-tube receiver is not necessary to obtain the time service of Arlington. A crystal detector, especially a piece of galena, will pick the signals up several hundred miles distant from Washington.

To understand the language of high-powered Hertzian waves it is necessary for the operator to be familiar with the code. The radio alphabet can best be mastered by practicing on some instrument which will emit dots and dashes similar to those formed by the regular radio transmitter.

With the Radio Cartoonists



WHY BOYS STAY ON THE FARM
(Thomas, in the Detroit "News")



MANDY SPOILS A GOOD JAZZ CONCERT
(Washington "Star")

Crystals May Yet Be Best for Receiving

RADIO is now in a stage where owners of sets are not satisfied with some of the local broadcasting, but are diligently moving their dials and adding more equipment in hope of bringing in the so-called long-distance broadcasting stations. More often, the only portions that are heard are the call letters and the signing-off data. But what else goes with this tuning may be mentioned only by the owner himself, with its hissing, howling, and rearrangement of batteries and connections.

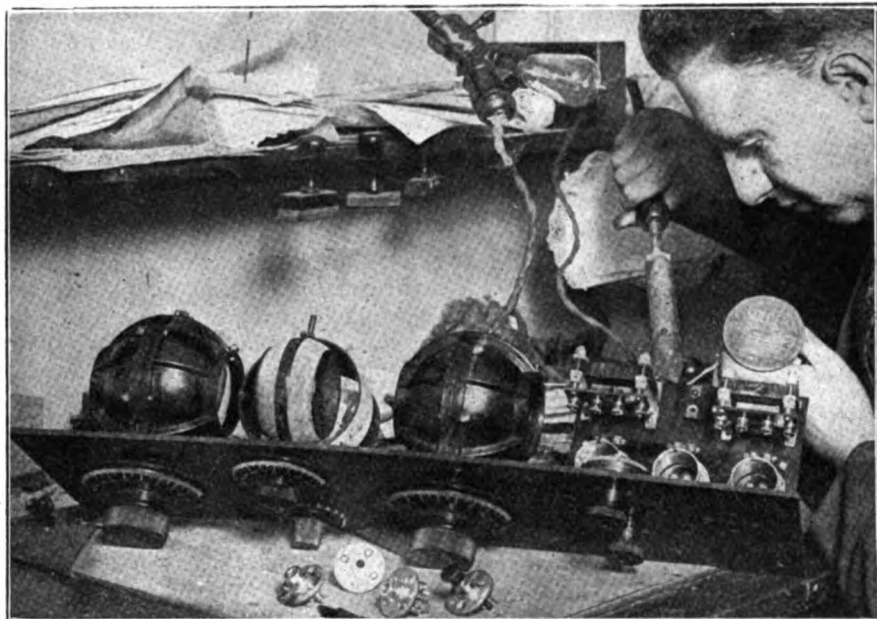
Radio this year is in the same condition as last, particularly in regard to creating long-distance reception of phone. Being a new instrument, we have realized its delights and enjoyed the entertainment it has produced; and as soon as fans learn that the long-distance records are being accomplished by most everyone, the idea will soon fall by the wayside. When this happens, the crystal-detector sets will either be used alone or in conjunction with the vacuum-tube amplifiers as a means of amplification. It may be said that a crystal is the only detecting device that will receive the phone without distortion during its action. Whatever the sounds may be, instrumental or vocal, the crystal does not become paralyzed or get out of order. A good crystal-detector once set works alone, unaided by batteries.

Crystal sets have a range from 25 to 30 miles to depend on. If the radio-broadcasting stations are to remain where they are for some months to come, every receiving set will be within range of one of them.

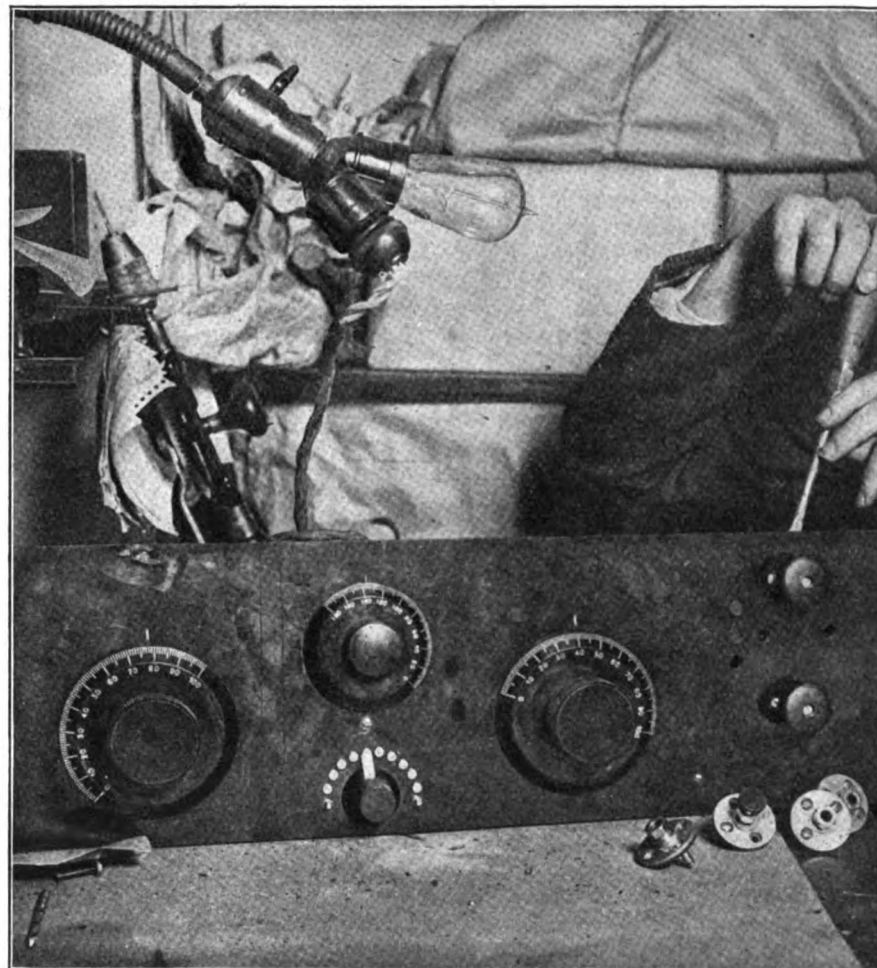
Radio Knowledge Greater Than Instinct

NO less an authority than Dr. C. P. Steinmetz, America's foremost scientist, stated these facts recently in a public address, and gave it as his opinion that an antenna was a safeguard rather than a liability in case of electrical storms. Those of you who feel timid when storms are in the vicinity might well remember that Dr. Steinmetz' *knowledge* is more likely to be correct than your *instinct*. Even if these other stations are on exactly the same wave length as the one you are hearing, they will cause no signal at all to be received. You see, of course, that in localities where there are many stations, this ability to select to some extent the station you want to hear may be very useful.

This Long-distance Regenerative Set Was Made for \$27.80



(Both photographs C. Kadel & Herbert News Photos.)



With the many types of receiving sets now on the market, it would be impossible to give precise directions regarding the building and operation of each. However, vacuum-tube receiving sets come under a general head, so that broad instructions on each class are certain to fit each individual case with due allowance for the peculiarities of each particular set. The use of the regenerative arrangement complicates the operation of a set not a little; but it also makes for louder signals that could not be obtained with a simple circuit. Regeneration is obtained by either the tickler coil or by a grid and plate variometer. Such a set is shown in the above half-tone. The upper half-tone is from a photograph of Mr. Samuel Lebowitz, working on a set that he constructed for only \$27.80. He is shown making some soldering connections on his amplifier section. Note the two variometers with the variocoupler in the center of the photograph. The half-tone at the bottom is the front of the panel.

Vessels Now Guided Through Fog by New System of Radiotelegraphy

By Ortherus Gordon

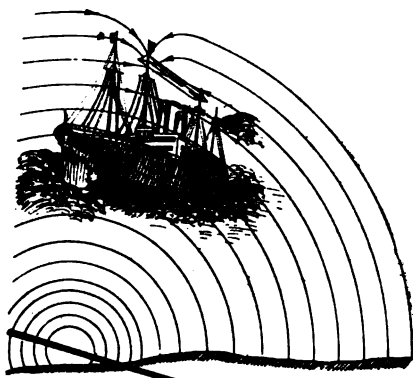


Figure 1.—When a ship is directly over the radio-piloting cable, the waves strike both collector coils with the same force and effect. The slanting line is the cable from Fort Lafayette to Ambrose Lightship. Drawn by S. Newman.

FOR more than two years, the aids to navigation on the surface of the Ambrose Channel fairway, in the harbor of New York, have been supplemented by a radio-piloting cable. It is submerged and in construction is similar to trans-Atlantic cables, excepting that it is thinner and has only a moderate number of strands. It follows the course of the ship channel for twenty miles, from Fort Lafayette at the Narrows to the outer buoy near Ambrose Lightship; and this fact, together with its name, "radio-piloting cable," gives some indication of the purpose for which it was designed and laid.

Having perfected a system of radio-compass stations whereby a ship approaching any port on the Atlantic or Pacific seaboard, in a fog, may safely pick up the light vessel, or buoy, at the harbor's entrance, the United States Navy Department turned its attention to continuing that service right up the bays and into the basins or docks. It was not enough that a ship should be guided to the outer entrance of the harbor. That ended her navigational difficulties, to be sure; but it did not get the vessel to a dock, where her passengers and valuable cargo might be discharged. It often happened that all the time saved in making the channel entrance by means of the radio compass was lost in waiting for fog to lift so that the ship might proceed up the harbor to the docks. Time is valuable where steamships are concerned. Delay means not a few hundred dollars a day, but thousands of dollars an hour, according to the size of the ship and the demand for her services.

Perhaps the success of the submarine-signalling devices now employed on all vessels suggested the use of a submerged piloting-cable. By means

of two microphones placed in a vessel's forward hold, below the waterline and on the outer shell of the ship on each side, the navigator in the chartroom with headphones on, can hear the distinctive underwater signals of certain lighthouses, sometimes for as much as fifteen miles. Not only that, but by switching from one microphone to the other, he could determine the direction from which the sound waves were coming and steer his ship accordingly.

This is the successful principle of submarine, or submerged, signaling. A device placed at strategic points for transmitting sound waves, and the ship has "ears" to catch them. Why not an electrified cable along the channel course, with suitable ears on the ship for detecting the impulses sent out by that cable?

The suggestion was seized upon and carried out. Experimenting took place at New London, Connecticut, and the project declared practicable. At once the Navy Department proceeded to larger experimentation in New York Harbor. The cable was laid and the tug, "Algorma," fitted with "collector coils" which were to serve as "ears." The inner end of the cable was brought into Fort Lafayette and attached to the apparatus for producing the buzzer impulses sent out on this new form of transmitter. A flow of three amperes was found ample for practical purposes.

On board the ship, the collector coils were placed on each side of the vessel at an equal distance from the 'midship lines. They consisted of from 400 to 800 turns of insulated wire, it having been demonstrated in the preliminary tests that the number of turns directly affected the audibility of the signals received. There must be a rigid sameness about the coils, and all wires leading to and from them must be identically placed in relation to the central position of the headphones. In other words, the effective electrical constant must be the same. On this depends the accuracy with which the path of the submerged cable may be followed, since the guiding instinct is derived from comparing the strength of the signals as caught by the extended ears.

If a tuner is used; that is, if the collector coils are employed as antennas and supplemented by a resonance receiving-circuit, the efficiency of the outfit is increased a thousandfold. For such work as this system will be called upon to perform for the present, tuned circuits, while desirable, are not necessary.

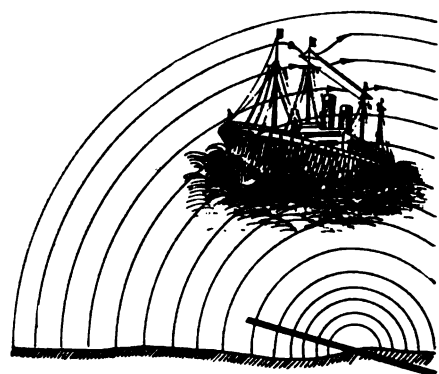


Figure 2.—When a ship is out of the channel and off her course, the collector coils on the side furthest from the cable receive little or no excitement; while the other one gets an overdose. The difference in intensity warns the helmsman, who brings the ship back on her course. The slanting line is the cable from Fort Lafayette to Ambrose Channel Lightship. Drawn by S. Newman.

The ears may be placed above or under water—no difference is noted in the result. It is probable that they will eventually take their place in the bows of the vessel, alongside the microphones of the submarine bell and whistling device. In that position they will reduce to a minimum the distortion due to the shielding effect of the ship's hull.

In the pilot house, the radio helmsman stands at the wheel, headphones on his ears. The left ear-piece is connected with the coil and circuit on the port side of the vessel; the right is connected with that of the starboard side. The man who actually steers the vessel may be an "old salt" unacquainted with the mysteries of wireless, or a high-strung radio engineer with little or no knowledge of ships. If he can hear, and has intelligence enough to distinguish between varying sound intensities, then he can guide a vessel along the path of the radio cable without training or experience. All he must do is to keep the "hum" in his left ear equal to that in his right. He might be blinded, and the bridge blanked off by canvas screens, yet the ship would faithfully make her way through the fog which hangs between her and a journey's end.

To one familiar with the elementary theories of radiotelegraphy, the principle upon which the success of the cable depends is readily understandable. The Hertzian waves emanate from the cable in concentric circles, growing larger and larger as they move away from it. A ship directly over the cable, as in Figure 1, cuts these waves into exact halves, so that the "collector coils" on either side of

What Makes the Radio Receiver Work

By Donald Van Wyck

WIRELESS receivers are made in various forms and designated as single, bi-polar, and watch-case. In radio the watch-case receiver is used exclusively. Usually two of these receivers are placed on a head band and made to fit the head. The complete article is termed a head set. As these head phones, or receivers, must respond to very weak signals they must be made with very light diaphragms and wound with copper wire. Now, if the cap of the receiver is unscrewed, a thin piece of metal, known as the diaphragm, will be noticed. It is held by magnetism. This diaphragm may be taken off; but be careful not to bend it. Under the metal diaphragm are usually two electromagnets, or permanent magnets, with steel cores. On these magnets are wound many turns of copper wire. Both ends of the magnets are termed "poles." One is the north pole; the other, the south pole. The names are used so any person may understand the direction in which the respective poles would be attracted if the magnet were free to swing like a magnetic compass. If a piece of iron is brought into proximity with these poles, it will be attracted. Whenever current passes through such a coil, it becomes a magnet and attracts pieces of iron. The fact that the magnetic pull is present only when the current is on makes the device a very useful one for changing electrical energy into mechanical energy. These coils are seen everywhere in electricity—in door bells, relays, alarms, and telegraph sounders used in telegraph offices.

In the telephone receiver, these magnets are mounted, one each, on the ends of the permanent steel-magnets. With this arrangement, the magnetism from the permanent magnets is carried up through the iron in the coils so that

(Continued from preceding page)

the vessel receive signals of equal strength. This is the navigating position of the vessel, and the one continually sought for as the ship veers from side to side.

As this veering there is a noticeable increase in the strength of the signals in one ear-piece and a corresponding decrease in the other. A slight shift of the helm and the condition is corrected. Thus, in the thickest of harbor fogs, or in heavy rain or in blinding snow, American ports will present a safe entrance to vessels equipped with "ears," the installation of which costs less than a thousand dollars.

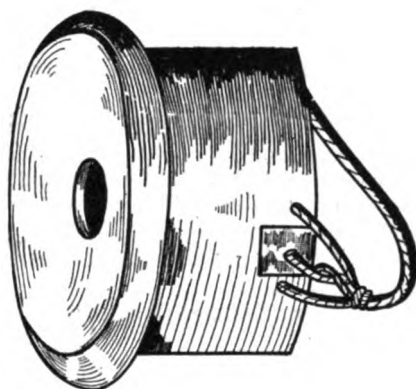


Diagram showing the watch-case receiver. This type of receiver is used exclusively in radio. It is small, light and durable.

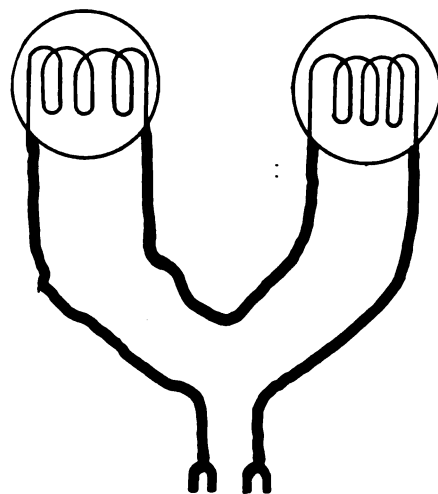
the thin sheets of iron, or the diaphragm, is attracted. When the feeble radio-currents arrive at the telephone receiver, all the energy is used in magnifying the attraction that the magnet exerts on the diaphragm. This diaphragm is an exceedingly sensitive piece of telephone mechanism. It takes very little energy to move it. Telephone receivers will not operate when alternating current is used. The current moving in one direction would neutralize the current moving in the opposite direction, and there would be no vibration of the diaphragm. Therefore, the ether waves, or radio waves, which are alternating current must be changed by means of the crystal or vacuum tubes when used as detectors.

Receivers look more or less alike to a beginner; but there is a vast difference between them, especially on the inside. A receiver, to really work right, should be wound with copper wire; but the sole idea, or principle, of the receiver hinges on the fact that there must be many turns of wire very close to the iron core. Receivers are usually rated by their resistance; but this method is entirely wrong. The easiest way to rate receivers is by the resistance of the wire used; but a great mistake is made when this is done, as this resistance is detrimental to the telephones. What is expected from a telephone receiver is the number of turns, or ampere turns, with the least amount of resistance. To get this resistance, a larger size of wire could be used; but when this is done, it will be found that, owing to the thickness of the wire and the distance from the poles, the resistance will increase, thereby lowering the efficiency of the phones.

But this is absolutely contrary to correct receiver design. As the receiver has the resistance, it lacks the number of turns and, actually, less

wire is used. This will give the receiver less efficiency in its work, as the high resistance will deaden the signals. Each receiver will have a total resistance of 1,000 ohms. The two receivers in series will have a combined resistance through which a current of 2,000 ohms must pass. It does not pay to go much higher than the 2200-ohm receiver. It is far better to secure the extra value in getting the very best mechanical design. As the wire used in receivers is very fine, great care must be exercised, when the receiver is open, not to touch and break these fine wires where they connect to the binding posts located inside the receiver.

Another thing in a receiver that may be greatly improved upon is the diaphragm. It is evident that if the diaphragm is to give out sound, it must be able to vibrate freely. Some of the trouble with receiver diaphragms is



How two receivers are connected and how the electro-magnets appear inside the receiver.

due to the fact that they have not sufficient clearance from the pole pieces, making them inoperative. When this is evident, tighten a little on the cap and notice the result. If no change is noticed, then remove the cap, reverse the diaphragm, and then rest the receiver.

If the diaphragm does not clear the pole pieces, a paper washer may be used. The washer is inserted between the base of the receiver and the diaphragm. The iron diaphragm is held in position by means of the cover and the action of the poles. Should a current pass through the coils of the bobbins, the pull of the poles on the diaphragm will be varied. This variation causes the vibration of the diaphragm and, consequently, produces sound. This is satisfactory in most cases.

Plate Voltage an Important Element of V-T Transmitters

By John Kent

ONE of the most essential parts of any radio transmitter is the correct high-plate voltage applied to the plates of the vacuum tube. A very good plan to follow in the construction of any type set, is to design the apparatus so that it will work efficiently with as few pieces of apparatus as possible; and yet, parts may be added from time to time that will improve the set in general and not put on the builder too great a financial stress. A simple vacuum-tube transmitter is no more complicated than the average regenerative receiver, which it resembles. A simple vacuum-tube transmitter making use of the standard parts and utilizing the B batteries for high-plate voltage may be assembled easily in any radio amateur's workshop.

The parts needed for a small transmitter consist of an inductance—which is used as the inductance for the antenna as well as for the grid—plate coupling-coils of a vacuum tube and its controls; a variable condenser; a means of modulating the currents generated by the oscillator of a high voltage

source for the plate circuit and a microphone.

For the plate voltage, ordinary B batteries may be used. However, use batteries that have a variable voltage from 22 to 500 volts. This will enable the operator to cut in just the amount of power needed for the plates of the tubes.

The ordinary flashlight cells will not work so well, because there will be quite a call on the battery and, of course, these batteries will not hold up and will have to be renewed frequently.

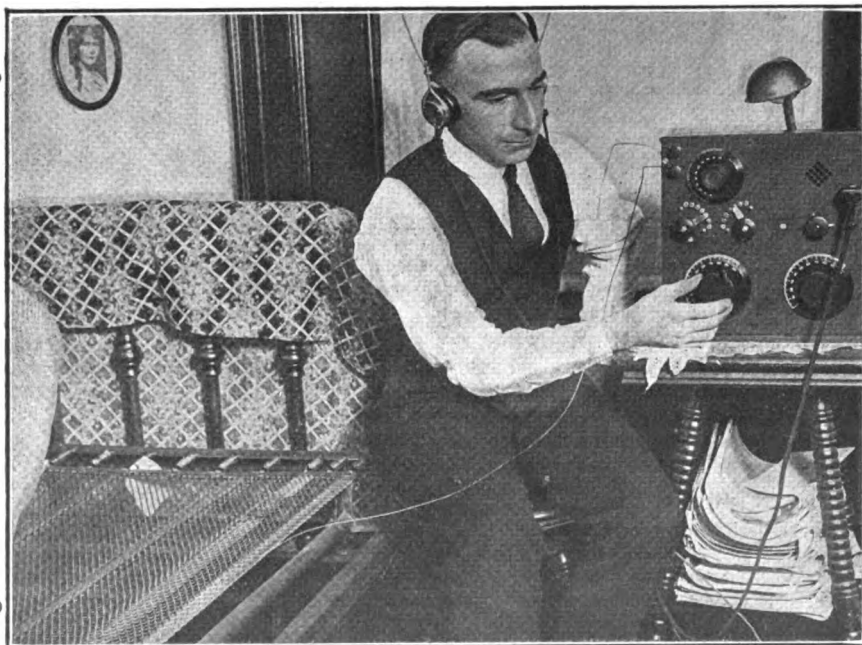
If a transmitter tube is used, the plate voltage will have to be between 350 and 500 volts. Hundreds of amateurs who are now using a transmitter for C-W (continuous wave) work, employ the Colpitts circuit in order to know what the plate voltage does. It may be repeated that a good battery for the plate voltage makes the set work in a satisfactory manner. Signals have been transmitted over some distances, and by using the regular transmitting tube the range is increased considerably.

Regarding the aerial, the average

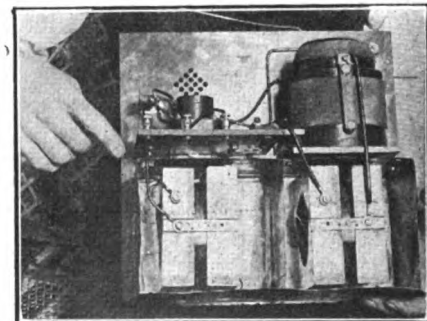
radio fan will have to improve upon his aerial which is being used for broadcast receiving. It is quite impossible to send out signals of a wave length, and keep within the law, on a single wire 100 feet long. The radio fan will have to build an antenna for his sending set which will give him a sending wave-length of 200 meters. Such an aerial may be constructed by building a four-wire inverted-L aerial, 50 feet high and about 100 feet long. Particular care should be taken in the erection of it. It should not be placed near metallic objects, and the best of insulation should be used.

Satisfactory results will be secured only after careful adjustment of the various pieces of apparatus used. Do not be discouraged by the first results, which are often very poor. Further experimenting, the changing of a tube, renewing a battery, lighting the tube more brightly, will increase the radiation, and improve the experiment. A thorough understanding of the apparatus, and the workings of the circuit, and patience, will work wonders.

How to Use Your Bed Spring as an Aerial



(Both photos C. Kadel & Herbert News Service)



ments, there are certain essentials which must be provided: The correct aerial, the proper ground, a means for altering the wave length, an instrument for changing the radio frequency, audio frequency, and the correct telephone receivers. The large half-tone shows Harry Luckert, of New York, who is using his bed spring as an aerial, and a very good aerial this useful domestic element makes. Mr. Luckert was refused permission to erect an aerial on his roof—and utilized his bed. He has accomplished surprising results, hearing WWJ, Detroit; KDKA, Pittsburgh; WGY, Schenectady, and WJZ, Newark. He is using, as may be seen, a one-tube receiver of the regenerative type, consisting of two variometers, and a vario-coupler. This set is carefully shielded and he claims his results are due largely to this, admitting, however, that his location is apparently favorable for long-distance reception. The smaller half-tone shows the rear view of the set with Mr. Luckert's finger pointing to a variometer. This set is small and very compact.

There is nothing complicated about radio reception. The apparatus may be of the simplest sort. If the distance to be spanned is relatively small, but little experience is necessary; for anyone may turn the knobs and adjust the detector. No license is required and anyone may intercept radio waves without formality of any kind. The

cost is low, considering the wonderful possibilities of a receiving set. After all, it is a question of what is expected of the receiving equipment, and successful results demand that the receiving equipment be fitted to the requirements of the owner. No matter how simple a receiving set may be, or how modest the require-

Latest Important Radio News of the Week

IN Missouri a movement was started recently for state control of broadcasting. This movement is showing signs of spreading to other states, and it was the radio interests of Massachusetts that suggested the conference here between the radio and motion picture people. It was believed that the best time to hold the conference was during the Chicago Radio Show, the first manufacturers' show ever held, because the leaders in the industry would be here.

"Listening In," by Carlyle Moore, will be produced out of town October 23, with Ernest Glendinning in the leading role.

Amsterdam, which boasted the first successful Marconi wireless telephone communication with London, is broadcasting concerts regularly from The Hague to London, thus following the example given by America. American enterprise and initiative have supplied the Amsterdam Stock Exchange with direct cable communication to New York.

Dr. Albert Abrams, of San Francisco, originator of the electronic method of diagnosis and treatment of disease, is in New York. He claims that missing persons can be located by radio. Dr. Abrams visits the East, seeking support for clinics for his theory in this country and Europe. In an interview he expressed his eagerness to give all his time and energy to these clinics and to contribute the needed apparatus. The "Electronic Reactions of Abrams" have elicited highest praise from his followers and provoked bitter criticism from doctors of medicine and other scientists. As a retort to criticism in the "Journal of the American Medical Association,"

Dr. Abrams resigned from that association. Dr. Abrams says all material things are radio-active and that sufficiently delicate apparatus can measure the degree of radio-activity and determine a substance being examined without even seeing it. Dr. Abrams says he has devised such a sufficiently delicate apparatus. "A drop of blood," said Dr. Abrams, "with its billions of electrons, is a condensation of the multitudinous vibrations of the body."

With the work of installing a large radio broadcasting station at Police Headquarters, New York, the Western Electric Company has begun putting in receiving sets in police stations, starting first with the borough headquarters station. Material for the Bronx headquarters in the Bathgate Avenue Station has been delivered and installation will start immediately. It has no apparatus for broadcasting and comprises the usual reception apparatus, with amplifiers and loud speaker. All notices sent from the general headquarters will be copied.

E. F. W. Alexanderson, inventor of the Alexanderson alternator, is expected from Sweden next month.

Senator Marconi announces that he will take a personal interest in building up radio interest in his native country, Italy.

European electrical scientists and radio experts of international reputation will visit America and meet this country's radio experts at the National Radio Show, to be held at Madison Square Garden the week of November 29-25.

What a Microphone Looks Like

TWO buttons, or carbon granule chambers, characterize the Western Electric microphone used in WBAY, New York. One button is located on each side of the vibrating diaphragm, so that at any given point in the vibration one button is compressing carbon granules while the other is releasing pressure. This means that current flow, affecting the voice transmission, is being increased on one side of the diaphragm and decreased on the other.

Every fan who has studied the action of the single-button microphone knows that its results are not exactly proportional to the amplitude of the sound waves producing them. Some distortion takes place. With the two-button device this distortion is cut down tremendously. The two buttons of the microphone are connected with one side of the transformer—or in telephone language, the repeating coil—in such a way that the resulting currents are both in the same direction and their combined effect is the production of waves that are quite free from distortion.

The electrical equipment is so arranged that another type of transmitter may be used when desired. It is not a microphone at all, but what is generally known as a condenser transmitter. It contains no little cups of carbon granules which characterize the microphone although it has a vibrating steel diaphragm and makes use of air damping. It requires considerably more preliminary amplification than the microphone but it has certain characteristics which at times makes its use desirable.

He Had Something to Brag About!

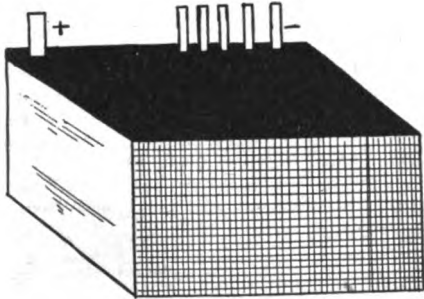


Radio Bug:—"Son, I can't brag about your quality or modulation, but you sure are there with the distant audibility."

The Radio Primer

Weekly A B C of Radio for the Beginner, in which Elementary Facts and Principles Are Fully and Tersely Explained

By Lynn Brooks



This larger size of battery, also a B battery, is known as the variable type. This battery can be used where a change of voltage is required.

WHAT is the variable B-battery used for? How can you tell it from any other batteries?

The variable B-battery is used in conjunction with the plate of the tube to carry out the principle of making the tube function. The positive pole of the B-battery is connected always to the plate of the vacuum tube whether the tube is a detector or an amplifier. If, by accident, the negative connection from the B-battery is connected to the plate the tube will not function at all. The B-battery is a necessary element for the tubes and may be detected easily by their size. The accompanying illustration shows what the variable B-battery looks like. It is much smaller than the storage battery. The variable taps are brought out on the top of the battery.

Are there any non-variable B-batteries?

Yes—B-batteries of the non-variable type. They are the same size, carry no taps, have a constant voltage and can be used with fixed voltage.

Describe the storage battery.

A storage battery consists of a number of cells, each cell made up of a number of plates and grids in an electrolyte solution of such character that the electrical energy supplied to it is converted into electrical energy—a process called discharging.

What is the theory of the storage battery?

The action of the storage battery is practically the same as that of the primary battery and is subject to the same general laws. The cells of a storage battery are connected in the same way as primary cells and, when charged, are capable of generating a current of electricity in a manner similar to that of the primary battery. It differs, however, from the primary

battery. It is capable of being recharged after exhaustion by passing an electric current through it in a direction opposite to that of the current of discharge. This difference constitutes the principal advantage of the storage battery over the primary battery.

* * *

How is the electrolyte generally used?

The electrolyte consists of a weak solution of sulphuric acid which permits ready conduction of the current from the primary battery. The greater proportion of acid, within certain limits, the smaller the resistance offered.

* * *

What is the effect of the current passing through the electrolyte?

It decomposes the water into oxygen and hydrogen. This is indicated by the formation of bubbles on the exposed surfaces of both plates. These bubbles are formed by oxygen gas on the plate connected to the positive pole of the primary battery, and hydrogen on the plate connected to the negative pole.

* * *

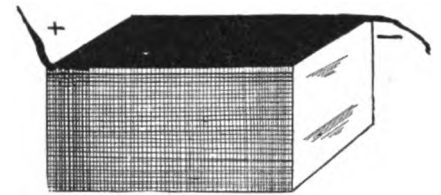
How is the electrolyte prepared?

One part of chemically pure concentrated sulphuric-acid is mixed with several parts of water. The proportion of water differs with several types of cell from 3 to 8 parts, as specified in the directions accompanying the cells.

* * *

In preparing the electrolyte, how should the water and acid be mixed?

The mixture should be made by pouring the acid slowly into the water. Never do it the reverse way as an accident will result. It cannot be too strongly stated, in mixing the liquid,



B battery of the non-variable type.

that it should be stirred with a clean wooden stick, the acid being added slowly to the water. The acid is corrosive and will burn the flesh. Distilled water should be used in preparing the solution. The mixing of the two ingredients causes them to become very hot.

* * *

How should the cells be filled?

Sufficient of the electrolyte should be poured into the jars to either completely cover the plates or to come within half an inch of the top of the jar. Large cells should be filled by means of an acid-proof pump. During this operation wear rubber gloves.

* * *

What about the density of the electrolyte?

It should never exceed 1,300 when the battery is fully charged.

* * *

What should be done with the old electrolyte?

When a battery is taken down, the electrolyte may be saved and used when reassembling the battery, provided great care is exercised when pouring it out of the jar not to draw off any of the sediment. It should be stored in convenient receptacles, preferably carboys which have been thoroughly washed and never used for any other purposes.

* * *

What is the voltage of a secondary cell?

This depends generally on the density of the electrolyte, the character of the electrodes, and the condition of the cell. It is independent of the size of the cell.

* * *

What are the colors of the plates?

In the case of formed plates, and before the first charging, the plates that are positive are of a dark-brown color with light- or red-gray spots, while the negatives are of a yellowish gray. These spots, on the positive plates, are small particles of lead sulphate which have not been reduced to lead peroxide during the process of forming. They represent imperfect sulphation.

THOUSANDS of radio beginners have come into the radio field since summer. They will find "The Radio Primer," published weekly in RADIO WORLD, a regular source of instruction and aid. For this reason, RADIO WORLD will republish, from time to time, some of the valuable primer articles that appeared in its early issues. These articles, by experts, contain a vast amount of radio information that cannot be duplicated. Every beginner will find them necessary to the building of sets and cooperative with the new material being printed weekly.

Regenerative V-T Receiver for Short Waves

Describing Photographs on Front Cover of This Issue

By Fred. Chas. Ehlert

A MATEURS are asking constantly: "What is the most efficient hook-up, or diagram, whereby loud signals may be obtained?" The tube detector undoubtedly is the most sensitive detector yet devised; but a new circuit has been created, to be used with the vacuum tube, which will render the tube self-amplifying. This is the regenerative circuit.

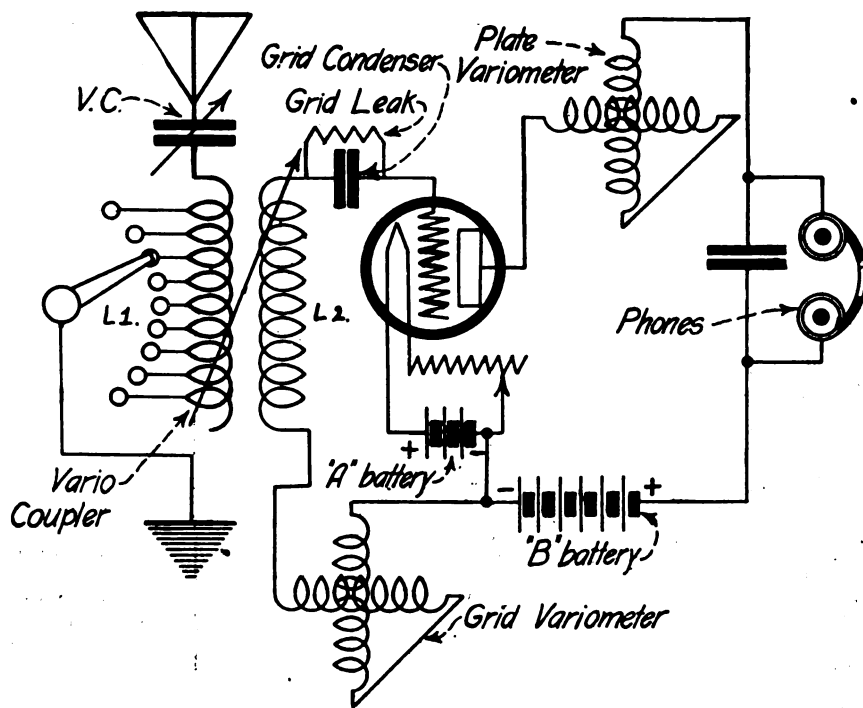
A vacuum tube, when hooked-up to a special circuit, will generate oscillations whose frequency can be controlled by varying the capacity and inductance of the circuit. The inventor of this circuit is Major Edwin H. Armstrong, U. S. A. He has contributed what is universally acclaimed as the most important invention since radio was first discovered. One type of a circuit where regeneration can be produced is shown in the accompanying circuit, whereby variometers are employed to produce that effect. All regenerative circuits are delicate to operate for the regenerative effect which gives rise to all kinds of noises in the telephone receivers.

The equipment needed for this circuit are two variometers, one variocoupler, grid condenser and leak, tube socket, and tube detector, with batteries and phones.

This circuit is a short-wave regenerative circuit employing the variometer in the plate circuit for production of such regeneration as that of Major Armstrong's invention. L-1 is the primary winding of the variocoupler and L-2 the secondary of the variocoupler. In series with the primary is a variable condenser, but this is to be "tried out" to see if it is needed. Personally, I believe it should be left out.

A grid condenser and leak is shown which should be connected in series with the grid of the tube. This grid condenser has a capacity of .00025 mfd., and may be purchased at most any radio shop.

The 22-volt battery is connected in the plate circuit of the tube with the plus side of the battery connected to the plate of the tube. One side of the filament of the tube is connected to the wire running from the telephones to the grid variometer. Be sure that the 6-volt battery is connected in right. Before making connections, be positive that the battery leads are correct. If the leads from the 22-volt B-battery become crossed with the filament of the tube, don't be surprised if your



Schematic diagram of a complete regenerative receiver employing variometers. One variometer is placed in the grid circuit while the other variometer is placed in the plate circuit of the vacuum tube. This receiver will respond to the shorter waves with a good volume of sound. Suggested by Fred. Chas. Ehlert. Drawn by S. Newman.

tube does not light. This means that you have a burnt-out tube and that another tube must be purchased. But be sure that all connections are right before lighting.

The rheostat in series with the tube which controls the filament lighting of the tube is also shown. In case it is turned too high, the tube also will burn out. These precautions will have to be taken care of, but aside from this, there is not much to worry about. Generally the socket for the tube is marked as follows: P, for plate; G, for grid; F plus and F minus for filament. These two F marks are to be

connected to the 6-volt storage battery. Be sure to connect them to the proper polarity with the rheostat. In working this set, you will learn by experience when lighting the tube that it will start to hiss. The most sensitive spot is just below where the tube starts to hiss.

Again I caution you not to turn the filaments too high, as probably they will burn out the tube. By keeping the filaments at their proper brilliancy the tube's life will be lengthened. By using the tube you will soon learn its great advantages over the crystal detector.

WJZ Celebrates First Anniversary

WJZ, radio call-letters on the lips of thousands of radio enthusiasts, held its first anniversary services during the evening of October 5, when several of the artists who broadcast from WJZ last fall again visited this station.

It is generally regarded that KDKA is the father of broadcasting; also that WJZ popularized the broadcasting idea and introduced it in the Metropolitan area, where it attracted the best of talent and, with the assistance of New York radio publications, aroused the nation to the great possibilities of radio broadcasting.

WJZ was officially opened October 5, 1921, at 1:55 p. m., when several records were played to enable the radio audience to tune in their radio sets to receive, a

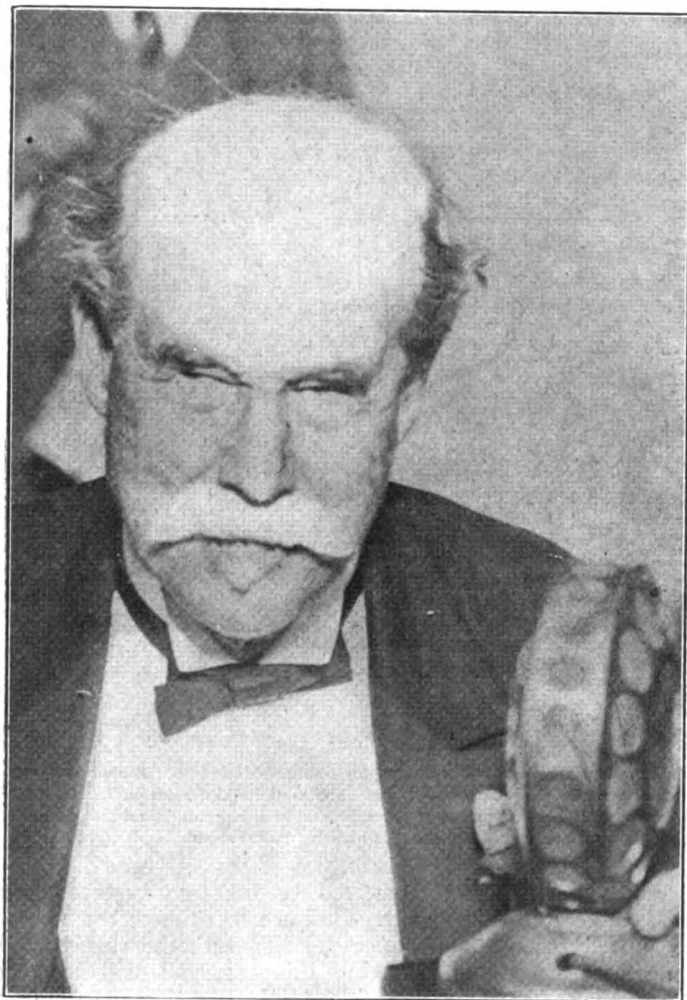
few minutes later, the play by play results of the World Series.

The response to the broadcasting by WJZ was immediate, as suggested by letters received from Massachusetts, West Virginia, Ontario, Pennsylvania, New York, and New Jersey.

The first artists to broadcast in person were: The Shannon Four, well known recording quartette, consisting of Charles Hart, tenor; Elliott Shaw, baritone; Wilfred Glenn, bass, and Louis James, tenor. Soon thereafter the foremost recording team, Billy Jones, tenor, and Ernest Hare, bass-baritone, entertained the growing invisible audience. Two prominent instrumentalists, Constance Karla, violinist, and Anna Welch, harpist, followed and other artists of note.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.



(C. Central News Photo Service.)

Sir Thomas Lipton as he appeared just after talking, by radio, across the Atlantic. The instrument at his left is the transmitter, or acousticon, into which he spoke, and which started his words on their long journey to London. Commenting on the experiment, Sir Thomas said: "This is the biggest thing of its kind in the world—and worthy of America as a big part of this world."

AT WOR, the broadcasting station of L. Bamberger & Sons, Newark, New Jersey, an attempt was made, last Saturday night, to bridge the Atlantic Ocean with the human voice. W. S. Moler, publicity manager for WOR, reported that a message had been received from Gordon Selfridge, "the Marshall Field of London," stating that the voice was heard "more or less distinctly." The person who spoke into the transmitter at WOR was Sir Thomas Lipton, at present visiting the United States. Mr. Selfridge's cable also stated that a vocal selection was distinctly heard. According to Mr. Moler, this is the first time the human voice has been broadcast such a distance, over a 400-meter apparatus. It was necessary to tune up to over 2,000 watts, or twice the ordinary capacity of a 400-meter outfit. Sir Thomas and a few friends went to Newark to make the experiment. The radio message was sent to Mr. Selfridge at Marconi House, London.

Consul Wesley Frost, Marseilles, states that owing to governmental restrictions the development of amateur radio clubs in France has been so retarded that up to date there have been few in existence outside of Paris. The Radio Club of France has recently established its first branch office at Marseilles, and its local representative has offices at 44 Rue des Abeilles and in the grounds of the French National Colonial Exposition.

Sweden sent missions to England, France, Germany and the United States, two years ago, to study the various wireless systems and types of apparatus in use. In 1921, the mission,

under the direction of Seth Sjungquist, head of the Royal Telegraph Administration of the Kingdom of Sweden, visited America to inspect the high-power station of the Radio Corporation and to particularly see the Alexanderson alternators in operation. When the Reichstag met this year it sent a special legislative committee to England to study the vacuum tube as developed there, and it was only after hearing this report that the Reichstag recommended the use of the Alexanderson alternator and authorized the signing of the contract by the Telegraph Administration.

The installation of small radio outfits in all lighthouses of the Department of Communications, Mexico, is to be given a trial. Two sets are being supplied, after which, if the results are satisfactory, all lighthouses will be similarly equipped.

The announcement, "Flowers sent by radio," is made by a Bond street, London, firm of florists. "Altogether we have 2,300 agents," said the manager of the firm, "and flowers can be delivered in all parts of America and Canada in a few hours. The idea is spreading rapidly in England, though we receive more orders from the other side than we send."

The latest use of radio is to locate missing relatives. Amateurs are requested to send out general or QST calls containing complete descriptions of the person missing with such other data as may be given them for broadcasting.

An interesting innovation in broadcasting was started last week at station WLW, Cincinnati, when Paul Briol inaugurated a tri-weekly book review by radio. Books by the best authors of the present were reviewed briefly and interesting anecdotes regarding the authors were read. This feature will be worked into the evening programmes on Tuesday, Thursday, and Friday nights.

For the third time, American radio amateurs plan communication with continental stations using their own amateur sets. This year's transatlantic tests will be conducted from December 12 to December 31 by the American Radio Relay League in cooperation with the amateur organizations in Canada, England, France and Holland.

English manufacturers have organized for the purpose of building and operating broadcasting stations with the approval of the government. Special wave-lengths will be allotted and stations will be erected in various areas, so that the whole territory of England will be well covered, and yet no interference will be experienced. By following a systematic method of locating stations and distributing wave lengths, the English will not have to suffer the early inconveniences which accompanied the advent of broadcasting in this country.

Secretary of Labor Davis started broadcasting, on October 2, for the Department of Labor through the Naval Air Station at Anacosta, NOE. The service will be for three fifteen-minute periods each week from 7:15 to 7:30 every Monday, Tuesday and Thursday. Secretary Davis, in his first broadcast, presented a short exposition of what the Department of Labor can do and is doing for American wage earners. A definite program will be announced later.

Sunday religious services have been added to the weekly schedule of WGY, Schenectady, New York. Every Sunday, a Schenectady church will be connected to the radio transmitting-outfit by land wire and the entire service of that church will be sent out, beginning at 10:30 a. m. At 4:30 o'clock, every Sunday afternoon, vesper services will be held in the studio of WGY, and a short address will be delivered.

W. K. Vanderbilt has departed from Southampton, England, on his new motor-yacht, said to be the most costly and luxurious pleasure craft afloat. Her radio apparatus, it is reported, is as powerful as that of any of the transatlantic liners.

The first radiophone exchange in the world, installed by the Air Ministry, is in daily use at the London Air Station, Croydon, England. Its main purpose is to connect the aerial-traffic controller with the pilots of airplanes operating between Great Britain and the Continent.

Radio and the Woman

By
Crystal D. Tector

I AM not unmindful of the fact that radio has me on my toes most of my waking hours—and, perhaps, more of the hours when I should be asleep than my doctor would approve—but even after a night with the “owls” I feel as chipper and gay as if I had set up counting an unexpected legacy. Most everything can be overdone. A plethora of riches produces nausea. One can have too much of a good thing, and all that; but I have yet to become bored by the varied excitement that radio throws in my way.

* * *

The other night, for instance, I attended a radio party down on Long Island. The hostess was one of the most charming young matrons of New York's very charming set. She sent out cards for a hundred guests. “You are invited to a radio evening,” was the simple but alluring phrase in the corner of the invitations. Of course, I had the usual argument getting Friend Husband to put on his evening togs. He swore the weather was still too warm and made other petty excuses, but I had my way. Luckily some dear friends motored us down.

* * *

Our hostess has one of those huge country homes that make one positively jealous. Her big living room,—I suppose I should be “class” and call it a “reception room”—where the chairs were arranged in a semi-circle before a radio-set banked with flowers. All one could see were the tuning knobs and the huge loud-speaker jutting forth from a mass of pink roses. When the music and the vocal selections began to come through, the scene was unusually attractive. I believe that it was the first affair of its kind ever held in America. If there have been others I have never heard of them—and if any of my readers can enlighten me, I wish they would write.

The programs rendered that evening were particularly fine. Only one number—a violin solo—seemed to suffer until a few turns of the dial and when the minimum of volume was reached, everything was perfect. Believe me, there was not a bored person in the room. Every one remained seated until the time tick came through from Washington, and all considered it quite a novel thing to see if their timepieces were correct.

* * *

The broadcasting programs over, a supper was served. While this was the “matter of the moment,” the chairs in the reception room were removed and the floor made ready for dancing. And—after some maneuvering, during which dozens of men, who never before had taken even the smallest interest in radio, peered into the set and asked a thousand questions—we picked up dancing music being broadcast from St. Louis! Imagine the charm of it! Dancing on Long Island to music being played in St. Louis.

I wish I had the space to give more than this mere outline of this very attractive affair. But I can drop a hint to all hostesses who are looking for something new this winter in the way of entertainment: Give a radio party. If you want some inside suggestions, drop me a line and I will help you all I can.

* * *

I have had a rather big “mail” since my last “copy” was written for RADIO WORLD. One of my correspondents who requests me to withhold both her name and her address, because her husband would “never forgive her” if he knew that she wrote to me, wants to know if iron pipe may be used for stays on an aerial 40 feet high, or is iron pipe obstructive to radio waves. Listen, dearie—and don't tell your husband—but iron pipe may be used for poles to support your aerial, but it will absorb some of the radio waves. Wood is better.

Heard Atlanta, Georgia, in Des Moines, Iowa

EDITOR, RADIO WORLD: In RADIO WORLD of September 23, page 29, “Who Is This Broadcaster?” I heard this program very plainly, and as I have been keeping a radio log I find that “Little Red Riding Hood” was given by a woman, in a child's dialect, from the broadcast station WSB, the “Atlanta Journal,” Atlanta, Georgia. I heard this program which started at 10:45 P. M., and ended in the morning; for when he signed off the operator said, “Good morning.”

As a rule, WSB is very clear here and everybody here looks to 10:45 as they know Atlanta, Georgia, will come in no matter how bad the weather is—static or not. This program was received on one-step single circuit using an A-P detector and one 301-Cunningham, amplified bulb. The outfit is home-made.

Hoping this information will help out radio fans.—Jack Clemons, Des Moines, Iowa.

* * *

Also in Cleveland

EDITOR, RADIO WORLD: On August 16, 1922, at 1 A. M., we received the message, and commented on the hour for a bed-time story and we heard the entire program. It was from Station WSB, Atlanta, Georgia.—Mrs. W. C. Blackburn, Cleveland, Ohio.

Only Relative Values

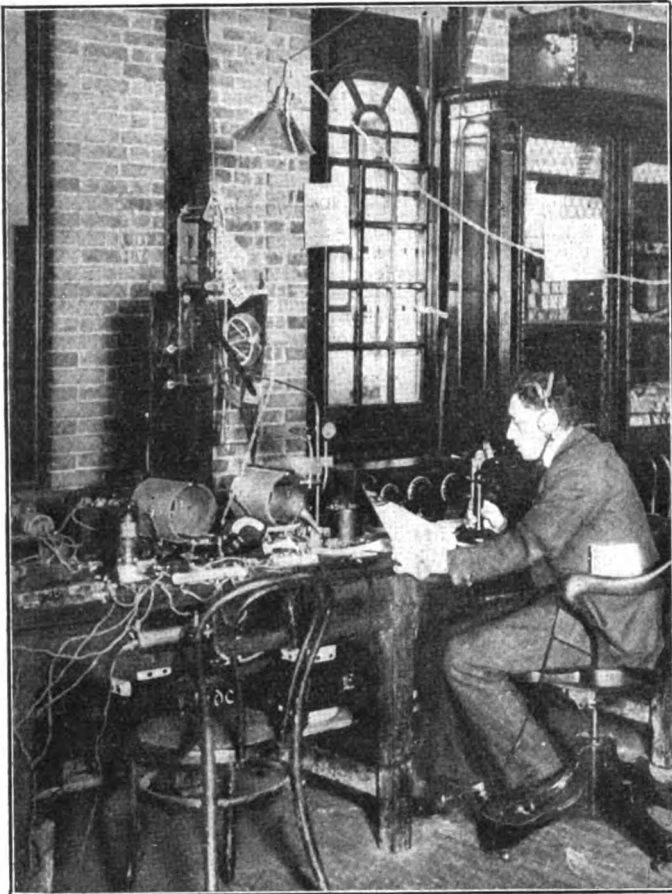
Always remember that the divisions and markings on dials and switches have only relative values, and do not directly indicate wave-length. They afford an easy means of resetting your instruments to tune in to a certain station.

New York Hotel Phone Operator Now Answers by Radio



Here is Miss Millie Culligan, telephone operator of the Vanderbilt Hotel, New York City, who was not content to remain the operator of an ordinary switchboard, but so familiarized herself with the radio system installed in the Vanderbilt that she is able to operate a set to perfection. Radio is fast becoming an essential of the leading hotels and hotel systems of the East. In general, it is now used for paging guests. During the past week, when New York City was crowded with guests—owing to the World's Series and Banker's Convention—a number of hotels installed temporary radio sets to keep their guests in touch with the latest news.

Interesting News Photos Collected for Busy



(C. Central News Photo Service)

Did you hear the news of the World's Series Baseball played at the Polo grounds, New York? Here is the room from which it was broadcast, play by play. J. C. Smith is the operator who is "shooting" the news to the millions who could not get seats for the big event.



(C. Central News Photo Service)

The world's greatest radio station is opened, and here is a bustling commercial institution, and so it is, for it is the greatest America Station, situated at Rocky Point, near Port Jefferson, of all the world. From it, President Harding flashed radiograms part of the receiving room into which messages are delivered for recording code messages. Radio Central, as the big station is of separate transmitters so as to ensure simultaneous communication at the Rocky Point Station enable the powerful transmitters to modulate, or control, the flow of power from the alternators employed at Radio Central. It consists of a line of 410-

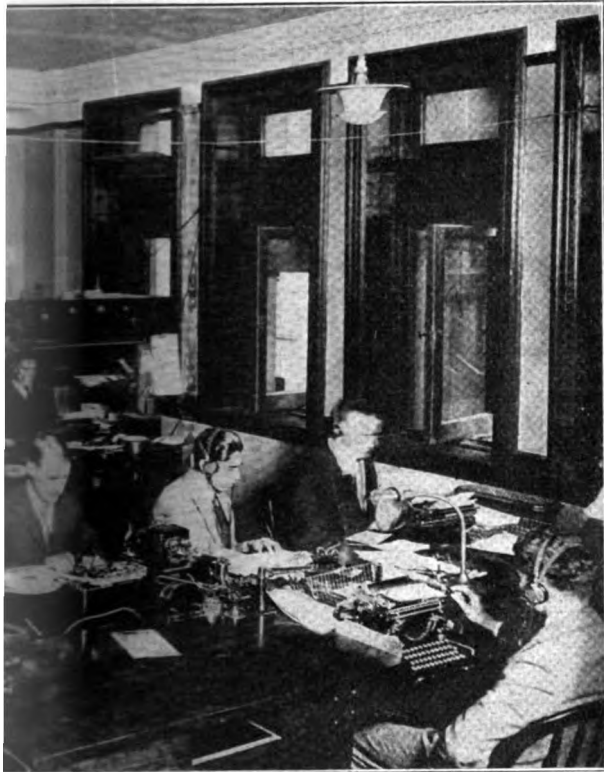


(C. International Newsreel Photo)

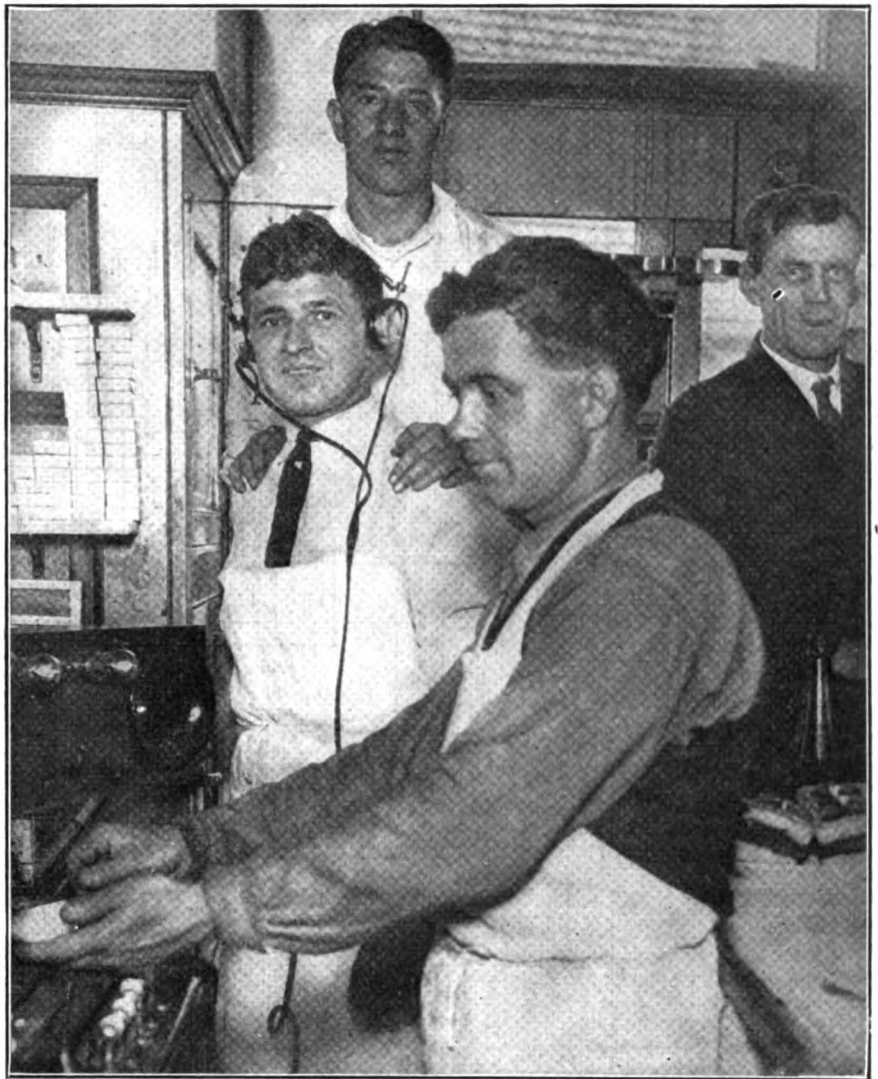
Clara Kimball Young, famous motion-picture star, talking over the transmitting apparatus of "The Examiner," Los Angeles. On this occasion Miss Young recited the late James Whitcomb Riley's poem, "That Old Sweetheart of Mine," and she received letters from radio fans even in the Middle West who heard her. The apparatus at her right is a 250-watt radiophone.



Graphs of the Week Radio Readers



Some reproduction of its busy office. It looks like the office of a real operating room in New York City of the Radio Corporation of New York. This station established America as the radio center for the world, greeting to twenty-eight other countries. The half-tone shows a transmission abroad. The typewriters with reels of paper are for use in, in reality, several stations in one. It comprises a number of stations with a number of stations abroad. The magnetic amplifiers operated at long distance. These ferromagnetic devices accurately radiating system, or aerial wires. The latest form of aerial is the towers, or masts, with 150-foot spreaders at the top of each.



(C. Central News Photo Service)

Over in Ridgely Park, New Jersey, they call this "The Dugout." It is a "quick-lunch" establishment, and the enterprising proprietor has installed radio for the benefit of his chef and customers.



The Grand Army veteran in the half-tone at the left wanted to listen in and the owner of a set obliged him. Before he had satisfied his longing, the old soldier was able to tune in himself. He asked, however, that his name should not be published—a request always adhered to by responsible editors. But the old fighter said that becoming acquainted with this new wonder gave him a new lease on life.

In the half-tone at the right, two electrical engineers of the College of the City of New York are testing aerials, one of the most fascinating "test ups" in radio. With the equipment laid out before them, it is possible to tell how aerials will work before being put up, thus precluding the possibility of erecting them in unsuitable locations. The young engineer with pencil and pad is Abraham Ringel. The other is Samuel Miller. RADIO WORLD has frequently referred to the splendid work in radio by the students and the faculty of this New York City institution.

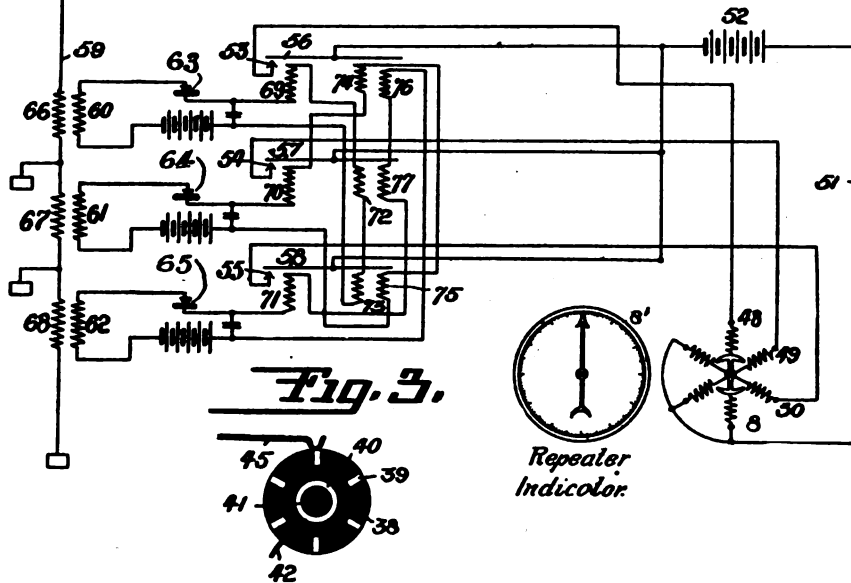
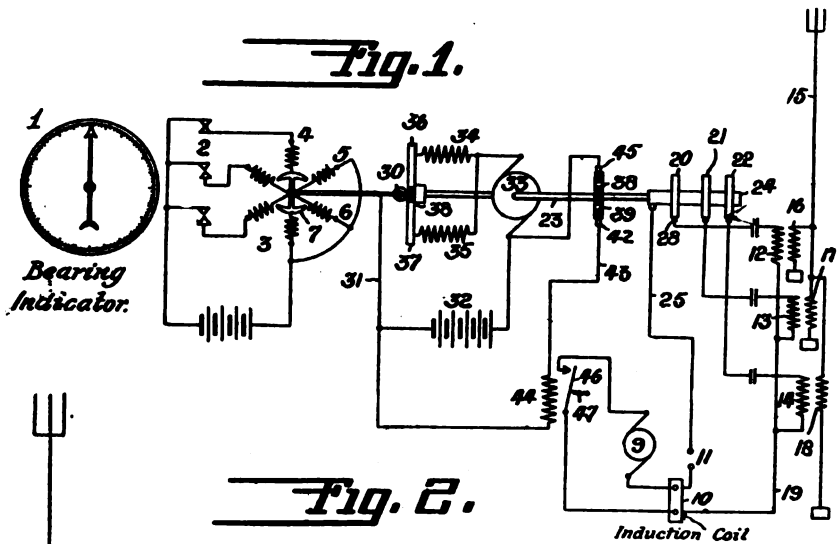
(C. Kadel & Herbert News Service)



Radio Patents

ized by the indirect use of the heating battery, or of some other source; but in either case associating this source with the output circuit battery.

It is well known that the current flowing through the output circuit undergoes fluctuations owing to sudden or gradual internal changes within the power battery. Such fluctuations in the space current of the vacuum tube are very troublesome. The method by which this invention overcomes this error may be explained as follows: Assume that the vacuum-tube circuits are so arranged, as hereinafter described, that the current for the input circuit comes from a source in series with the source for the output circuit. For illustration, suppose there is a decrease in the potential from the output circuit battery due to some internal change; this will necessarily tend



Schematic diagrams of Mr. Sperry's invention, the chief purpose of which is to provide simple and efficient means for causing an indicator, by means of radiant impulses, to follow automatically the movements of another indicator at a distant point.

Wireless Repeater System

No. 1,428,567. Patented, September 5, 1922. Patentes: Elmer A. Sperry, Brooklyn, N. Y.

THIS invention is for the purpose of automatically transmitting the readings of an indicating member by wireless to a distant point. It is particularly useful, the inventor claims, in automatically transmitting by wireless to an aircraft or other distant point the readings of a compass, fire-control instrument, or other indicator on a ship, whereby the ship's heading, or the bearing of a target observed from the ship may be constantly

communicated in safety to a distant point.

Such a system has especial uses in the aerial ordnance-control for heavy guns where the target is only visible from airplanes, which signal to the ship or other firing station the bearings of the target. In such a system, it is very desirable that the airplane pilot should know the bearing of his object.

The chief purpose of Mr. Sperry's invention is to provide simple and efficient means for causing an indicator, by means of radiant impulses, to follow automatically the movements of another indicator at a distant point.

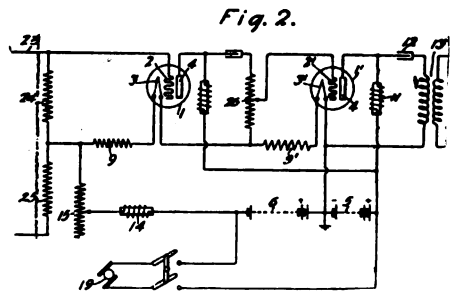
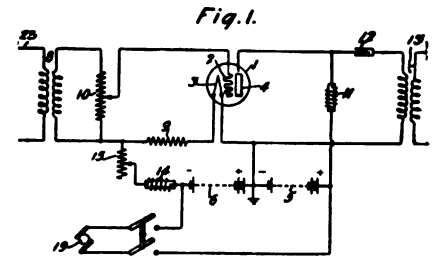
Circuits for Electron-Discharge Devices

No. 1,428,754. Patented, August 22, 1922. Patentes: Robert C. Mathes, New York City.

THE sources of direct current potential for the input circuit of an electron-discharge device of the audion type, is the basic element of this invention of Mr. Mathes. It is intended to provide

a more convenient and desirable method than has heretofore been used for securing a desired difference of potential between the filament and the grid of a tube of the audion type. A further object is to furnish a method and means for compensating for fluctuations in the potential of the output circuit battery of the vacuum tube.

Specifically, these objects may be real-



Schematic diagrams of the invention of Mr. Robert C. Mathes for the discharge of electrons.

to decrease the space current between the filament and anode of the vacuum tube. If the input and output batteries are of similar nature, this change, in all probability, will also decrease the potential of the input-circuit battery, which is in series with it, so that the grid potential will become less negative thereby tending to increase the space current to its former value. The compensation would take place in a similar manner for an increase in the voltage of the batteries, due, for instance, to the batteries being charged by some suitable means.

This scheme works especially well if the negative grid-voltage is derived from the drop of potential across the terminals of a resistance which derives its current from a battery associated with the output circuit battery.

You Will Need RADIO WORLD as a Radio Reference

Be sure to see that your file of RADIO WORLD is complete. There will soon be so great a demand for back numbers that the supply will not be sufficient to cover it. RADIO WORLD has been issued every week from April 1 to date. Start with No. 1.—RADIO WORLD. Mail, postpaid, for 15c a copy; any seven copies for \$1.00. Or send \$6.00 for one year (52 issues) and have your subscription start with No. 1.—RADIO WORLD, 1493 Broadway, New York City.

At the Radio Shows

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 4 to 22. U. J. Hermann, managing director, 549 McCormick Building.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31,

inclusive. Direction American Radio Exposition Company, 120 Broadway.

TRI-STATE TOBACCO GROWERS' RADIO SHOW, Covington, Ohio, October 21 to 28, inclusive.

NEW YORK ELECTRICAL AND INDUSTRIAL EXPOSITION, Grand Central Palace, New York City, October 7 to 14, inclusive.

SPRINGFIELD RADIO EXPOSITION, Springfield Auditorium, Springfield, Mass., October 3 to 7, inclusive.

SOUTHERN CALIFORNIA RADIO SHOW. Combined exhibition of the Southern California Broadcasting Association, the Southern California Radio Association, and the Southern California Radio Trade Association. Los Angeles, October 9 to 14 inclusive.

INTERNATIONAL RADIO SHOW, Madison Square Garden, New York City, November 20 to 28, inclusive. E. C. Buchignani, director of publicity.

A Warning to Radio-Show Exhibitors

AS to the value of radio exhibitions: Radio expositions are all right in their way. They have a legitimate place in radio affairs—**BUT THEY MAY BECOME A NUISANCE AND A MENACE UNLESS THE INTERESTS OF THE TRADE ARE PROPERLY SAFEGUARDED.**

Radio exhibitions, organized and conducted with an honest regard for radio art, science, and business, are excellent things. When run on go-as-you-please principles by promoters who have nothing in mind except the sale of space to exhibitors, they are likely to do much more harm than good.

For instance, how many of us have visited radio expositions and been confounded by the din and noise, by the barrage of unrestricted announcements and the cannoading by batteries that filled the air with meaningless sounds, making the would-be enthusiasts wonder what it all was about, and sending them out into the night filled with the idea that radio is a noisy, senseless thing.

A properly regulated method of receiving and sending messages in connection with radio shows and in making

business and official announcements, would greatly lessen the resentment of the judicious, and this could, and undoubtedly would, be regulated if practical radiomen had anything to do with the actual management of the show.

Therefore, **RADIO WORLD ISSUES THIS WARNING TO MANUFACTURERS** of radio goods and to all others interested as radio exhibitors:

Don't sign up for space at the next radio show whose representative calls on you for a reservation of space unless that representative can prove positively and convincingly that the board of management contains the names of practical radio men. Even then be sure that these radio men will have something to say about the **ACTUAL RUNNING OF THE SHOW IN ALL ITS PHASES.**

Beware of the radio show promoter who hasn't any more interest in radio than he has in canned milk or typewriters.

RADIO SHOWS SHOULD BE RUN BY RADIO MEN. Until they are, the radio industry and our constantly growing army of "fans" will not get a square deal.—**THE EDITOR.**

General radio-trade problems will also be taken up at conferences of manufacturers. One of these problems will be broadcasting. Many manufacturers believe that the industry is being held back by poor broadcasting, poor programs, and a general lack of knowledge of what the public wants.

Another problem to be discussed is, what is regarded as some, a boycott in England against radio apparatus made in the United States. James F. Kerr, business manager of the Chicago Radio Show, who recently returned from a trip to New York, Boston, and other Eastern cities, reports that not less than 127,000 radio sets, manufactured in the United States and shipped to England, are now being returned to the manufacturers. The Eastern manufacturers were depending largely on their export trade. The Western manufacturers have been better off because the farmers of the Middle West are going in stronger than ever for radio and are making the market one of the busiest ever known.

Chicago Radio Show

THE Chicago Radio Show, the first show ever endorsed by the National Radio Chamber of Commerce and the Radio Division of the National Electrical Manufacturers, promises to be one of the largest trade expositions ever held. When the doors of the Coliseum are thrown open to the public on Saturday, October 14, practically every large manufacturer of radio apparatus will be represented in the show, which will continue until Saturday, October 21. It will be open to the public both afternoon and evening for the eight days.

It will be the first time that the manufacturer has taken the opportunity to meet the jobber, dealer, and public at the same time.

Ed Wynn, the famous comedian, and his company, will put on "The Perfect Fool" the opening night for broadcasting. There will be a society night, a radio ball, a children's afternoon and other features during the week. While the entire Coliseum will be given over to the exhibits, the Coliseum Annex will be given over to meetings.

Radio brings it MAGNAVOX Radio tells it



Make your receiving set complete. Equip it with the wonderful Magnavox Radio that tells it clearly and in full volume to all within reach of its voice

AFTER once using a Magnavox Radio, the Reproducer Supreme, you would no more go back to the telephone headset than you would exchange your electric light for a tallow candle.

With the Magnavox Radio, due to the electrodynamic principle involved in its construction, you hear every program or message at its best.

A Magnavox Radio so increases the use and enjoyment of any receiving set that it is considered the one essential part of the receiving station.

R-3 Magnavox Radio with 14-inch horn (here illustrated), is ideal for use in homes, offices, etc.

Price \$45.00

R-2 Magnavox Radio with 18-inch horn for those who wish the utmost in amplifying power; for large audiences, dance halls, etc.

Price \$85.00



Model "C" Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Radio.

AC-2-C, 2-Stage \$80.00
AC-3-C, 3-Stage 110.00

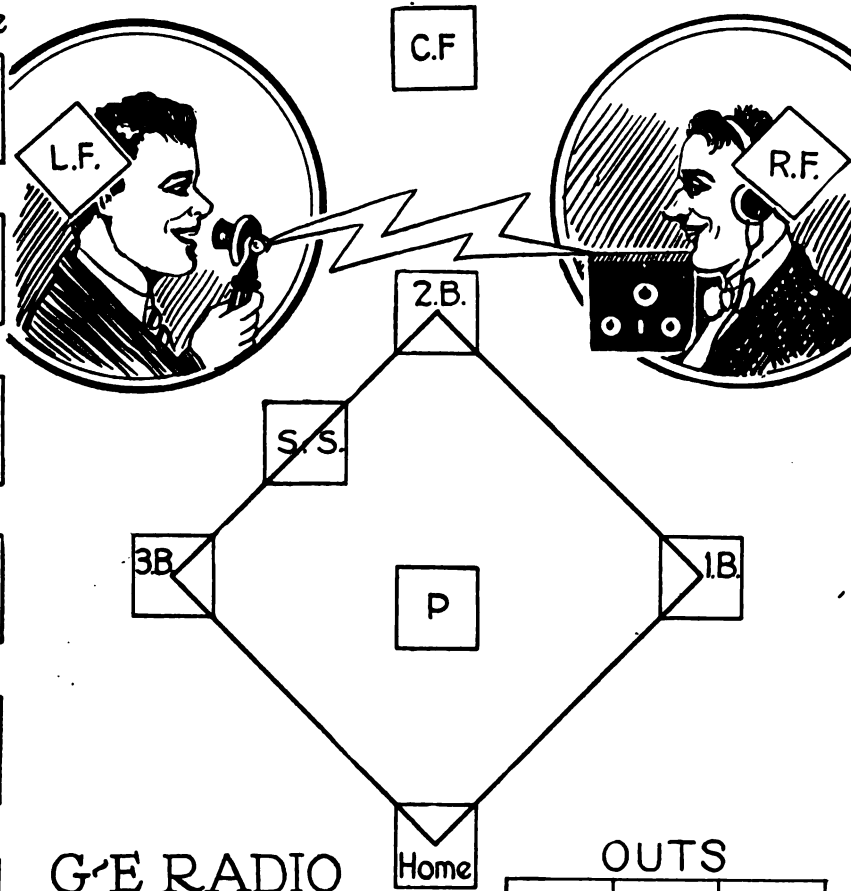
Magnavox Products May Be Had of Good Dealers Everywhere

The Magnavox Company
Home Office and Factory: Oakland, Cal.
New York Office: 370 Seventh Avenue

Baseball at Home all Winter by Radio

National League

American League



G-E RADIO
Base ball
Player board

OUTS

1	2	3
---	---	---

Teams

1	2	3	4	5	6	7	8	9	10	11	R.	H.	E.

BALLS	1	2	3	4	STRIKES	1	2	3
-------	---	---	---	---	---------	---	---	---

To operate this radio playerboard, cut out the small squares and the baseballs on either side of the diamond. Paste these onto cardboard if possible. Then write in the names of players and their position. Five extra squares may be used for either team when pinch hitters or substitutes are put in the lineup. The operation will then be much the same as on the electric player boards used in halls to report ball games.

Place the square containing the name of the first man at bat on home. If he singles, move him to first and place the second batter on home. If one strike is called, place one of the baseballs over the square marked No. 1 under STRIKES. If the next delivery is a ball, place another of the baseballs over the square marked No. 1 under BALLS. Advance these base-balls as the balls and strikes are called. When one is out, place one of the baseballs over the square marked No. 1 under OUTS. A small dot may be placed in the square marked HITS and ERRORS as these occur and at the close of the half of each inning score the runs made in the SCORE BY INNINGS space.

Take the principal players of the Giants and Yankees, or make up your own teams, and following the games as they were played at the Polo Grounds, or any other games, you can have baseball at home all winter.

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD

1493 Broadway, New York City.

Please send me RADIO WORLD for months, for which

Please find enclosed \$

SUBSCRIPTION RATES:

Single Copy	\$.15	.....
Three Months	1.50	.....
Six Months	3.00	.....
One Year (52 Issues).....	6.00	.....
Add \$1.00 a Year for Foreign and Canadian Postage.		.....

From Pole to Pole

THE modern school-boy knows radio from A to Z, and can rattle off the terms with a fluency that staggers the casual dabbler in the new art. In some sections of the country, however, only rumors of wonders of radio have seeped in and the native isn't always quite sure what it is all about. In Bleeker, a little hamlet near Gloversville, New York, a progressive farmer was erecting poles for his aerial for the purpose of getting crop reports and weather forecasts from WGY, the General Electric Company's broadcasting station at Schenectady, New York. A neighbor happened along and learning that the work had something to do with radio asked: "Which pole does that feller sing off of?"

3000 Ohm Sets \$3.98
 PLUS 20 CTS. POSTAGE AND PACKING
 Satisfaction Guaranteed or Money Back.



We mail phones the day your order arrives. Every pair tested, matched and guaranteed as sensitive as \$8 to \$10 Sets. Circular Free.

Tower Mfg. Company
 113 STATION ST BROOKLINE, MASS.

**Complete Radio Station
 for Rent**

THE Navy Department is offering its radio station at Miami Beach, Florida, for lease to the highest bidder, pending the enactment of legislation authorizing its sale. Bids will be opened at the Central Sales Office, Navy Yard, Washington, October 17, 1922. NGE, the station, is completely equipped and, on 1620 meters, has a radius of about 300 miles.

The site comprises 13,650 square feet on Miami Beach, and includes an operating building, bungalow, storehouse, steel antenna-towers and complete radio-equipment. The operating building is built of terra cotta faced with stucco, contains machinery, operating, store and wash rooms, and an office built in 1921. The operating room is modern, being sound proof and copper-screened on all sides. The bungalow contains six living and sleeping rooms, suitable as quarters and fully equipped for the radiomen of the station.

Two steel towers, 210 feet high, support the large L-type and shorter T-type aeri-als, both of which are said to be in good condition.

The equipment includes a rotary spark-gap transmitter, generators, motor generators, switchboards, transformers, protective devices, condensers, loading coils, instruments, tools, and batteries; even clocks and typewriters.

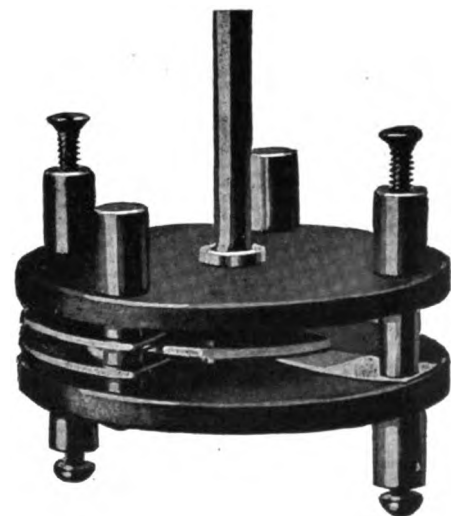
Bidders, who are required to be of the Caucasian race, must make an offer of a yearly rental, not to exceed five years, and forward three months' rental in advance. The successful bidder must furnish a \$25,000 bond to the Navy.

**"RADIO"
 VARIABLE
 CONDENSERS**



These condensers are the Standard of Quality. Carefully tested, inspected, balanced and adjusted to give maximum satisfaction.

- 3 plate Vernier\$1.50
- 23 plate 4.00
- 43 plate 5.00



Sent prepaid on receipt of price.
 Special discounts to Radio Clubs.

Jobbers and Dealers write or wire for the biggest proposition in Radio—TODAY!

**FREDERICK H. PRUDEN
 INCORPORATED**
 LERNER BUILDING
 993 Bergen Ave.
 JERSEY CITY, N. J.

Q S T
RADIO FANS
 Perfection in Radio
 Headsets attained in
"ECHO HEADSETS"

give clear, distinct tones, reproduce perfectly the most sensitive radio signals in music, speech and code.



No matter how perfect or expensive your apparatus; no matter how strong or perfect the waves; without "ECHO HEADSETS" your results cannot be perfect. We ship phones the day your order arrives. Every pair tested, matched and guaranteed as sensitive as the most expensive headsets made.

Sold with money-back guarantee.

Sent C. O. D. by express, who will hold money for 48 hours' trial, if not satisfied express company will return money.

S. Pearson RADIO Co.
 142 Maple Street
 Richmond Hill Long Island, N. Y.

At Your Service!

There appeared in RADIO WORLD dated April 1, 15, and 29 the following articles:

April 1—A 500-Mile Radiophone Employing a 5-Watt Tube, by Frank A. Hahnel. "Tell Me, Please, How Will This Set Receive?" by E. L. Bragdon. Short Cuts in Receiver-Circuit Design, by O. C. Roos. Making a Short-Wave Regenerator, by Fred. Chas. Ehlert.

April 15—First Principles of Electricity as Applied to Radio, by John P. Miles. Your Storage Battery, by E. L. Bragdon. What Makes Radio Possible, by Edward Linwood. Ground Connection as Vital as Antenna, by Fred. Chas. Ehlert.

April 29—Valuable Pointers on Aerial Construction, by Edward Linwood. What Is Meant by Tuning, by E. L. Bragdon. Radio-Frequency Amplification and Regeneration, by Frank Armstrong. Honey-Comb Coils and Condensers, by Edward Linwood. Charging the Storage Battery, by E. L. Bragdon. How to Construct the Variocoupler, by Frederick J. Rumford.

Each copy sent on receipt of 15c. per copy, or the three copies for 45c.; or better still, send your subscription beginning with any one of these numbers, and we will send this paper for 52 issues, and you will then have a complete file for ready and constant reference. RADIO WORLD, 1493 Broadway, New York.

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

Radio Goods that Stand the Test

Manufacturers, send a sample of your goods to our Technical Editor, Fred. Charles Ehlert, 6908 Pleasant Street., Queens, Long Island, N. Y. It will be carefully tested and returned. If your goods satisfy our experts, RADIO WORLD'S endorsement will be published in our merchandise department without charge or obligation of any kind on your part. This is a free service on the part of RADIO WORLD, calling for no expense whatsoever on the part of the manufacturer, except the sending of a sample of his goods.

Excellent Vernier Variable Condenser

(Manufactured by Frank P. Marsh, 50 Linden Street New Haven, Connecticut)

A WELL-CONSTRUCTED variable condenser of the vernier type. It has 23 plates with three end-plates to make up the vernier condenser. Its capacity was found to be .00058 mfd., employing the 23 plates, while with the vernier alone the capacity was approximately .00007 mfd. The construction of the condenser is as follows: End plates are of bakelite, with edges and faces polished. All plates are of the best grade even-gauge hard aluminum with edges cut to allow no burrs. The movable plates are mounted on a solid brass shaft accurately spaced and locked to correct position. The vernier which is a handy element of this condenser is made up of three plates with the center plate movable. It is a two-knob control, one knob controlling the condenser adjustment while the other knob, located in the center of the condenser knob, is used for the vernier adjustment. This enables the operator to adjust his set for fine tuning of concerts and gives loud signals. The condenser is nicely finished and when used in a set comprises a satisfactory condenser ready for panel mounting.

Vermica Variable Condenser

(Manufactured by C. S. Cherpeck, 3125 Davlin Court, Chicago)

A GOOD and inexpensive variable condenser is now being placed on the market. By means of a special screw-adjustment, fine, accurate tuning is made possible. In fact, with only a single knob, or dial, what is essentially vernier control is obtained.

Another feature of this condenser is that it can be knocked about without being put out of order or having its efficiency impaired. This makes it a handy and ideal piece of equipment for experimental, amateur and general radio work. Its capacity was found to be .0005 mfd.

Its convenient size makes it readily adaptable for either table or panel mounting. It can be mounted on any size panel up to half an inch. The Vermica Variable Condenser is neat and attractive.

Correction

In RADIO WORLD, Vol. II., No. 1, dated September 30, in the published test of the "P-T" Ultra-Sensitive Crystal Detector Contact Wire, the address of the manufacturer was incorrectly given. Address: "P-T" Crystal Contact Co., Box 1641, Boston, Mass.

Radio Goods Active As Indoor Season Begins

RADIO goods have seen enough activity lately to confirm the views of leaders in the business that the slump which occurred early in the summer was merely seasonal and that the business would return to its former scale in the fall, says C. F. Hughes, financial authority on the staff of "The World," New York. In other words, it appears certain now that radio is essentially a feature of indoor entertainment. A good deal of progress has been made in perfecting merchandise plans and in standardizing equipment. Retail stores are now offered the buying discount they were after and also may guarantee the various sets, which was another of their desires.

V. T. SOCKETS

Standard size, metal parts nickel plated, positive contact. Guaranteed satisfactory or money refunded.

20 cents each, 3 for 50 cents
POSTPAID

C. A. HOLLISTER

254 Court Ave. Lyndhurst, N. J.

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Radio Simplex Corporation, Wilmington, Apparatus. \$6,000. (Delaware Incorporating Co.)

W. W. Letts Service, Inc., Utica, N. Y. Manufacture of storage batteries. W. W. Letts, president and general manager; M. C. Welch, secretary and treasurer.

Eclipse Radio Co., Geneva, Ill. H. E. Krans, president and general manager; F. W. Krans, vice-president; J. Eric Anderson, secretary and treasurer.

Machen Radio Mfg. Co., 4639 East Thompson Street, Philadelphia.

North American Radio & Supply Corp., 5 Columbus Circle, New York, N. Y.

Ship Owners Radio Service, Inc., New York City, has moved its Baltimore office from 17 South Gay Street to 11 North Eutaw Street.

Victor Radio Corp., 801 East 135th Street, New York City, is appointing jobbers to handle its products.

The Radio Chain Store Company, \$125,000. Leon Abrams, Abraham Young, New York City, N. Y., and Maurice Abrams, Newark, N. J.

World Radio Corp., 423 West 55th Street, New York City. Wholesale distribution of radio materials and supplies. J. P. Johnson, general manager.

Banker Enters Radio Business

ARTHUR D. JENKINS has been appointed sales manager of the Tri-State Radio Company 825 South Meridian Street, Indianapolis. Mr. Jenkins was formerly in the investment-banking business in Chicago and New York, and for the past three years was connected with The National City Company, New York City. He has contributed articles to many of

the leading financial magazines. He will have charge of the national exploitation to be carried on by the Tri-State Radio Company in the near future.

H. G. Cisin with Dictograph Products

THE Dictograph Products Corporation has acquired the services of H. G. Cisin, author of "The Radio Telephone Handbook." Mr. Cisin has been placed in charge of Dictograph Radio sales promotion, advertising and publicity. He was formerly engineering editor of "Electrical Record." Mr. Cisin is a Cornell graduate, holding the degree of mechanical engineer and certificate of electrical engineer.

Homcharger Now Operating Three Plants

THE Automatic Electrical Devices Company, Cincinnati, manufacturers of the "Homcharger," which has proved popular in the radio field, has been compelled to add a third plant to take care of the unprecedented demand for this device.

The three factories, all located in Cincinnati, have a capacity of over 1,000 "Homchargers" a day, which, it is expected, will enable dealers and jobbers to obtain prompt shipments on their orders.

C. Brandes, Inc., Goes into Canada

C. BRANDES, INC., 237 Lafayette Street, New York City, radio manufacturers, have organized a Canadian subsidiary, C. Brandes, Ltd., and have leased a factory in Toronto, where work will commence as soon as alterations have been completed. In the meantime C. Perkins Ltd., Montreal, will represent the company in the Dominion. Edgar Rypinski has been appointed resident manager.

NA-ALD DE LUXE V. T. SOCKET



Contact strips of laminated phosphor bronze press firmly against contact pins, regardless of variation in length. No open current trouble possible. Socket moulded from genuine Condensite. Practically unbreakable. Special protected slot, with exterior reinforcement. Unaffected by heat of bulbs or soldering iron. All excess metal eliminated, aiding reception. May be used for 5 Watt power tube. Highest quality throughout. Price, 75c. Special proposition for dealers and jobbers.

ALDEN-NAPIER CO.

52 Willow St. Dept. L. Springfield, Mass.

JUST OUT!

50

"VACUUM TUBE HOOK-UPS FOR RADIO RECEIVING CIRCUITS"

Largest collection of V. T. Diagrams applying to Radio Reception ever Published under one cover.

Contains Latest on Radio Frequency and Super-Regeneration

PRICE PREPAID \$1.00

W. A. DICKSON

400 E. Fort St. Detroit, Mich.

Radio Now One of the Greatest Assets of Shipping

By W. Randall

SIR THOMAS FISHER, C. B. E., R. N. (retired), general manager of Canadian Pacific Steamships, Ltd., London, who is now in America, says radio is one of the greatest assets of maritime service.

"The most enthusiastic supporters of Marconi did not dream that radio telegraphy would develop to the extent it has during the past twenty years," said Sir Thomas to a representative of RADIO WORLD. "The usefulness and value of the new system of communication were soon apparent and radio was at once applied by the British Admiralty at Lloyds. The advancement of the science, insofar as it has affected shipping, has been great, and today no vessel of size is without wireless equipment. The question of safety at sea is undoubtedly the paramount benefit conferred by radio telegraphy; but other considerations, such as the facilities given for commercial and personal communications, and the means provided for keeping passengers informed of world events, are of such vast importance that the conditions of ocean travel have been revolutionized.

"The highest standard of efficiency has always been maintained in the equipment of the ships of the Canadian Pacific fleets. Up-to-date improved radio installation is carried on all ships. The installation in a typical radio room, on the "Empress of Scotland," comprises a one and one-half-kilowatt quenched-gap transmitter, five hundred cycle, with normal daylight working range of 500 miles; one quenched-gap emergency transmitter with range greater than 100 miles; a one and one-half-kilowatt continuous-wave valve-transmitter which has worked a distance of three thousand miles under favorable conditions; type ninety-one four-electrode valve receiver; type one and twenty-seven piano tuner, and type one hundred and twenty-three hydrodyne receiver, capable of receiving signals of a wave length up to thirty thousand meters. Also a direction finding apparatus.

"The Marconi operators aboard our ships tell many yarns about the efforts made by passengers to send the utmost in messages crowded into the fewest words. What is becoming a popular message is "Third epistle, St. John, verses thirteen fourteen," which, upon being decoded, if such a term may be used refers to the text: "I have many things to write but I will not with pen and ink write unto thee, but I trust I shall shortly see thee and we shall speak face to face." There are similar texts which convey explicit messages with a few words of wireless.

"We are just a bit proud to be able to say that the Canadian Pacific was the first

Canadian company to establish a daily all-Canadian news service for its fleet of steamships on the Atlantic, and that it maintains this exclusive feature for its passengers. The results have been very satisfactory. This news is made up daily by the Canadian Pacific, at Montreal, from the latest press dispatches from all over the Dominion and is transmitted to all Canadian Pacific ships on the Atlantic. The Canadian Marconi Company erected a special press station at Louisburg, Nova Scotia, for the purpose of transmitting such news.

"The Canadian Pacific is giving much attention to the importance of providing the latest radio direction-finding equipment on its ships, by means of which the position of a steamer may be quickly and accurately determined."

Of course the public appreciates the fact that radio programs are free, but broadcasting free verse is carrying generosity too far.—"The Evening Telegram," New York.

UNIT RADIO SETS

Our sets approved and installed in Borough President's Offices of Queens, New York City.

PRICE and QUALITY our premier consideration

Detector Units.....	\$8.00 to \$13.00
Amplifier Units.....	13.00 to 39.00
Tuner Units.....	18.00
Detector and 1 Step.....	26.00
Detector and 2 Step.....	39.00
Detector and 3 Step.....	52.00
Tuning Unit Detector and 2 Step.....	62.00

Dealers write for proposition
Immediate Delivery

American Radio & Electric Co.
1133 Broadway, New York City

KNOCKED-DOWN VARIABLE CONDENSER

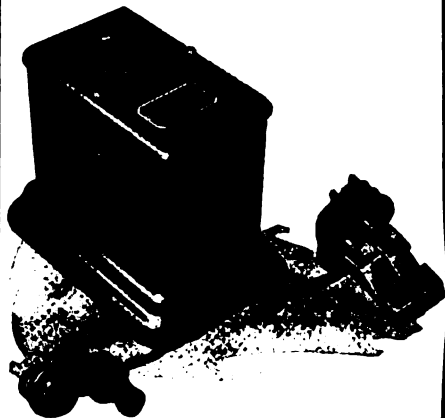
MONEY-SAVING PRICES

An accurately made, fully efficient instrument that cannot get out of order or adjustment. Fully guaranteed. Extra heavy aluminum plates. Condensite end pieces. All other parts heavily nickel-plated. Knob and pointer included. Furnished assembled or knocked-down at the following low prices. Easily assembled by anyone following instructions furnished. Save money—order from us. Folder upon request.

No. of Plates	M.F.D. Capacity	Assem- bled	Knocked- down
3	.00007	\$1.75	\$1.50
11	.00025	\$2.50	\$2.00
21	.0005	\$3.25	\$2.50
43	.001	\$3.99	\$2.99

Lott's Better Radio Condenser Co.
478 ORANGE STREET NEWARK, N. J.

Reliable and Beautiful RADIO-A RE-CHARGER



THE RADIO-A is a highly efficient dependable piece of apparatus, absolutely fool-proof, easily attached by simply plugging into ordinary 110 volt lamp socket. In case of current failure, the unit cuts out automatically until current is resumed, without discharging battery.

It is designed expressly for re-charging radio filament batteries, but may be used for automobile or any other storage battery of reasonable size and capacity.

Price, \$18.50

Dealers and Distributors

Here's a Winner! Write us for full particulars.

Simply screw into any 110 volt lamp socket and connect the terminals to your battery. Impossible to hook-up wrong—RADIO-A charges either way.



A compact portable Re-charging Unit that will fully charge a 100 A. H. Battery overnight, for from 5c to 10c, according to prevailing rates.

LAST A LIFETIME

King Electric Mfg. Co., Inc.
1681 FILLMORE AVENUE
BUFFALO, N. Y.

GREWOL DETECTOR

Nothing Like It
Nothing as Good

\$2.00

The Grewol Detector has taken its place among the standard, nationally advertised parts. In a class by itself because it does what no detector has yet been developed to do and still sells at a popular price.

Asked for by name, sold by reputation.
If your dealer cannot supply you, send \$2 and we will fill your order.
Your Dealer has Grewols

Always Set
and Ready

Glass Encased

Super-Sensitive

RANDEL WIRELESS CO.

Sole United State Distributors
9 CENTRAL AVENUE NEWARK, N. J.



(Actual Size)

Answers to Readers

ARC Hard Rubber Composition **PANELS**
Conform to Navy Specifications

A High Resistance Panel, Guaranteed Not to Warp, and Drilled Cleanly Without a Burr. Highly Polished—Edges Ground to Size.

Standard sizes, 7x18x3/16, 7x18x3/16, 7x24x3/16, 12x12x3/16, and 12x14x3/16, in stock for immediate delivery. Orders for special sizes received in the morning, shipped the afternoon of the same day. Binding posts, dials, and knobs to match. We have a complete line of Coils, Variometers, Variocouplers, Sockets and Rheostats.

Largest Discounts.

Jobbers and Dealers! Write for proposition and Free Sample!

CAREFUL ATTENTION GIVEN TO ALL RADIO ENTHUSIASTS

ALLIED RADIO COMPANY, INC.

Dept. D, 449 SEVENTH AVENUE, NEW YORK CITY, Fitzroy 3731

WANTED—A Reliable New England Representative.

For CORRECT RADIO MAILING LISTS Use
THE POCKET LIST

of Radio Manufacturers, Jobbers and Dealers in the United States and Canada. Issued Quarterly—January, April, July and October. October, 1932, issue extended to September 15th, 1933. Classified under three different headings—Manufacturers, Jobbers and Dealers—and alphabetically arranged by state, cities and towns and names of firms. Containing approximately 18,000 names and addresses.

We have been exceptionally careful to see to it that every Manufacturer, Jobber and Dealer is listed and, under the PROPER CLASSIFICATION. Most mailing list concerns charge more than \$100 for a list of this kind and, as a rule, these supplied are far from being correct. Compare this list with any other, and you will find it to be the very best obtainable anywhere at any price.

October issue ready for distribution September 25th. Price \$5.00 per copy, or \$10.00 per year (four issues, including monthly supplements which keep the list absolutely correct and up to date at all times). October edition limited. Send your order with remittance today.

F. D. PICKENS, 1621 CARRINGTON STREET
JANESVILLE, WISCONSIN

“TUNING IN”

TO THE RIGHT TUNE IS VERY SIMPLE WHEN YOUR CONNECTIONS ARE
SOLDERED WITH THE NEW

“POST SOLDERING IRON”

(The Iron with the Platinum Heating Unit). Removable Soldering Tip



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What is the power of the Naval station, NAH, New York? Does this station maintain a C-W transmitter? Is this the only station operated by the United States Navy near New York?—David Lloyd Jones, Fall River, Mass.

The power at the Naval Station at New York is 5 kilowatts. There is a 3-kilowatt radiotelephone transmitter in the station which can be used for straight C-W, interrupted C-W, and, also, for voice production. This station is operated at the remote control station, New York, and is not the only United States Navy station near this city. There is a radio station at Sayville, L. I., and another at Amagansett, L. I., operated by the Navy but under the remote control station in New York City. The Navy also maintains four radio-compass stations at Sandy Hook, N. Y., Mantoloking, N. J., Amagansett, L. I., and Rockaway, N. Y. The last-named station is for compass work with the airplanes.

Will you please publish a diagram showing the method for using a buzzer for detecting the sensitive spot on a crystal detector?—RADIO WORLD Reader.

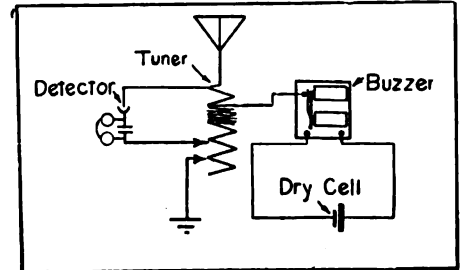


Diagram of simple method used in the selection of detector crystals, requested by "Radio World Reader." The same hook-up can be employed to assist in the adjustment of the set.

The accompanying schematic diagram shows the method of employing a buzzer with a tuning coil.

What is the relation between the length and height of an aerial?—Frank S. Smith, Omaha, Neb.

For receiving it is not necessary to have the aerial at such an excessive height. About thirty feet will do very nicely. An aerial about 100 feet long is necessary for receiving broadcasting stations.

I have a set consisting of a single-slide tuner with a pair of 2200-ohm phones, 3-wire aerial 35 feet long and 45 feet high. My aerial runs straight with the telephone lines, the distance from them being about two inches. Will this interfere with my set? At times I have trouble hearing voice from the telephone lines. What can I do to hear distinctly and eliminate interference?—Radio Student.

Answering your first query: Try and see if you can run your aerial in one stretch of about 100 feet. One wire aerial is far better than a number at a shorter distance. When erecting your aerial run it in such a manner that it will be at right angles to the telephone wires. If possible keep it clear from them as much as possible. The further you get away from telephone wires the better will be the results. Don't place your ground wire on the same ground as (Continued on following page)

If you did not get copies of Radio World No. 1 to No. 26, send us \$3.00. Or we will send you this paper for one year, (\$6.00 for 52 issues) and start it with our first issue, which will be mailed you as soon as possible after receipt of order.

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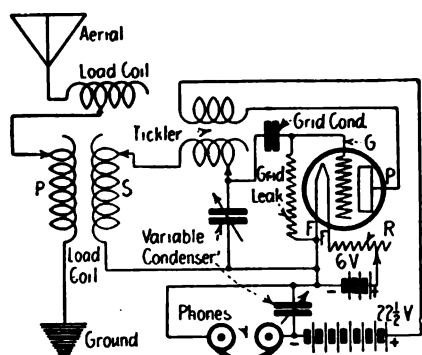
Answers to Readers
(Continued from preceding page)

that of the telephone ground. Seek a new ground, preferably an outside ground. With all this in view signals should respond, provided you have a good crystal detector. However, we advise you to read and digest the article entitled "Why the Open Antenna Is Best for the Radio Listener," by C. D. Wagoner, in RADIO WORLD, Vol. II, No. 2, dated October 7. This is very important.

Why can't I hear the broadcasting with a one-slide tuning-coil 4 inches in diameter wound with approximately 260 turns of No. 28 wire, phone condenser, phones, detector of the crystal type, and a 1-wire aerial 80 feet long. The lead-in is about 45 feet. What should the wave-length of this set be?—Milton Semken, Salt Lake City, Utah.

It seems that your aerial is a bit short for good results. Another thing: the size of wire you are using is too small. Its resistance is too high. This wire does not operate efficiently in a tuning coil. Too many turns have a bad dead-end effect. As your set stands the maximum wave should be about 3000 meters and the minimum about 200 meters. You will have poor results on the smaller waves. You should either make dead-end switches or employ a shorter coil for the 360-meter wave.

Will you publish a hook-up of a receiver that will respond to long waves having the use of regeneration?—Harold Yankton, Detroit, Mich.



Regenerative circuit employing tickler coil and loading coil for long waves, requested by Harold Yankton, Detroit, Mich.

The accompanying schematic diagram shows the proper connections for receiving the longer wave-lengths in a receiver. All connections should be carefully inspected before any attempt is made to listen in on the set.

I am enclosing diagram of circuit used in my receiver. I would like to see a hook-up whereby one stage of radio frequency is employed with such a circuit. Have tried several hook-ups and this one gives the best results.—Thomas E. Cecil, Erwin, Conn.

In RADIO WORLD, Vol. II, No. 2, dated October 7, this circuit was fully described by Mr. C. White in his article "Constructing a Radio-Frequency Regenerator."

Can you show by diagram how the wiring is accomplished on the tuner in RADIO WORLD, No. 26, dated September 23, page 13, Figure 5? Show the number of turns and taps thereon.—M. L. Proctor, Valdosta, Ga.

This information can be had only from the Bureau of Standards, Washington, D. C., the designers of this particular receiver.

A broadcasting map for 15c. That is, a complete broadcasting map appeared in RADIO WORLD, No. 8, dated May 20 Mailed on receipt of 15c. Radio World Company, 1493 Broadway, New York City.

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It was written by C. D. Wagoner, a radio expert.

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As radio enthusiasts have waited anxiously for the station to announce a schedule of music, experiments have been going ahead night and day in the hope that the auxiliary equipment would make possible the broadcasting of the excellent musical features of the Eastman Theatre.

Walking into the sending station yesterday morning, Arthur Alexander, director of the Eastman Theatre Orchestra and a member of the Eastman School of Music faculty, who has had years of experience in radio activities, suggested the elimination of some of the auxiliary equipment used to relay the music from the theatre to the sending station. It was agreed that it would be wise to try and simplify the equipment. Mr. Alexander directed the activities of the radio staff, and the experiments proved successful.

Those who were "listening in" were treated to a real surprise when the peal of the big Eastman pipe organ was heard distinctly and with little or no distortion. This surprise was magnified a hundredfold, however, when the strains of the fine orchestra were heard.

Football by Radio

An interpretation of this year's football rules and a general discussion of college athletics will be given from WGY, Schenectady, N. Y., on Thursday night, October 12, by Lieut. Elmer Q. Oliphant, director of physical education at Union College. Lieut. Oliphant is considered one of the greatest athletes ever developed in an American university.

He is the only graduate of Purdue University, or West Point, to win four letters, making the varsity teams in baseball, football, basketball, and track. He was All-American choice for half-back in 1915, 1916, and 1917. In 1915, he was All-American choice in basketball and as catcher in baseball. The address by Lieutenant Oliphant will be part of a "college night" program to be put on by the instrumental and glee clubs of Union College. The program will include the songs and cheers of many colleges and universities. Dr. A. R. Brubacher, president of the New York State College for Teachers, will also speak on "Tradition in College Education."

Rain by Radio

RAIN will come and go at your own will, in the future: says "The Gazette," Falls, New York.

This possibility is another prediction for the field of radio.

It was made by Marconi, the famous inventor, at his recent visit to America. Other radio engineers also have expressed the opinion that the control of rainfall by radio is possible.

Just as a bolt of lightning and thunder are forerunners of a rainstorm, says Marconi, so might radio produce the same result.

"We undoubtedly will accomplish this wonder some day," he says. "And then we will become the lords and masters of life on this planet. We will be able then to obtain any amount of power almost without effort.

"All the work will be done by the sun. Man will merely press the button.

"The developers of water power and of the radio transmission of electrical energy produced by water power will become exporters of electrical energy to less fortunately situated countries."

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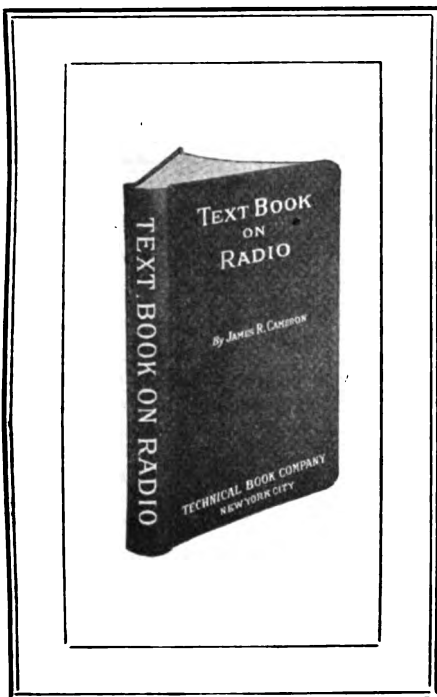
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A TABLE OF CONTENTS

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	Page		Page
"A" Battery.....	264	Aeriola Sr. Receiving Set.....	185
A C Radiophone Circuit.....	125	Alternating Current.....	38
Adjustable Filament Rheostat.....	47	Alternator, The.....	44
Adjusting Receiving Sets.....	177	American Radio Transmission Set.....	108
Adjusting Transmitting Sets.....	103	Ammeter Connections.....	56
Aerial Protective Device.....	89	Ampere.....	23
Aerial Construction.....	71	Apparatus for Reception of Electro-Magnetic Waves.....	169
Aerial Outfit.....	88	Apparatus for Undamped Wave Transmis- sion.....	107
Aerial Switch.....	75	Armstrong Super Regenerative Circuit.....	231
Aerial Wire.....	73	Audio Frequencies.....	43
Aerials.....	59	Audio Frequency Amplification.....	153
Aerials for Various Wavelengths.....	59		
Aeriola Jr.....	185		

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2,700 miles.
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the headquarters of the 9th Corps Area,
San Francisco, with the call WYCH, and
communication was undertaken with
Army transports on the Pacific. On one
occasion, the "Sherman" reported having
heard the signals from WYCH while she
was 700 miles west of Honolulu—a dis-
tance of, approximately, 2,700 miles.
Other signals were exchanged between
the Signal Corps station and the "Buford"
over a distance of 1,550 miles, and with
the "Sherman" again when she was 1,480
miles away.

This record is considered very remark-
able for a set designed for under 100
miles, although communication was not
maintained for any length of time and
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Battery**

A LONG spin on his motorcycle is
necessary for Stanley E. Schnabel,
Allentown, Pennsylvania, every time he
wants to listen-in on his radio set. In a
recent letter to WGY, Schenectady, New
York, Mr. Schnabel, who is the Associated
Press operator for the "Chronicle and
News," says that he uses his motor-
cycle battery to furnish current for his
wireless outfit and the battery generally
lasts one evening. He recharges on his
trip to and from work, but this isn't suffi-
cient for the night's fun at the radio re-
ceiver, so he takes a long spin after sup-
per to get enough "juice" for the set. He
is now planning to take his set along
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PATENTS

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RICHARD B. OWEN, Patent Lawyer
32 Owen Building, Washington, D. C.
2276-P Woolworth Bldg., New York City

Otherwise, Nothing Happened!

EDITOR RADIO WORLD: Being a "bug" interested in your "ideal" magazine, I take the liberty to forward you this "Hash Comic Story." I met my girl the other "nite," and as I was walking down to "receiver," her face "sparkled" with the "air" of joy, but I missed my "balance" and hit the "ground" and "2nd step." 'Twas some fall to "meter." As I fell, I heard the "crystal" of my "watch" break as I "tapped" it on the "dial." While I felt my "aerial" for bumps, who did "I-C" wandering down the avenue, a motor-car "buzzing" behind him, but "Cur-Rent" the villian. It was he who put the "damper" on my "radiation" with his sister Miss "Galena."

As he passed I "gapped" as to not "c q" was passing, my lady friend was telling me how "delightful" she was over the "vacuum" sweeper I gave her for her birthday.

Arriving at her home, her dad asked me to listen in on new set he had "resently" bought for "73" smackers. I did and was overjoyed.

Just then the clock "registered" three o'clock "am (p) here." It was the "signal" for me to "sign off" for the "nite." As "I-C"-was "going out" I realized that Mr. "Cur-Rent" was awaiting me with an "insulated" piece of "lead" in his "fist." I "howled" like a "squeak box" and the "copper" on his "feed-back circuit" asked me, "How do you come over." He did not know my "location." The cop said he would "charge" me with vagrancy. I told him I'd put the "Ohm's Law" on him.

He let me "pickup" my hat and told me to go "straight" home. So I took his advice and "dashed" "ohm" to my mother.—Doug Tremper, Brooklyn, N. Y.

Radio World: 1 year (52 numbers), \$6.

A B C Standardized Radio

Sectional Receiving Units and Radio Parts give unequalled satisfaction at low cost. Write for catalog.

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AGENTS

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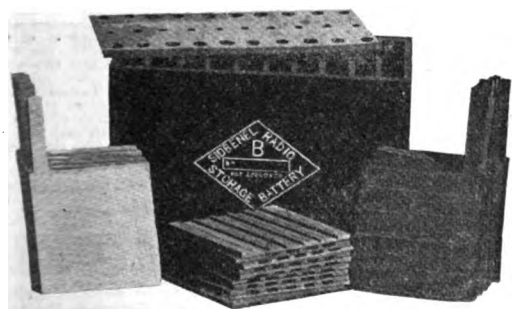
Put Them in Your Phones

Made for All phones

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Pictures and Facts About Armstrong Amplifier

Radio World has published a number of pictures, diagrams and descriptive articles regarding the New Armstrong Super-Regenerative Amplifier. The numbers containing this material are dated June 24, July 8, July 15, August 5 and September 18. They will be sent postpaid on receipt of 15 cents each, the five copies complete for 75 cents. Or you can subscribe, \$6.00 year; \$3.00, six months, and have your subscription start with the number dated June 24. RADIO WORLD CO., 1493 Broadway, New York.



22 to 500 Volt "B" Batteries

Lasts Five Years

Recharged From Any Lamp Socket

The Sidbenel is a Storage "B" Battery that will last five years of constant use without replacing parts.

It will give continuous service for at least six months before it becomes necessary for recharging. It can then be recharged in a few hours to its original capacity, all ready for another six months use.

A Sidbenel Storage "B" is something every radioist needs. Think of the money saved by not using dry "B" batteries, which are of no use after they once become discharged.

The Sidbenel pays for itself in six months. It is so ruggedly constructed that rough usage will not harm it. The container is one which is of genuine hard rubber, molded into ten compartments. Size 2½" by 3" by 4¼". Every inch of Sidbenel "B" is constructed under our own patents. The plates are especially treated with a newly discovered chemical that eliminates howling and screeching, so commonly found in any other "B" battery.

The Sidbenel "B" is shipped to you partly assembled—all you need to do is connect the plates together, and this takes but ten minutes and is most simple, as instructions are furnished with each battery.

Guarantee:—A two-year written guarantee is given with each Sidbenel Storage "B" Battery. This is your complete protection.

For recharging we furnish a rectifier for AC which costs \$0.25 extra. DC current requires none. Complete with directions:

One Unit, 23 volts.....	\$3.85
Two Units, 44 volts.....	\$7.50
Five Units, 115 volts.....	\$17.50
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Send for free catalogue on parts, and complete sets, and prices for repairing vacuum tubes.

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This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified advs., if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4794.)

HOOKUPS: Over 100 blueprints to select from at 10c. each. Send dollar for trial order. Radio Supply Co., Box 192, Pueblo, Colo.

TO THE TRADE—Fixed Phone and Grid Condensers. Write for price list and sample. SALKEY RADIO CO., 2378 Eighth Ave., New York City.

PATENTS—Electrical cases a specialty. Pre-war charges. B. P. Fishburne, Registered Patent Lawyer, 386 McGill Bldg., Washington, D. C.

Manufacturers of Rogers Radio Receivers and Rogers Receiving Radiometers. Rogers Radio Company, 5133 Woodworth Street, Pittsburgh, Pa.

FREE with each \$15.00 Western Electric Headset, one UV 200 Detector tube. We handle everything in Radio. NEWBURGH RADIO SHOP, 236 Broadway, Newburgh, New York.

Are you familiar with all the radio symbols used in the various hook-ups published in Radio World? If not, secure a copy of Radio World No. 26, dated Sept. 23. In this issue was a complete table of all important symbols used in radio construction and testing. Send 15 cents for a copy, or \$6.00 per year, and have subscription start with that issue. RADIO WORLD, 1493 Broadway, New York City, N. Y.

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AMALGAMATED RADIO SUPPLY COMPANY, 193A WILLIAM STREET, NEW YORK CITY

Navy Radio Sets Bring Bid of \$206

THE opening of bids by the United States Navy revealed the fact that forty-seven firms and individuals were interested in the 395 radio sets offered for sale recently. The highest bid received was on September 28.

It was \$206 per set, but the awards were not made until late in the week.

Any single copy of Radio World, beginning with No. 1, mailed on receipt of 15 cents postpaid. Any seven issues for \$1.00. Or send \$3.00 for 6 months (26 numbers) or \$6.00 for 1 year (52 numbers) and have your subscription start from No. 1. Radio World, 1493 Broadway, New York.

PATENTS
Protect your invention today. Write for 1922 Illustrated Book Free. Radio, Electrical, Chemical and Mechanical experts. Over 30 years' experience. A. M. Wilson, Inc. (Radio 3 ARH), 310-18 Victor Building, Washington, D. C. (Successors to business established 1891 by A. M. Wilson.)

THE LOOP'S THE THING. The coming aerial, most simple and inexpensive of all when our blue prints and specifications of the two better types are followed. Sent postpaid for \$1.00. No stamps. McGehee Development Co., Box 1337, El Paso Texas.

CASH FOR OLD GOLD, Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magneto Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 337 Hipodrome Bldg., Cleveland, Ohio.

FREE: Galena Crystal and Bulletin on Radio Supplies. Postage—2c. CONRAD RADIO COMPANY, 76 Boylston Street, Jamaica Plain 30, Mass.

NEWS AND GOSSIP OF THE STAGE—Send 10c. for specimen copy of NEW YORK STAR, the great illustrated theatrical weekly. \$4.00 year, \$2.00 six months, \$1.00 three months. New York Star Co., 1493 Broadway, N. Y.

BROADCASTING STATIONS: Letters and addresses of broadcasting station to-date appeared in Radio World for Oct. 7. Sent on receipt of 15c. Also a broadcasting map appeared in Radio World No. 8. Sent on receipt of 15c. Radio World, 1493 Broadway, N. Y. City, N. Y.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of Radio World, published weekly at New York, N. Y., for Oct. 1, 1922.

State of New York,
County of New York, ss:
Before me, a Notary Public, in and for the State and County aforesaid, personally appeared Roland Burke Hennessy, who, having been duly sworn according to law, deposes and says that he is the Editor of the Radio World, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and control, if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Hennessy Radio Publications Corporation, 1493 Broadway, N. Y. C.; editor, Roland Burke Hennessy, 1493 Broadway, N. Y. C.; managing editor, Robert Mackay, 1493 Broadway, N. Y. C.; business manager, Fred S. Clark, 1493 Broadway, N. Y. C.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock): Hennessy Radio Publications Corp., 1493 Broadway, N. Y. C.; Roland Burke Hennessy, 1493 Broadway, N. Y. C.; M. J. McArthur, Statler Hotel, Cleveland, Ohio.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of

FOR SALE—Regenerative sets with detector. Complete with tube and B Battery, \$35.00. With one stage, \$50.00, complete with tubes and batteries. Satisfaction guaranteed. Edward Bittner, Schuyler, Nebraska.

Exchange jolly interesting letters through our Club! Stamp appreciated. Betty Lee, Inc., 423 Broadway, New York City.

ISSUES OF RADIO WORLD from April 1 to Oct. 7 (77 numbers) for 15c a copy, or the whole lot for \$3.15. Or send us \$6.00 for one year and start with the first number. RADIO WORLD, 1493 Broadway, New York.

DO YOU USE A CRYSTAL DETECTOR? ARE YOU MAKING A CRYSTAL RECEIVER? Increase the efficiency of your crystal detector 1,000 per cent by using a "PT" Ultra-Sensitive Contact. Of special gauge and alloy. Makes and holds a quick, ultra-sensitive, stable adjustment. Using galena, you may pound panel or table without disturbing sensitivity in slightest. Proved practical on shipboard by an old-time Marconi operator. Using a "PT" Contact on galena, Arlington (NAA) was brought in clear at 3,300 miles (below the Equator); and Arlington came in loud at 2,200 miles (off Dutch Guiana). In both instances, nearby ships using vacuum tubes were unable even to hear NAA. As to stability, Cape May (WCY) was worked over 1,000 miles, sending right through crystal with 2 KW spark, without affecting detector's adjustment. Replace your old insensitive unstable contact with one which will hold its adjustment in addition to giving louder signals and music. Indispensable for pocket sets and crystal detector-bulb amplifier outfits. A novice can install. "PT" Ultra-Sensitive Detector Contact, with instructions, twenty-five cents coin or M. O. "PT" CRYSTAL CONTACT CO., Box 1641, Boston 8, Massachusetts.

total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear on the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear on the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bond, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date above shown is..... weekly. (This information is required from daily publications only.)

ROLAND BURKE HENNESSY, Editor.

(Sworn to and subscribed before me this 30th day of September, 1922.)

Notary Public, New York County, New York County Clerk's No. 304, New York Register's No. 4223. Commission expires March 30, 1924.

Note—This statement must be made in duplicate and both copies delivered by the publisher to the Postmaster, who shall send one copy to the Third Assistant Postmaster General (Division of Classification), Washington, D. C., and retain the other in the files of the post office. The publisher must publish a copy of this statement in the second issue printed next after its filing.

YOUR PHOTO IN THIS PAPER ATTENTION AMATEURS!

Have you built your own receiver?

Are you experimenting with any particular hook-up?

Are you improving your set?

Are you doing any interesting constructive work in radio?

Why not share this knowledge with your thousands of brother fans who read RADIO WORLD every week?

We want pictures of receiving sets with descriptions of how you overcame some difficulty, or of any additional part or unit that you have added to obtain better results. These are the things that, probably, the other fellow is looking for. Send in your information; pictures or whatever you have done to improve the art.

Remember the beginner is looking for them.

We intend to print in this paper, each week, pictured information and description of value to radio amateurs. If you have found a newer or better way of doing anything, don't keep the secret but tell it to your thousands of brother fans.

Send in a photograph of your set with or without accompanying diagrams and measurement. State whether you figure in the picture yourself, or not, and without any expense whatsoever to you we will make an engraving and publish it. Be sure to write your name and address plainly on photograph.

Send in your picture at once, or if you have not made a set or done anything else in making radio material, tell the boy next door all about this offer.

Address: Technical Editor

RADIO WORLD, 1493 Broadway, New York City, N. Y.

Broadcasting Suffering in Germany

BROADCASTING in Germany seems to be suffering from an overdose of "verboten," according to reports reaching the United States Department of Commerce from Vice-Consul Nathaniel B. Davis, at Berlin, says an International News Service dispatch from Washington. With apparatus costing a great deal of money, and with Government restrictions weighing heavily, the amateur does not enjoy anything like the freedom of activity that obtains in this country.

The German Post Office Department, which is in charge of all radio communication, permits private companies and individuals to build their own plants only on payment of a license fee. Ordinarily, the department itself installs the plants; it also rents receiving sets for 2,500 marks a month.

Orange Label Tea

Special 10¢ Tins

So good,
you ask
for more!



Enjoy a cup of *good* tea—let it greet you at breakfast, cheer you at luncheon, revive you at dinner and promote refreshing sleep.

Also sold in 1 lb., 1/2 lb. and 1/4 lb. TINS

A Generous Sample will be sent on request. Address: Ridgways, Inc.,
Department K, 60 Warren St., New York.

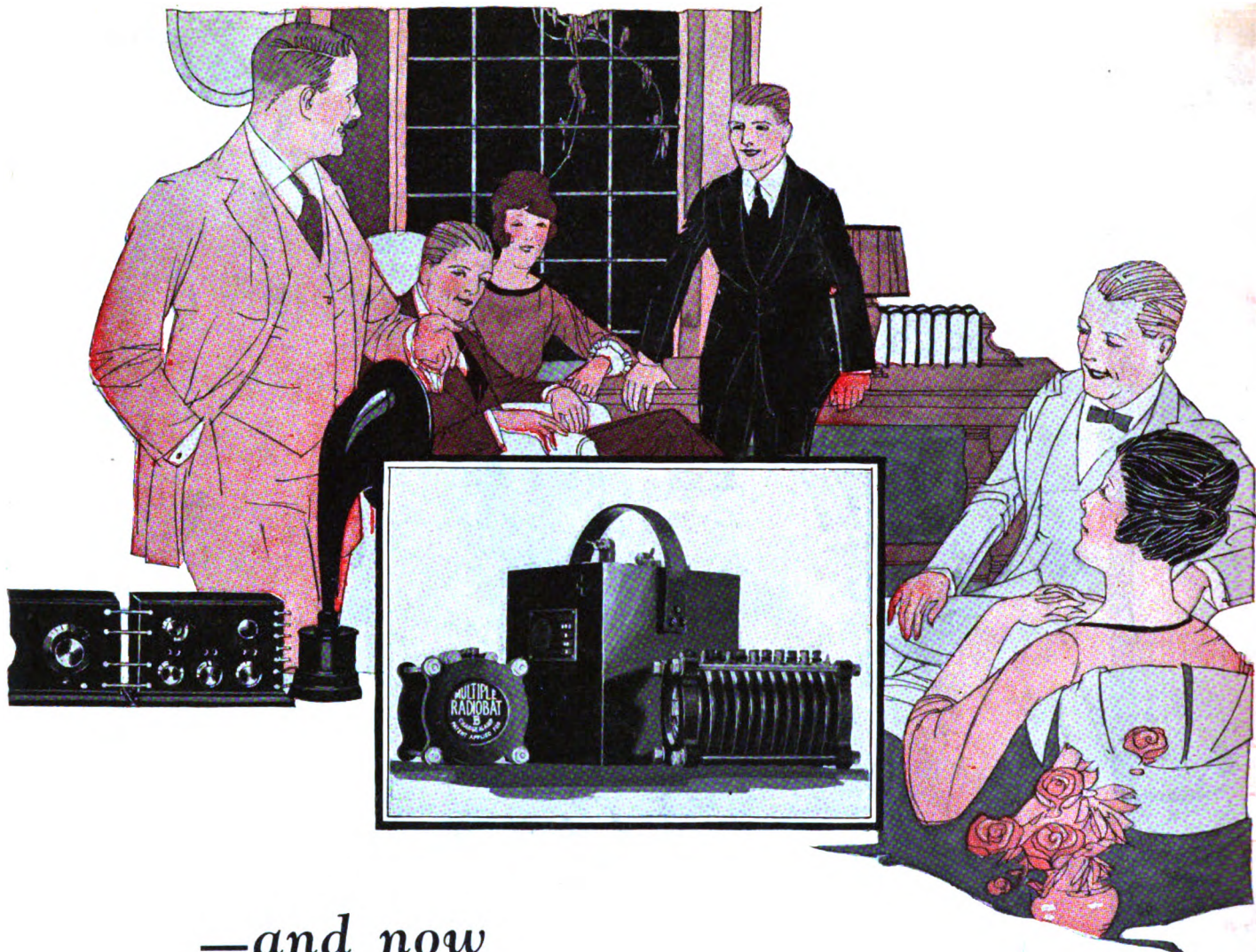
Ridgways Tea



GOLD MEDAL San Francisco 1915



GRAND PRIZE San Diego 1916



—and now
harmony replaces discord!

MUSIC—clear as a bell; speech—so that every word is marvelously distinct; jazz—in un-interrupted syncopation; opera—with that transcending, full-toned quality which brings its remarkable beauty into strong relief.

Until you have actually heard reception through RADIOBATS "A" and "B" you cannot imagine how wonderful radio can be—and there *is* no way to hear it, till these epoch-making, new-principle batteries are hooked in.

This sort of radio reception *is* a matter of *batteries*. Elimination of most *noises* is a matter of batteries, rather than static or other interference.

RADIOBATS "B"—as well as "A"—are *leak-proof* because they have the *only solid electrolyte*; and they are more economical, because, like "A" Batteries, they are indefinitely *rechargeable at home*.

These noises are caused by the *irregular* voltage output, natural in ordinary "B" batteries. Where the current output becomes unvarying, these noises cease—and this marvelously clear and life-like reception results.

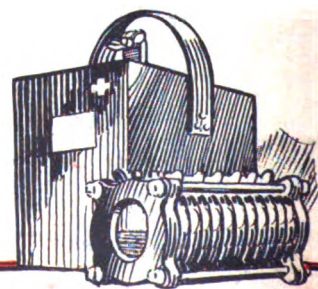
Send now for the intensely instructive booklet "The permanent Power Unit for Radio" and send your dealer's name and address so that we may arrange an immediate demonstration. There is absolutely no obligation.

And it is because RADIOBATS "A" and "B" are the only batteries which act as radio batteries *should*, that we urge you to listen to a demonstration at your dealer's.

MULTIPLE STORAGE BATTERY CORPORATION
 350-A Madison Avenue, New York



"A" and "B" **RADIOBATS**
The Permanent Radio Power-UNIT



See Page 3

October 21

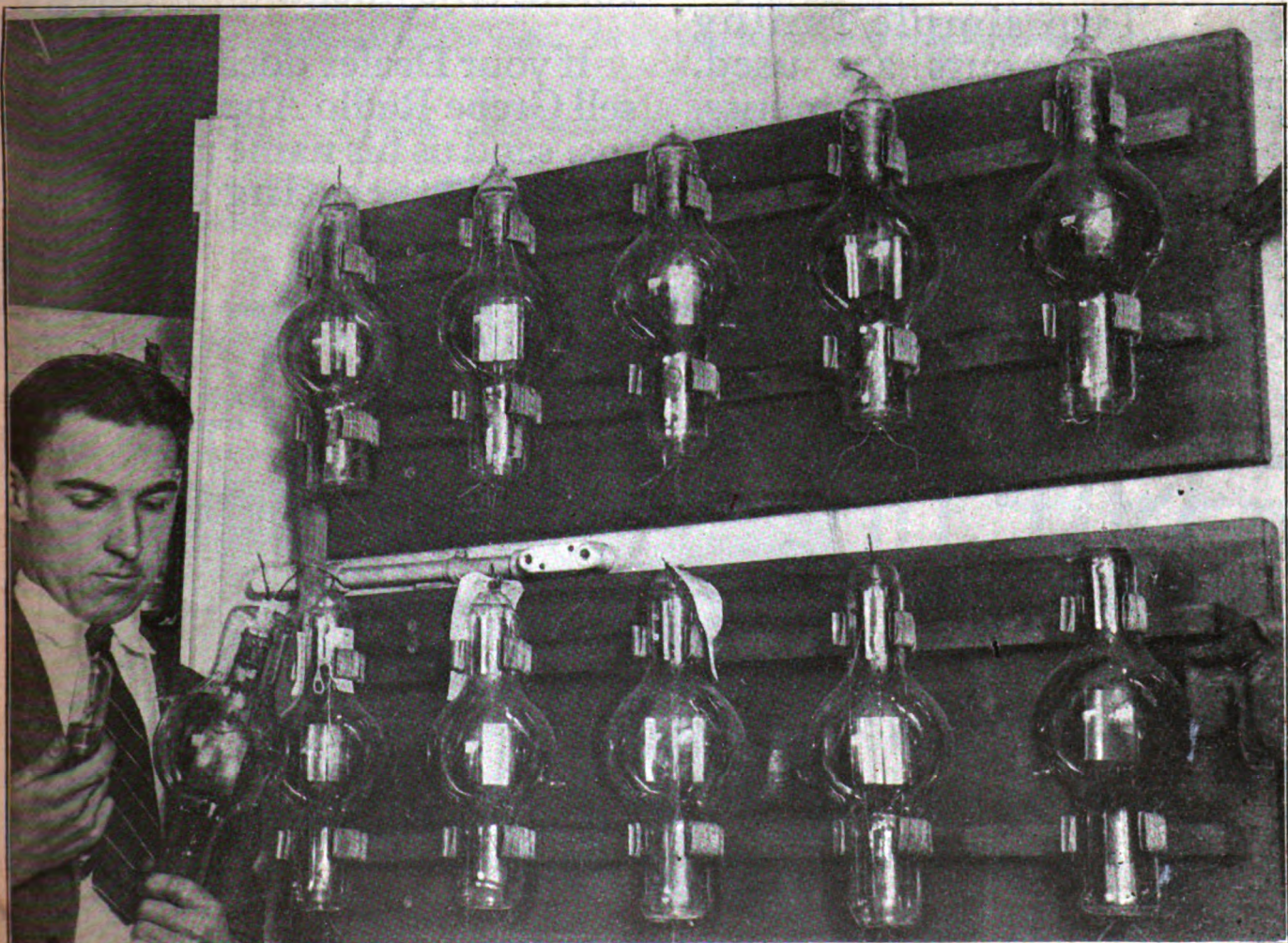
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48 Numbers

RADIO WORLD

(Trade Mark)

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P U B L I S H E D E V E R Y S E V E N D A Y S

250-Watt V-T's Broadcast Big News Events



These huge tubes cost \$120 apiece, and are necessary for the broadcasting of big news events such as the World's Series, and the Philharmonic Concerts. Raymond F. Guy, "O G N" of WJZ is comparing a radio-tron with a 250-watt V-T.

(C. Kadel & Herbert News Photos)



Just scales and full measure,
 'injure no man.'
 "The full measure of service
 goes with Grebe Receiver"

Doctor M.

ANYONE who knows a radio will tell you how well the Grebe CR-5 performs on the daily concerts, lectures, etc., in the air.

Two simple tuning adjustments are used. Tiresome adjustments, unpleasant interruptions are unnecessary with the Grebe CR-5. Its

range, 150—3000 metres.

Ten years experience in satisfying a critical radio public has taught us how to build it for your year-round enjoyment.

If your Dealer does not sell Grebe Radio Apparatus, send us his name and receive interesting circular.

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VOLUME TWO RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the act of March 3, 1879.]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. II, No. 4. Whole No. 30

October 21, 1922

15c. per copy, \$6.00 a year

Editorial Announcement!

RADIO WORLD Suggests

National Radio Week Nov. 26 to Dec. 2, 1922

REASONS:

To create greater public interest in radio. To increase the output of manufacturers. To increase sales by distributors and dealers.

To make possible a still greater volume of Christmas-gift purchases.

PLAN OF CAMPAIGN:

Request interest and space of radio editors throughout the United States and Canada for a National Radio Week.

Remind fans that Radio parties would be pleasant and profitable, and that during that week they should invite friends—especially those not acquainted with radio—so that they may listen in with their hosts.

Bigger and better window and counter displays during National Radio Week.

Have you, as a manufacturer, distributor, or dealer, or fan, any other suggestion to make?

Suggestions forwarded to Radio World on this important event will be received gladly and accorded attention in the editorial columns of Radio World.

The suggestion now is that NATIONAL RADIO WEEK be held from November 26 to December 2. (Thanksgiving Day falls on November 30.)

Why should not radio, bringing music, entertainment, and information, and supplementing the official Thanksgiving messages cheer from our President and the Governors of States, be made an important part of the wholesome activities of Thanksgiving Day? These greetings, coming from men of our country prominent in science, literature, the stage, and the church, and heard through the new medium of radio, will give an added importance to their utterances.

Write and tell us what you will do to help along National Radio Week

Address at once: National Radio Week Editor, Radio World, 1493 Broadway, New York

Be a Booster for National Radio Week!

Important Improvements in Radio Receivers

By C. White, Associate A. I. E. E.

SO busily are we engaged in trying to invent new circuits that we often forget the possible improvements we can make in the construction of the average radio-receiver. Fortunately there are many manufacturers who, realizing that amateur radio popularity is here to stay, are actually employing scientific research to better their apparatus. Still, nevertheless, there are a vast majority who are satisfied to build anything that just works—and that's all. But, the amateur who builds his own outfit is subjected to the same dangers as the unscientific manufacturer, in that he is often deceived into thinking that if the set works it is O. K. in every respect and represents the height of efficiency.

There is not a man who would knowingly put a poorly constructed appliance in his home, but there are amateurs who care for nothing save to hear a sound over their sets, and they will quickly say, "Why worry" if something is at least heard. On the contrary, a majority of radio fans are electrically inclined and are beginning to seriously consider if they have outfits that present the acme of electrical perfection.

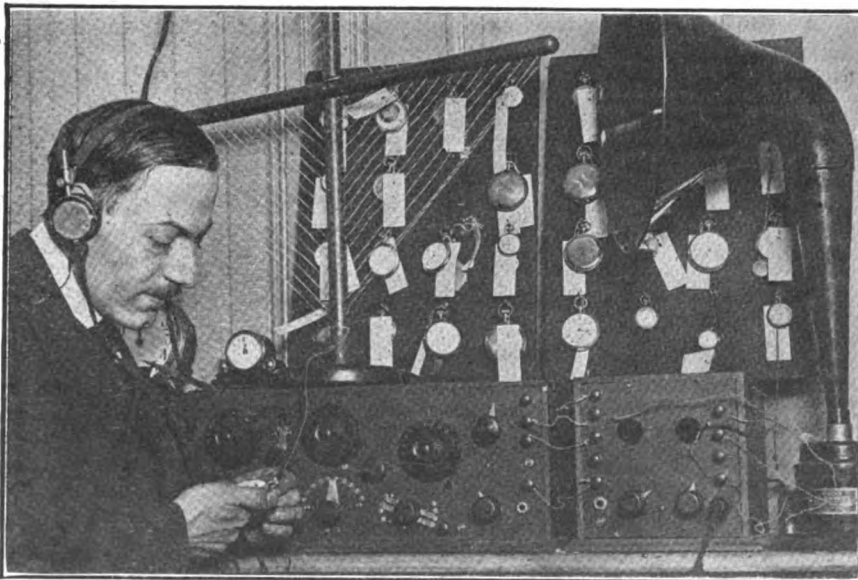
The first consideration in any electrical circuit is to cut all losses as low as possible without incurring too much expense. The average dividing line is generally the point at which scientific perfection and economical construction costs are just about balanced. In other words, if a certain additional improvement saves less than the cost to make the same then it is foolish to incorporate such an alteration. In most every radio circuit, variable condensers of the rotary plate, air insulated, type are employed. These condensers as generally constructed for radio work have a rather high loss of energy, owing to the fact that the air gap is relatively large. The amateur will find that, in the ordinary regenerative and non-regenerative circuit, it is far better to use a fixed mica condenser, shunted with a small three-plate air condenser as a vernier. By so doing, he will not only cut down the initial cost of installation, but will also raise the efficiency of his set, since a mica condenser is more nearly a perfect condenser. For most tuning circuits, a mica condenser of .0005 microfarads with a large three-plate vernier will be

about the right size. If .0005 mfd., is too much capacity another mica condenser of .00025 mfd., may be placed in series with it. The cost of such an arrangement is several dollars cheaper than a corresponding 23-plate variable condenser, yet it is more compact, sharper in tuning and, electrically, more efficient. It is even sometimes more economical to use the better scientific methods.

The resistance of a radio circuit is often the least consideration. To the average man, any kind of copper wire is good enough. Generally he will employ No. 22 or No. 24 S. C. C., or D. C. C., magnet wire for his coils and No. 18 wire for hooking-up the component parts of the set. While there is nothing radically wrong with the use of the latter, still for the coils it would be far better to employ a wire made up of the smallest size of S. C. C. magnet wire procurable, wrapped together in the fashion of the strands of a rope. The number of strands will naturally depend on the size of one strand. By so doing, the effective resistance of the circuit to radio and audio-frequency waves will be greatly cut down. A single wire containing the same amount of copper will offer the same resistance to direct current; but with respect to alternating current, its effective resistance will be much more owing to the tendency of high-frequency currents to crowd to the outer surface of the wire and not use the center. By using wires of smaller diameters in parallel and insulated from each other, this so-called skin effect can be reduced. The type of wire just described may be purchased at radio stores. Naturally, if the amateur so desires he can wind these strands if he has the time, but it is a slow and cumbersome job without the aid of the proper mechanical appliance.

Shielding is another point that has been seriously neglected on amateur apparatus—in many cases by the amateur building his own set; in others, by manufacturers of cheap outfits. Any cabinet-mounted set should first be shielded from the body capacity of the operator. This is accomplished by lining the interior of the cabinet with fine copper-screening. Most people think that after this has been done

Have You a "Radio-Regulated" Watch?



(C. Kadel & Herbert News Service)

The up-to-date jeweler regulates the watches left in his charge by radio, because the time of the day sent from Washington, over the ether waves, is so absolutely correct there cannot be the slightest variation of even a fraction of a second. The engraving shows Simon Rimler, a New York jeweler, and his radio time-receiver. Soon the boast of the man who knows that his watch is exactly on the second will be: "Mine is a radio-regulated watch."

Be Sure of Your Ground Connection

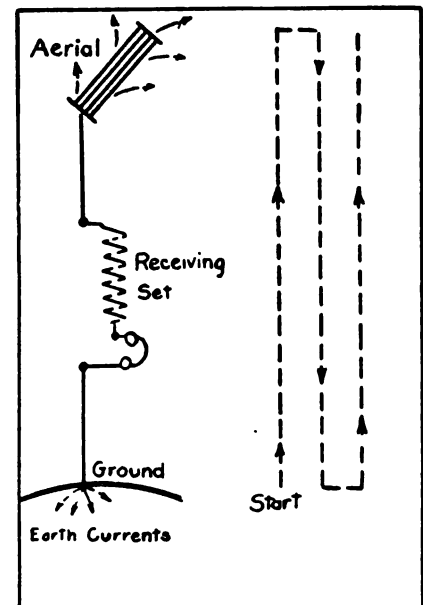
By Fred Chas. Ehlert

THERE are few beginners who are dabbling in radio who realize sufficiently the prime importance of a good ground connection. To many, the principal part of the receiving station is the aerial; whereas, if the truth were known, the ground is every bit as vital to good clear and dependable reception as the aerial. Altogether too many amateurs spend hours in erecting an antenna, endeavoring to see that the wires do not touch other objects and inspecting joints to see that they are securely soldered. But the ground is left until the last and is then made by twisting a few turns of bare wire around the most convenient pipe. The accompanying simple sketch explains the essentials of a radio receiving-station.

The radio waves as they pass through the air and the ground are oscillating in character. This means that they first go from the transmitting aerial to the receiving aerial, then to ground and from there back to ground of transmitter. After the cycle is completed, they reverse their direction and travel down through the earth of the transmitting set over to the ground connection of the receiver, up the antenna, and back through the other to the transmitting antenna. This scheme of going first one way and then the other is made possible because of the condenser effect. It is obvious that the ground must play its part as satisfactorily as the aerial. Whatever applies to the aerial applies likewise to the ground.

For instance, the aerial is made up of copper wire of fairly good size. No. 14 will give good service. This is necessary to reduce the antenna resistance.

Similar precautions should be taken with the ground. It should be made to present as low a resistance as facilities permit, so the minute radio currents may pass down the antenna through the set and thence to ground without being forced to overcome obstacles. It is safe to say that most grounds could be improved, but this is not always advisable because of the ex-



Schematic diagram of a simple receiving station showing how the impulses—on the signals or sounds—pass from the earth to the antenna and then back to the earth.

(Continued from preceding page) the screening is one hundred per cent perfect. This is not the case, because we have only shielded our apparatus against external capacity effects and nothing at all has been done to cure the trouble originating from internal inductive interferences. Each component part of the set should in addition have a copper screen around it. The advantage of so doing cannot be fully appreciated in a small single-circuit receiver; but when the more complex circuits are used and the coils are mounted compactly, mutual inductive interference between coils is sure to occur and the only remedy is to shield each group of coils that are to be mutually coupled from the adjacent group. Care must be taken to see that none of the connecting wires become grounded on the shield; and all shields should be grounded—that is, connected electrically to the ground terminal of the outfit.

Another element that the amateur gives but little attention, is the selection of his vacuum tubes. The average man is of the general opinion that, for receiving, there are two types of tubes only: the UV 200 and UV 201. This is erroneous. There are other tubes for reception, although their characteristics are much different from those of the ordinary types. The power, or transmitting, tubes have proved very satisfactory in this connection. In fact, they give very much more volume per tube than the others. This is especially noticeable in the regenerative re-

ceiver. The marked advantage of power tubes for reception is the increase in volume and the absence of hissing, such as the soft or gaseous tube is accustomed to do when operating at its critical point. The objection to the use of the power tube as a detector and amplifier is the necessity of securing high-plate voltage. Small-size B batteries in series is not an altogether satisfactory method of obtaining the necessary potential, since the current drain on the same is quite heavy. Manufacturers of B batteries are providing a larger size battery for this purpose. No matter what type of tube is used, it is always satisfactory to use some form of vernier rheostat for precise adjustment of the filament current.

In choosing a circuit, always give a double circuit first preference over a single circuit because the former is better in its selectivity. After you have chosen your circuit and are ready to construct, bear in mind certain facts concerning the general improvement such as I have explained. It may cost a little more to put all these improvements on your receiver; but you will find that they are fully worth the money, time, and trouble. When purchasing or placing an audio or radio-frequency amplifying transformer in your receiver, be sure to see that it is shielded, especially if more than one stage of amplification is used. Buy a good standard make of transformer, because transformers may "howl," even if shielded, if their coupling is too critical.

pense involved. A heating system may or may not make a good ground. The chances are against it; but if the receiving set is connected with the earth by a connection on a radiator, the oscillating current must overcome the ohmic resistance at each pipe joint.

If the ground connection is made to a gas pipe, the beginner may find that he has no ground at all. For the protection of their patrons, gas companies, as a rule, insert a wood or composition pipe-insulator somewhere between the gas meter and the first burner. If the amateur discovers one of these insulators, he should not overcome the difficulty by bridging the insulator with a piece of heavy wire, as he is then nullifying the good work of the gas engineers. Instead, the ground wire should be carried beyond the meter before attaching to the pipe.

How Radio Was Installed in Our Home

By Hattie Briggs Hartman

A FEW days ago, a motor-car stopped in front of our home. On the seat, by the driver, was a curious box. Before we were able to decide what it was, an electrician from a neighboring town jumped from the car, dashed up to the porch and announced that he had come to install a radio for us! In spite of our protests, he signaled his helper, and after asking us if we minded having a wire fastened to a tree at one end of the grounds, proceeded to install his magic machine so quickly that it seemed easier to permit him to proceed than to try and curb his enthusiasm.

A wire about the size used for telephones was fastened to a maple tree about thirty feet from the house; the other end was fastened to the eaves on the second story. An insulator was arranged at each end of the wire, and another wire of the same size was dropped down over the edge of the porch. This wire was fastened to the machine.

The men then began to look for the best way to use the ground wire, and decided that it would be feasible to bring the water pipe in the kitchen into play for that purpose. A small wire was run from the

front porch, through the living room and dining room, over the tops of doors and wall molding, into the kitchen. There it was strung to the pipes which went up to the bath-room and so on down to the water pipe where it enters the kitchen from out-doors. The wire was no larger than medium-sized linen thread and was up so high that it did not interfere in any way with the occupancy of any of the rooms.

The electrician rushed back to the porch, placed the jar of flowers which stood upon the porch-table aside very hastily, and put the radio machine on the table, under the hanging wire which came from the upper porch. This was fastened to the rear of the box, and the ground-wire was also adjusted. A battery stood upon the floor near the table and as the wires from the machine were snapped into place, to connect the battery, lights were visible inside the box which constituted the machine. The machine was about 30 inches long and 14 x 14 inches the other way. At the lower right-hand corner there was a knob, which, when turned just right, brought sound to the proper

degree of clearness. The expert adjusted the horn in its proper place, manipulated the knob, turned two small dials which were at the side of the box and, in a moment, cried, "We have it!"

He listened a second longer, jerked the head-set from his ears, and turned with a satisfied expression as he looked at our bewildered faces. In the shortest space of time imaginable, a burst of music came to us from Washington, D. C., and we were listening to one of the most famous bands in the country. Our home is at least six hundred miles from Washington. It was the most entrancing music we had ever listened to and we all sat with taut nerves, wondering whether it was really true or if the "city man" were playing a trick on us.

It was rather a shock to us when the announcer gave the name of the band. We knew we had been listening to real music and not to a reproduction on a phonograph disc. Our visitor manipulated the discs a few seconds, and exclaimed: "Here is something!" At once we were listening to an orchestra in Pittsburgh. At the end of an overture familiar to every music lover, we were ready for anything which might come to us; for we knew that it was coming to us through space—over vast stretches of country. We called in the neighbors by telephone and, in a short time, the porch was filled with a wondering audience.

At ten o'clock we set clocks and watches by radio. A few moments after that, we were listening to a college glee-club in Wisconsin. We caught Newark, New Jersey, and heard a famous tenor. Later we heard a Shakespearian recitation. It was an adventurous evening; sitting on our front porch and hearing voices from the air!

Sunday afternoon a sermon came to us from Rochester, New York. We heard it as plainly as if we had occupied a front pew in the church. We were rather awe-stricken to hear the earnest message from the lips of a man of God so many miles away from us. The choir was wonderful. That same evening we had a treat in listening to a lecture on the City of Albany. The bed-time stories sent out from the broadcasting stations might have easily come from the lips of a mother in her own home while coaxing her babies to sleep.

Bulky Loose Coupler of 12 Years Ago and the Vario-Coupler of To-day

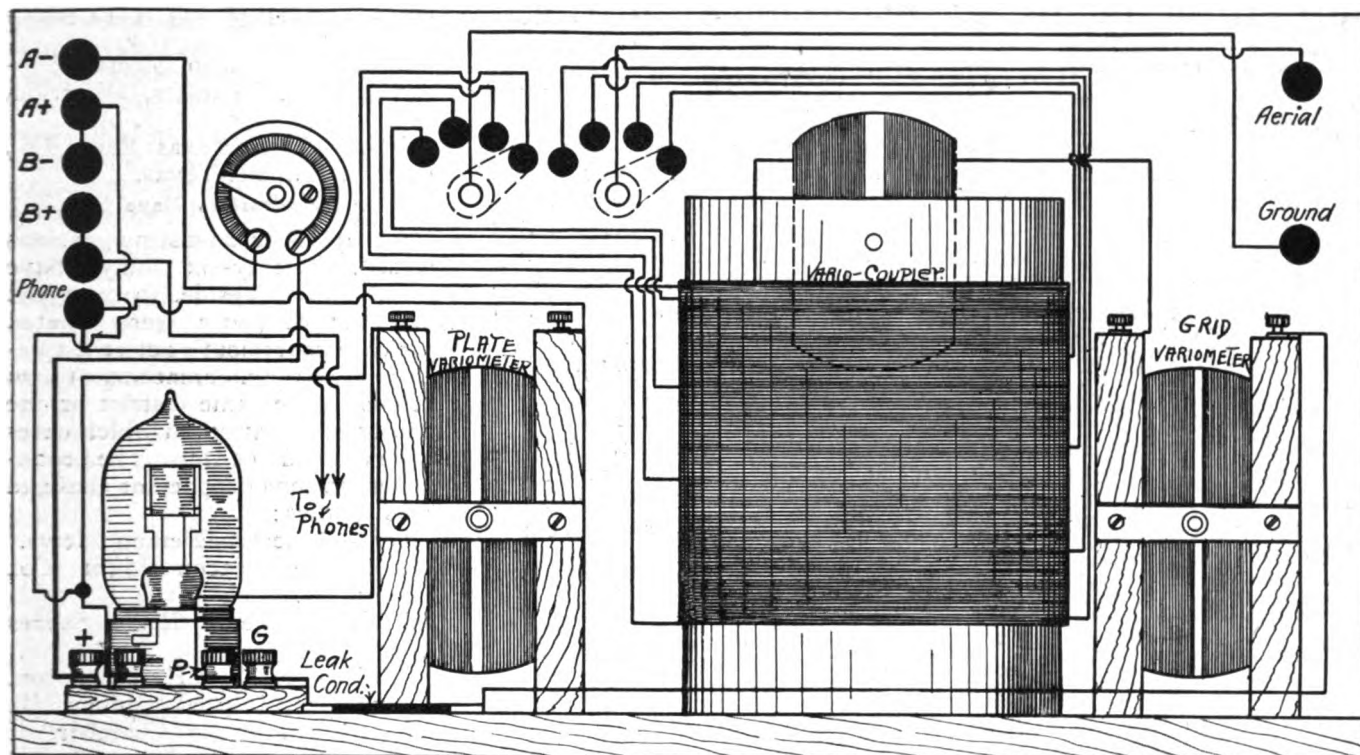


(C. Kadel & Herbert News Service)

Compactness is the watchword in radio as in all other up-to-date matters. Mr. F. Clinton (right) is holding one of the old, massive loose-couplers, popular twelve years ago. Mr. W. Guillet (left) is showing, in comparison, the modern vario-coupler which has replaced it. The big instrument is on the way to the scrapheap.

One-Tube Regenerator Hook-up for Loud Sigs

By Harold Day



Schematic diagram of a set capable of receiving signals of great volume. It is known as a two-variometer regenerative-type receiver, and it will pick up short wave-lengths of the broadcasting stations, continuous waves, interrupted continuous waves, and also damped waves. All of these may be received on this machine, owing to the feed-back in the plate circuit. Drawn by S. Newman.

WHAT should I do to my set that will enable me to hear the broadcasting stations with much more volume, or, as they say, louder signals?

This question I am asked most every day. Here is the answer:

There are many circuits which may be tried out, but most of us don't like to dabble with hook-ups with which we are not familiar. The above is a hook-up of a one-tube circuit which will surprise any operator who dabbles with it. There is nothing complex about it—it is a plain, simple hook-up. No trouble should be experienced with a good aerial and ground. The parts need-

ed for this set may be purchased at most any radio shop. They consist of two variometers, one variometer, one tube socket and detector vacuum-tube, one vernier rheostat, two switch knobs and about a dozen contact points.

The wiring diagram is clearly shown. Care must be exercised to see that the proper connections are made. In the illustration, six connections, or binding posts, will be seen at the left. They are two for the A, or storage, battery; two for the B battery of 22 volts, and two for the connection with the telephones. In connecting up the B battery, one must be careful that

the plus side is connected to the plate side of the tube. If this connection is not correct, signals will not be heard.

There are two variometers, one in the grid circuit and the other in the plate circuit. The variometer in the plate circuit tends to tune in and feed back into the grid the added voltage of the plate circuit. The set then becomes what is called a regenerative set. As all regenerative sets generally are hard to tune, it will be noticed that this type receiver is very simple to operate. Due to the self-amplifying feature of the set, signals of satisfactory volume will be experienced.

Another Radio Myth Exploded

By C. D. Wagoner

ANOTHER myth to be exploded. Many people have the idea that an antenna attracts lightning, that it is dangerous to have it erected near the house. When their attention is called to, possibly, the electric-light wires crossing the street and coming into the house overhead, or the telephone wire running in a long span from a distant pole, the answer often is, that *these* wires are insulated, and hence lightning will not strike them!

This would be laughable if it were not so often heard. Lightning, striking through thousands of feet of air, the best insulator there is, would not bother much about an eighth of an inch of rubber surrounding a wire. The fact is, that lightning is just as likely to strike the power wires as it is the antenna. Yet we do not often hear of accidents due to lightning coming into a house by the electric-light feed-power wires.

Do not understand me to say that lightning *will not* strike the antenna, or the power wires either. If lightning makes up its mind to strike in a given locality, it is going to strike, and it is as likely to hit the house or the wiring inside it as any other point. As a matter of fact, a well-installed antenna with correct grounding device—described later—actually helps to *prevent* the house from being struck, in that it "drains off" the charges.

Broadcasting Increases Five-Hundred Per cent in Past Year

Stations Now in Every State—Additions up to Going to Press

WASHINGTON, D. C.—There were 546 broadcasting stations in the country on October 5; one or more in every State of the union. These stations supply radio enthusiasts with all the entertainment, news, governmental data on weather, agriculture, health and other subjects they may listen to all day and far into the night. But the total of 546 stations is literally too great, and the stations are not well distributed, according to Department of Commerce officials. Most of the broadcasters are located in the East and Southeast, where time schedules must be employed to avoid interference. The public would be better served, it is held, if there were fewer stations and they were more widely distributed or located in proportion to areas and population. Five hundred and thirty-five stations are broadcasting on 360 meters, the balance on 400 meters.

Sifting of Stations Needed

"What is needed now," one official explained, "is a sifting out of the lesser stations, which are not rendering satisfactory service and popular entertainment, so that the radio public may listen in to good music, authoritative statistics, and current news." The creation by the department of the Class-B license, granted to only the superstations, will guarantee high-class entertainment and excellent radio service, since those stations are granted authority to use a special wave length of 400 meters. There are eleven of these stations located in seven States, making good programs, without mechanical music and cheaper forms of entertainment, available in practically all the eastern and some central States, where the fans listen in on 400 meters, watching local papers for the daily programs.

The 535 stations operating on 360 meters will have to look to their programs, as public opinion will indicate which shall continue in service for any length of time. The operating expense is so high that, eventually, only the good ones with sound backing will remain.

In September, 1921, the Department of Commerce licensed WBZ, WJZ, and KDPM, three Westinghouse Electric stations, to broadcast at Springfield, Massachusetts,

By Carl H. Butman

Newark, New Jersey, and Cleveland, Ohio. They are still active today. During the next two months, October and November, the Detroit News, WWJ, and the Westinghouse station at East Pittsburgh, KDKA, were licensed, and then, in December the fun began. Twenty-three stations were licensed, January saw the addition of only eight, in February there were 24 new licenses issued; 77 in March; 76 in April; and, in May, the peak of the radio curve was reached with 97. Since then the number of licenses issued has fallen off slowly each month as follows: June, 72; July, 76; August, 50. In September but 39 stations were granted licenses. This, a government radio inspector says, is due to the fact that the saturation point is reached. There are enough regular broadcasters. Many of the larger, mostly the older, stations are seeking Class-B licenses, but not many such licenses will be granted, due to the qualifications laid down and the program requirements.

Broadcasting Now in Every State

With the issuance of a license in Laramie, Wyoming, every State in the Union now has one more broadcasting stations. As has been the case since the industry got a fair start, California still leads, having to-day, 66 stations, Ohio, follows with 35, and New York is third having 30. There were eleven licenses issued during the past week, as follows:

KFDA—Adler's Music Store, 5 watts, Baker, Oregon.

WMAV—Alabama Polytechnic Inst., 750 watts, Auburn, Alabama.

WRAU—Amarillo Daily News, 20 watts, Amarillo, Texas.

WMAU—Louisiana State Fair Association, 50 watts, Shreveport, La.

KFEC—Meier & Frank Co., 100 watts, Portland, Oregon.

WMAU—Paramount Radio Corp., 400 watts, Duluth, Minn.

WNAG—Rathert Radio & Elec. Co., 45 watts, Cresco, Iowa.

WMAQ—The Fair Corporation and The Chicago Daily News, 1,500 watts, Chicago.

KFBU—Bishop N. S. Thomas, 10 watts, Laramie, Wyoming.

WMAR—Waterloo Electric Supply Company, 50 watts, Waterloo, Iowa.

WQAQ—West Texas Radio Co., 60 watts, Abilene, Texas.

Few Broadcasters Have Quit

Of the 558 broadcasting stations licensed, twenty-six only have fallen by the wayside, so to speak, and some of those were deleted from the department's active list because of the amalgamations of two stations in the same district or the transfer of a station, in which cases the service did not stop. The broadcasting stations dropped or changed are as follows:

KOQ—Modesto Evening News.

KNR—The Beacon Light Co., Los Angeles.

WGNC—Orpheum Radio Stores Co.

WCAZ—Robert E. Compton, Quincy Whig Journal, Quincy, Ill.

WAAE—St. Louis Chamber of Commerce.

KZI—Irving S. Cooper, Los Angeles.

WGH—The Fair, Chicago.

WFAK—Domestic Electric Co., Brentwood, Mo.

WEAQ—Y. M. C. A., Berlin, N. H.

KGC—Electric Lighting Supply Co., Hollywood, Calif.

WAAT—Otto H. Taylor, Wichita, Kans.

WGM—Georgia Ry. & Power Co., Atlanta, Ga.

KSC—O. A. Hale & Co., San Jose, Calif.

WOC—Karlawa Radio Co., Rock Island, Ills.

KQL—Aron A. Klugs, Los Angeles.

KGB—Edwin L. Lordon, San Francisco.

WGH—Montgomery Light & Power Co., Montgomery, Ala.

WPD—Newspaper Printing Co., Pittsburgh.

KFU—The Precision Shop, Gridley, Calif.

WDW—Radio Construction & Electrical Co., Washington, D. C.

KDYD—Rocky Mountain Radio Corp., Denver, Colo.

WAAB—Times-Picayune Pub. Co., New Orleans.

WQB—C. D. Tuska Co., Hartford, Conn.

WAAF—Union Stock Yards & Transit Co., Chicago.

KOJ—University of Nevada.

Every Radio Set Has a Reliable Range

By John Kent

IT seems that the first question the average person asks when purchasing his collection of radio equipment concerns the relative range of such a set. The dealer eventually may answer this question by giving some attractive distance, or he may be more honest and tell his customer the limitations of the apparatus and the range that may be expected under varying conditions.

The range of any set, no matter how good or how poor, cannot be guaranteed. An estimate is no more than a guess. Two sets, identical in every respect, may have a widely different range when set up in different localities. You may have a set that gives very good results and you may move only a few blocks away and discover that your set is useless. This may be due to the fact that you were not able to erect as good an aerial in your new locality as in your old, or your ground may be not as good. Possibly there are high buildings about you that would cut off some of the waves.

Under given conditions, you can shortly ascertain the working or reliable range of your set. You will find that there are some stations that you can hear with, practically, the same intensity under almost all conditions. This distance you may call your "reliable range" although it may seem considerably lower than the range advertised by irresponsible dealers and manufacturers.

At times you may hear remarkable distances with satisfactory intensity, but these results cannot be depended on. Therefore, they must be classified under the variable range of your set.

There are many things which determine the range. Among them are time of day, atmospheric conditions, local conditions, circumjacent obstructions, topography,

and the nature of the aerial and ground. Reception of transmission can seldom be carried on over as great distances during the daytime as during the night. This is due, possibly, to the ionization of the air particles by the sun's rays, causing a partial absorption of the waves. Buildings with steel frames also ab-

sorb waves. Topography has a decided effect on radio. Waves travel much more readily over water than over land. Metal and mineral deposits sometimes causes absorption losses.

The importance of a good aerial and ground cannot be overestimated, as this greatly affects the range of a set. You cannot expect to get the same result with an indoor loop as with one outdoors.

To Study Radiotelegraph Signals

(Reprinted by General Request)

INTERNATIONAL RADIOTELEGRAPHIC CONVENTION

LIST OF ABBREVIATIONS TO BE USED IN RADIO COMMUNICATION

ABBREVIATION.	QUESTION.	ANSWER OR NOTICE.
PRB	Do you wish to communicate by means of the International Signal Code?	I wish to communicate by means of the International Signal Code.
QRA	What ship or coast station is that?.....	This is.....
QRB	What is your distance?.....	My distance is.....
QRC	What is your true bearing?.....	My true bearing is..... degrees.
QRD	Where are you bound for?.....	I am bound for.....
QRF	Where are you bound from?.....	I am bound from.....
QRG	What line do you belong to?.....	I belong to the..... Line.
QRH	What is your wave length in meters?.....	My wave length is..... meters.
QRJ	How many words have you to send?.....	I have..... words to send.
QRK	How do you receive me?.....	I am receiving well.
QRL	Are you receiving badly? Shall I send 20?..... for adjustment?.....	I am receiving badly. Please send 20. for adjustment.
QRM	Are you being interfered with?.....	I am being interfered with.
QRN	Are the atmospheric strong?.....	Atmospherics are very strong.
QRO	Shall I increase power?.....	Increase power.
QRP	Shall I decrease power?.....	Decrease power.
QRQ	Shall I send faster?.....	Send faster.
QRS	Shall I send slower?.....	Send slower.
QRT	Shall I stop sending?.....	Stop sending.
QRU	Have you anything for me?.....	I have nothing for you.
QRV	Are you ready?.....	I am ready. All right now.
QRW	Are you busy?.....	I am busy (or: I am busy with.....). Please do not interfere.
QRX	Shall I stand by?.....	Stand by. I will call you when required.
QRY	When will be my turn?.....	Your turn will be No.
QRZ	Are my signals weak?.....	Your signals are weak.
QSA	Are my signals strong?.....	Your signals are strong.
QSB	Is my tone bad?.....	The tone is bad.
QSC	Is my spark bad?.....	The spark is bad.
QSD	Is my spacing bad?.....	Your spacing is bad.
QSE	What is your time?.....	My time is.....
QSF	Is transmission to be in alternate order or in series?.....	Transmission will be in alternate order.
QSG	.....	Transmission will be in series of 5 messages.
QSH	.....	Transmission will be in series of 10 messages.
QSI	What rate shall I collect for.....?	Collect.....
QSK	Is the last radiogram canceled?.....	The last radiogram is canceled.
QSL	Did you get my receipt?.....	Please acknowledge.
QSM	What is your true course?.....	My true course is..... degrees.
QSN	Are you in communication with land?.....	I am not in communication with land.
QSO	Are you in communication with any ship or station (or: with.....)?	I am in communication with..... (through.....).
QSP	Shall I inform..... that you are calling him?.....	Inform..... that I am calling him.
QSQ	Is..... calling me?.....	You are being called by.....
QSE	Will you forward the radiogram?.....	I will forward the radiogram.
QST	Have you received the general call?.....	General call to all stations.
QSU	Please call me when you have finished (or: at..... o'clock)?	Will call when I have finished.
*QSV	Is public correspondence being handled?.....	Public correspondence is being handled. Please do not interfere.
QSW	Shall I increase my spark frequency?.....	Increase your spark frequency.
QSX	Shall I decrease my spark frequency?.....	Decrease your spark frequency.
QSY	Shall I send on a wave length of..... meters?	Let us change to the wave length of..... meters.
QSZ	.....	Send each word twice. I have difficulty in receiving you.
QTA	.....	Repeat the last radiogram.

*Public correspondence is any radio work, official or private, handled on commercial wave lengths. When an abbreviation is followed by a mark of Interrogation, it refers to the question indicated for that abbreviation.

In order to pass the government examination, an amateur or expert must be familiar with the signals adopted by the International Radiotelegraphic Convention. This is an important question covering a license of communication.

(Continued from preceding page)

KYW—Westinghouse Electric & Manufacturing Co., Chicago.

Amateurs Still Increasing

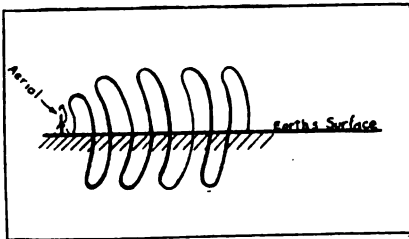
The interest in radio has been demonstrated also by the applications for amateur transmitting stations, of which there were 16,467 on September 1, 1922. On June 30, 1921, there were but 10,809 amateurs authorized to send radio communications. Since that time, fifteen months ago, 5,658 more have been added to the ranks using 200 meters wave-length.

The Radio Primer

Weekly A B C of Radio for the Beginner, in which Elementary Facts and Principles Are Fully and Tersely Explained

IF radio waves use the ether of the air, why is the earth necessary?

Electricity must have a positive and a negative pole before it can be made to travel from one point to another. Electric currents always travel from a positive pole to a negative pole. If a radio wave of only one pole—either positive or negative—were to be



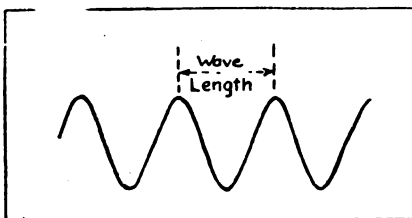
Showing the wave length measurement of a continuous wave.

sent to the top of the antenna, there would be no corresponding negative pole to attract it. Therefore, to secure a movement of the waves, the earth must be used as the other pole. The sketch shows how the wave travels. Part of the wave is above the earth's crust, the corresponding half is beneath it.

* * *

What is meant by the wave length?

A radio wave is supposed to have the shape shown in the illustration.



Hoops of the electrostatic component of an electric wave motion.

The length of the wave is figured as being the distance from the top (crest) of one wave to the top of the next wave.

* * *

Now that we know what wave lengths are, what have they to do with the sending and receiving of messages?

One may have his own idea; but the best answer to this question is the recent transatlantic achievement of the Amateur Radio Relay League by which it was proved that a short wave can travel great distances. Wave length does not have a bearing on sending distance, but the latter is not directly dependent on it. The large stations, such as the transatlantic, use the longer wave-lengths because they

By Lynn Brooks

are least affected by atmospheric disturbances and because it would be more difficult and more expensive to generate the high frequencies of short waves while using high power.

* * *

Transmitting stations use a number of wires, while for receiving only one wire is used. Why is this?

The problem at the sending station is to shoot out just as much electrical energy as can possibly be handled. The additional wires provide this capacity. At the receiving station it is not advisable to try and pick up a great amount of the transmitted energy. It is better to arrange an aerial in the most economical manner and then use the energy so as to get the most from it. The receiving station is also bothered with receiving impulses of interference either from other stations or from waves generated in the air by natural means. A multiwire aerial picks up more of both kinds of waves and makes it necessary to lose much of the signal energy in order to get rid of the interfering energy.

* * *

Why is it that radio signals do not continue traveling forever?

If the earth were perfectly flat and without trees, houses, or wires, and if the air did change its character by day and night, there is no reason why the waves should not continue indefinitely. But every tree is a miniature antenna which picks up some of the ethered energy, houses and wires afford an easy path into the earth, and the air is affected by the sun rays to such an extent that much of the initial energy of the waves is neutralized.

* * *

Then would a one-wire aerial be best for receiving purposes only?

This depends on the location and general make-up of the station. If the amateur is located over fifty miles from a broadcasting station, he should not attempt to receive with anything less than an outdoor aerial consisting of one copper or phosphor bronze wire, one hundred or more feet in length. If he is within fifty miles and intends to install an outfit with one or more stages of amplification, then an indoor aerial may be considered.

* * *

Why is one-wire considered sufficient for a receiving station?

For two reasons: wave length and static. Most amateurs are concerned

primarily in the broadcasts which are sent out, with a few exceptions, on 360-meter wave lengths. To receive these broadcasts most efficiently, the natural wave length of an aerial should not be over 360 meters. The second reason has to do with radio's greatest enemy—static. Therefore, the greater the number of wires making up the aerial, the greater the static charge on them. The greater the aerial the stronger the signals received, but not in the same proportion. For these reasons it is best to sacrifice some of the signal strength in order to reduce the intensity of static.

* * *

What is meant by the natural wave length of an aerial?

Every aerial has a wave length which it should pick up without any tuning whatsoever. This is the natural, or fundamental, wave of the aerial in actual use.

* * *

If the frequency of these waves are inaudible, how are they reduced?

After the detector has eliminated one-half of each wave, it has done all in its power—all that may be expected. The remainder of the action must be carried out by the telephone receivers. Every time an operator at the transmitting station presses the telegraph key, a series of little sparks jump a gap and travel to the antenna. To a listener it sounds as if the spark were a single one, but it is really made up of hundreds of little sparks that start without much power and gradually grow to their highest power then decrease to zero again. If we had a pen that could move fast enough it would trace a series of curves. For it is the sparks that leave the gap and pass up the aerial wire and down to the ground connection. In general, the spark impulse can be considered as having the same form until it strikes the receiving antenna, passes down through to the tuning coil, thence to the detector.

* * *

What happens to this wave when it meets the detector?

The detector refuses to pass the entire wave. It will, however, allow one-half to pass through.

* * *

Will these waves make sound in the phones?

No; because they are still traveling too frequently. They must be slowed down many more times before the little diaphragm in the phones will transmit their message to the ear.

The Theory of Radio Communication

How Radio Waves Are Generated so We Are Able to Hear Them

By Horace Beers

THE atmosphere is composed of atoms of oxygen, nitrogen, helium and other gases suspended in what the average individual terms "nothing, or a vacuum." "Nothing," however, is known to radio engineers as ether. Ether can be given a wave motion similar to that which occurs in water.

To transmit radio signals it is necessary, therefore, to first create waves in varying groups and of varying strength; second, to intercept them with apparatus capable of changing them to sound waves.

To create the waves it is necessary to have two surfaces separated by a distance of from ten to several hundred feet and to create between them an electrical pressure which changes its direction—first toward one surface, then toward the other—hundreds of thousands of times every second.

It is the common practice to use the ground for one surface and provide another surface by erecting a structure composed of one or more wires insulated from the earth and suspended many feet above it. Between these, by means of suitable transmitting equipment, we create an electrical pressure of from one to twenty thousand volts, which radiates in all directions.

These pressure waves are, however, only part of a radio wave. From any wire in which the current is flowing electro-magnetic and pressure electro-static waves are radiated.

The creation of these waves may be compared to the action of hurling a rock into a pool of water. The amperes of current put into the antenna correspond to the size of the rock, while the volts of electrical pressure are equivalent to the force with which the rock is hurled. The

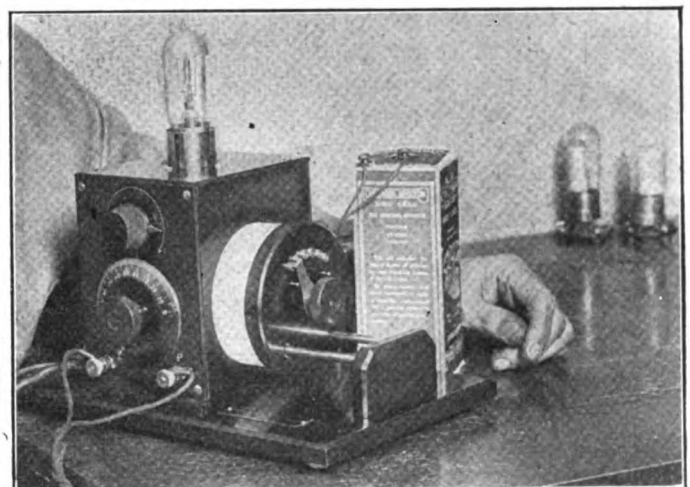
larger the rock and the greater the force behind it, the bigger the splash and consequent waves. The more amperes of current flowing in the antenna circuit and the greater the pressure (volts) between antennae and the ground, the stronger the waves radiated. These radio waves have similar characteristics to another class of waves—sound waves. When the note, C, is struck on a piano, the sound waves it produces vibrate 256 times per second, and either a C tuning-fork, or wire, tuned to C—or in its immediate vicinity—will vibrate 256 times also. Then the two wires are said to be in resonance. The waves radiated by a radio transmitter always produce a definite number every second. In order to hear a station, the receiving equipment must be put in resonance with the waves radiated by the transmitter. This operation is known as tuning.

Smallest Two-Stage Amplifier and a Dry-Cell Set



(C. Kadel & Herbert News Photos)

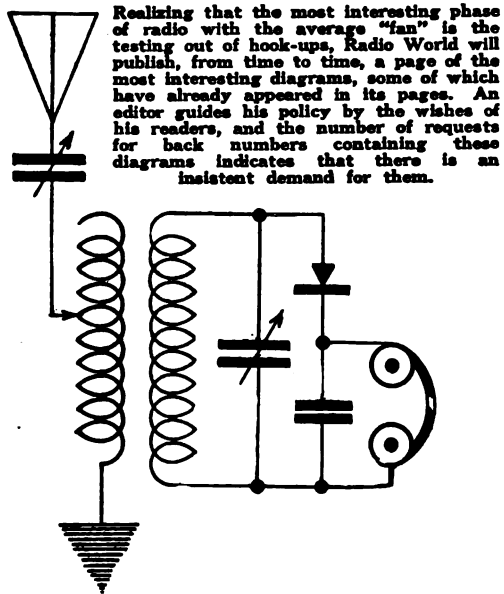
Two new and distinct apparatuses for radio use are shown in the above pictures. They were constructed by William A. Bruno. The first illustration is that of a two-stage amplifier which, Mr. Bruno claims, is the smallest of its type. Due to its small size it is obvious how such a small amplifier could be made to operate. Mr. Bruno, of the American Institute of Electrical Engineers, built this amplifier for the purpose of making it a "space saver." Two vacuum tubes, two transformers, and the rheostats are all confined in the cabinet. One control takes care of both tubes. Notwithstanding its small size it is so well designed that it eliminates all distortion. Another important feature of this amplifier is that it eliminates



(C. Kadel & Herbert News Photos)

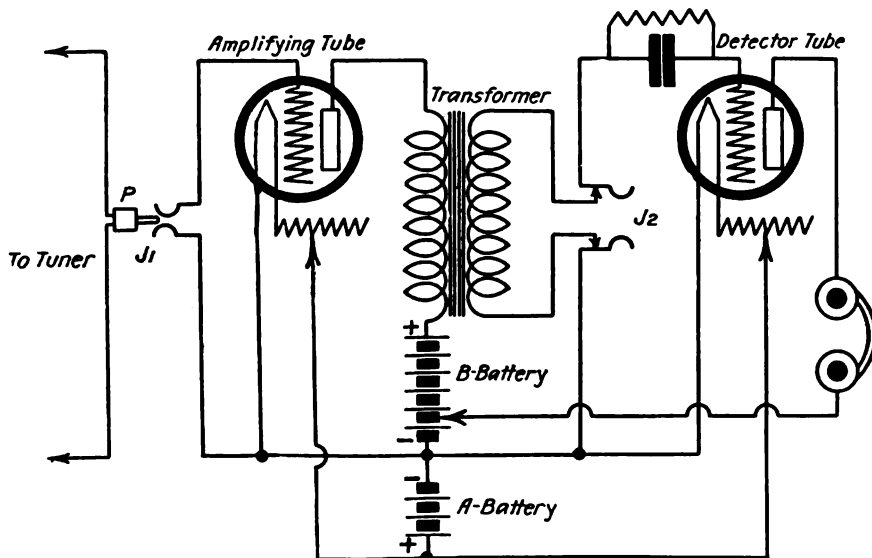
the troublesome storage-battery for lighting the filaments and, in its place, uses the dry cell as its filament power. The smaller engraving at the right shows a set which also operates on the dry cell. Without a doubt, more people would own radio sets if the costly and bulky storage-battery could be eliminated. Of course, radio sets using the dry cell would become more popular. Concerts have been received from Detroit and Pittsburgh as well as other local stations, using but one dry cell. This receiver is a compact one of the coupler-type. There are simple circuits with a physical connection between the aerial-ground circuit and the closed circuit, known as the oscillating circuit, in which the detector is placed. Since this work is not concerned with the theories, or mathematics, of radio, but rather with the application of the results, many sets are used with the distinct aerial and ground, also oscillating circuits, with no physical connection between them. Transference of energy between the former and the latter is affected by means of two windings which are brought in to more or less close inductive relation. In one form, these windings are known as the loose coupler; in another, they form a vario-coupler. These coils are in this machine. The vacuum tube is mounted on top of the cabinet. The dry cell is along side to be used as fuel for filament lighting.

Radio World's Page of Hook-ups

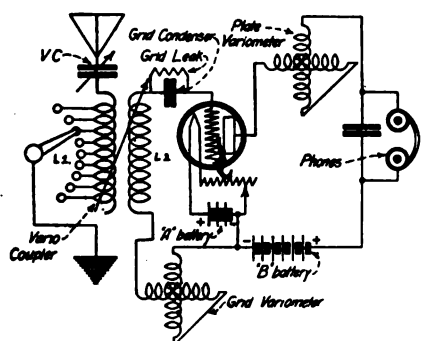


Realizing that the most interesting phase of radio with the average "fan" is the testing out of hook-ups, Radio World will publish, from time to time, a page of the most interesting diagrams, some of which have already appeared in its pages. An editor guides his policy by the wishes of his readers, and the number of requests for back numbers containing these diagrams indicates that there is an insistent demand for them.

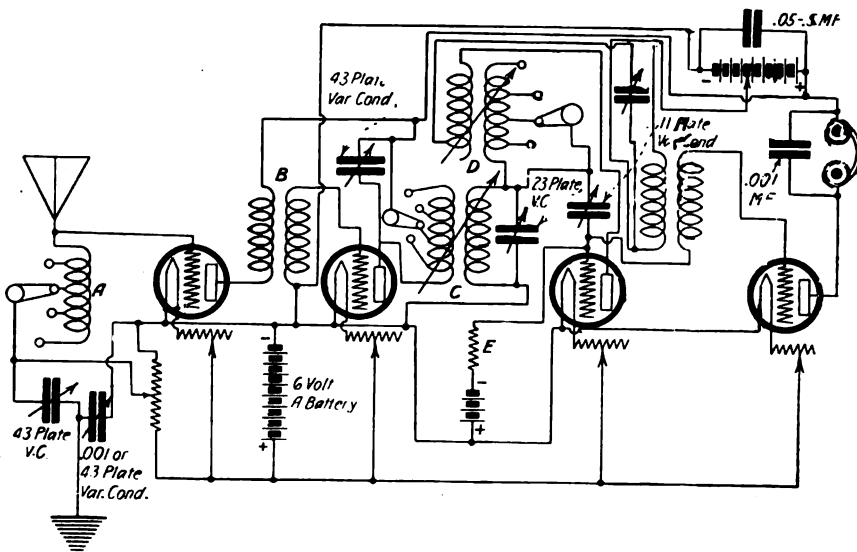
Schematic diagram of a crystal receiver, showing the loose coupler in a circuit. This method of coupling is termed inductive coupling. It has many advantages over the conductive or single circuit receiver. Suggested by Charles H. Plath. Drawn by S. Newman.



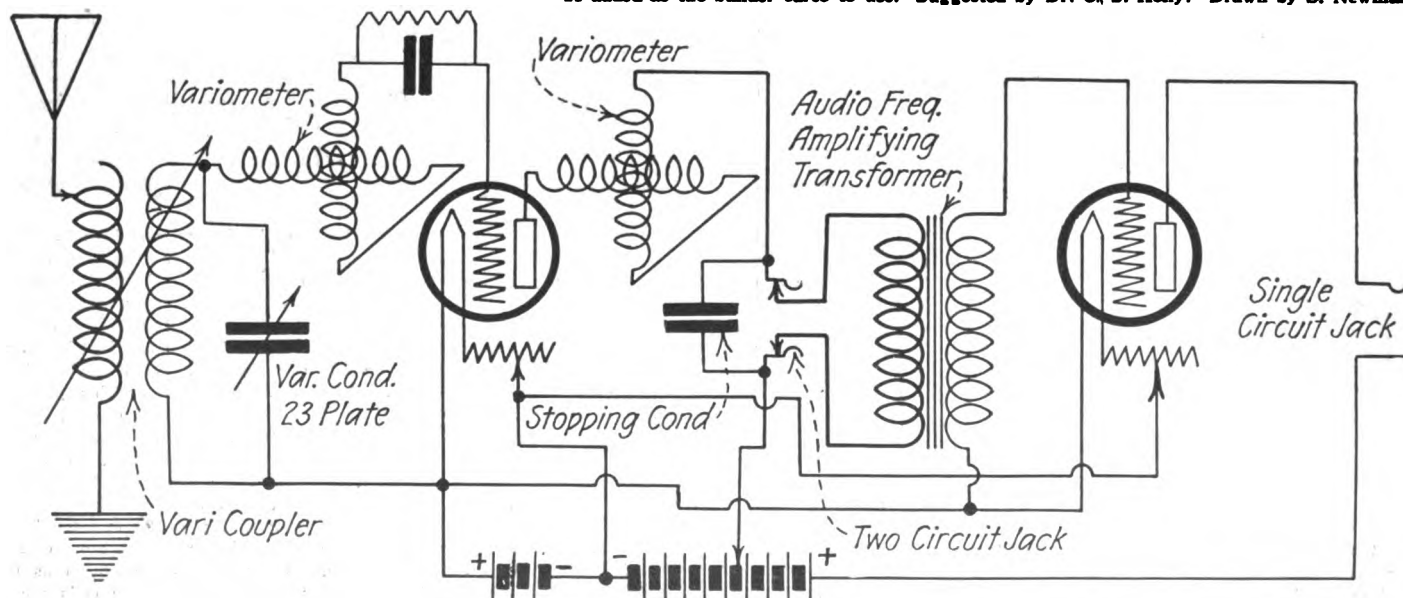
Schematic diagram showing the amplifier and detector with radio-frequency transformer. P is a plug from the tuning circuit, J-1 the jack of the amplifier. Suggested by Harold S. Potter. Drawn by S. Newman.



Schematic diagram of regenerative receiver of the variometer type. In the above hook-up it is easy to discern where the variometers are placed in the grid and plate circuits, respectively. Suggested by George W. May. Drawn by S. Newman.



Schematic diagram showing circuit employing radio-frequency. A is the loading coil. B, any standard radio-frequency transformer. C-D are variocouplers. E is a variable grid leak from 1½ to 3 volt bias. As many stages of radio-frequency and audio-frequency may be added as the builder cares to use. Suggested by Dr. O. S. Kelly. Drawn by S. Newman.



Schematic diagram of a regenerative set, employing variometers as means of regeneration. Jacks are utilized in the stages, which enables the radio listener to use as many stages as he desires. The grid condenser shown in the circuit of the second stage may be left in or out. This is to be considered by experimentation. Suggested by Fred. Chas. Ehlert. Drawn by S. Newman.

Parts of a Radio Receiver

THE telephone receiver commonly employed in radio reception is known as the watch-case receiver.

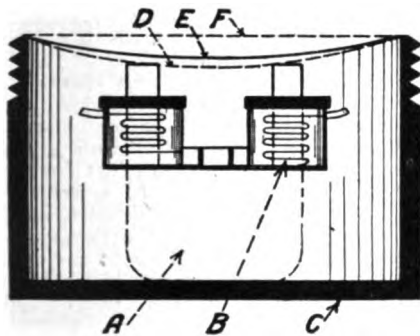
It consists essentially of a permanent magnet, A, with pole pieces having a north and south pole. On these poles are wound coils consisting of many turns of fine wire, as shown in B.

C is the case of the receiver which is made either of aluminum or bakelite.

E indicates when a current is sent through the coil of the magnet which takes this position.

F indicates when the current flows in the opposite direction, decreasing the total strength and allowing the diaphragm to spring away from the pole.

A D-C resistance of a receiver, as described, would be about 2200 ohms. Over 10,000 turns of fine



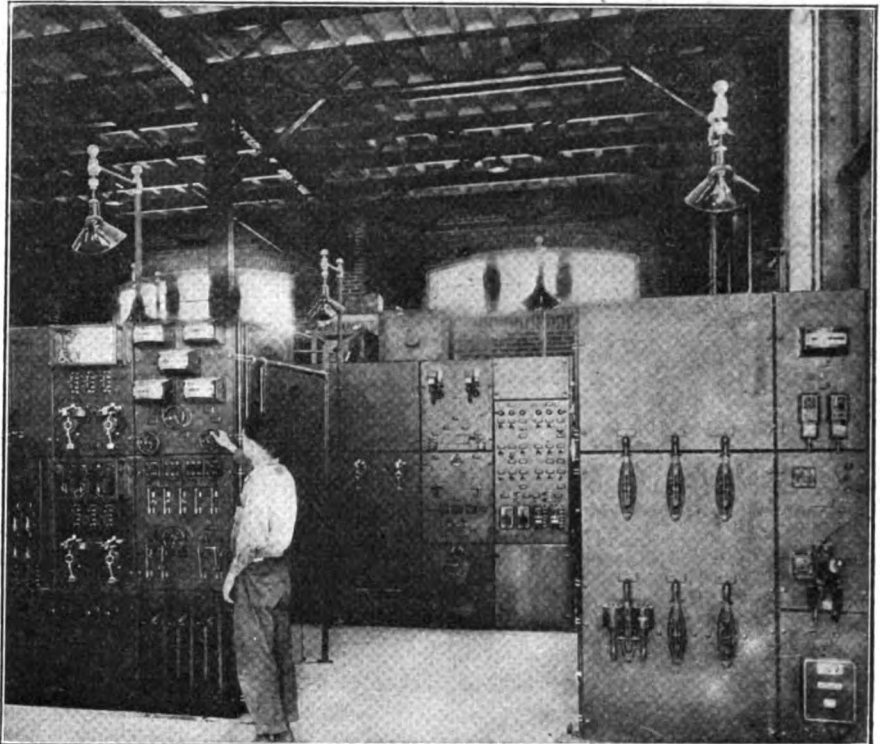
Schematic diagram showing the inside of a telephone receiver, and indicating how the telephone functions.

wire are employed to make up the winding. The impedance to an alternating current, of course, will be greater, depending on the frequency of the current and the effective resistance of the circuit. At 400 cycles, a certain receiver of this type had an impedance of 2900 ohms; at 800 cycles, an impedance of 3900 ohms; at 1000 cycles, an impedance of 4400 ohms. This is the type receiver used by most amateurs and radio operators, to-day, in radio reception, whether it be spark, undamped, or telephonic reception.

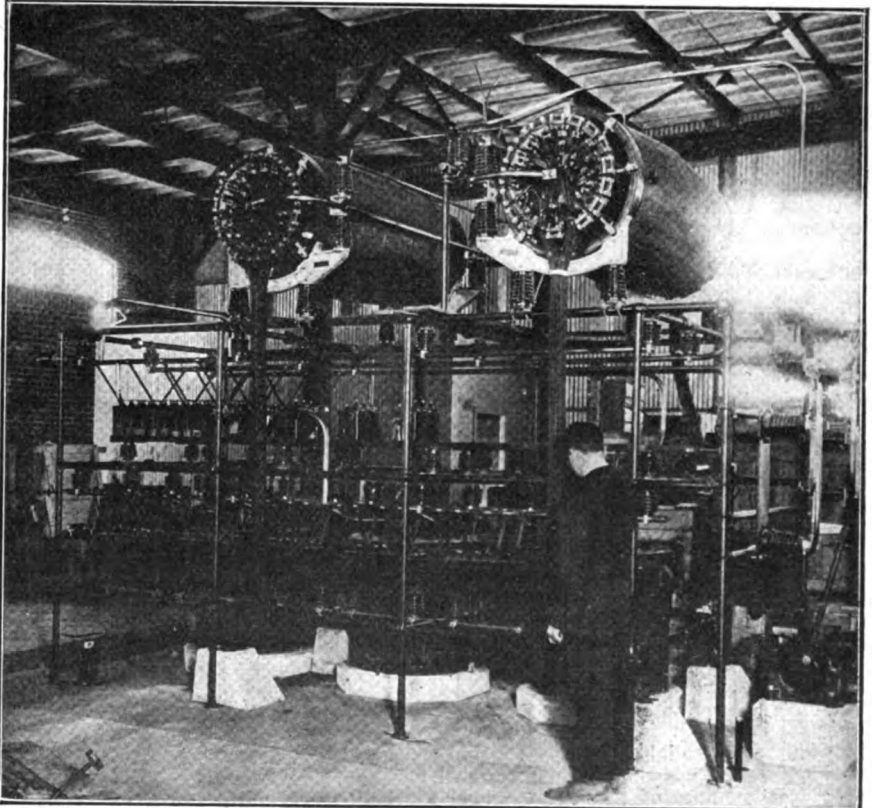
Army Tank Directed by Radio

ONE of the new Signal Corps radio sets designed for the whippet tanks of the United States Army was tested out last week, for the first time, at the annual field day of the Army Ordnance Association, Aberdeen, Maryland. The standard sets, designed for the master tanks of each group, include both telegraph and telephone apparatus. Under direction of the commanding officer, in the rear, the radio tank executed intricate orders immediately, charging and attacking enemy tanks directed solely from back of the lines. Observers report a most satisfactory test.

Radio Apparatus that Hurls Messages Across the Atlantic



(Both photographs, C. Central News Photo Service)



The huge radio stations used for transatlantic work are interesting studies. One of these stations, the Radio Central, located at Riverhead, Long Island, New York, some seventy-five miles east of the metropolis, contains some of the most valuable radio apparatus in the world. The actual operation of this station takes place in New York City. The operator located there sends the dots and dashes over land wires to Riverhead, from which place they are broadcast. In order that messages of such a nature may be sent, it is imperative that the proper power and circuits be employed. The illustration at the top shows the switchboards which control the power. The various meters and circuit breakers which appear on the front of the switchboard keep the operator informed in regard to the power being used and also the power being transmitted to the aerial. The illustration below shows the transformer rack.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

THE management of the Hotel Belmont-Causarinas, Bermuda, proposes the installation of radiotelephony for the reception of the United States broadcasts. In view of its ideal situation on one of the highest points of the islands, the Hotel Belmont is particularly adapted to the installation of radio apparatus. The stretch of several hundred feet between the hotel proper and the Causarinas Annex provides an excellent span for an antenna.

The boys who attended after school Athletic Centre 62, New York City, received a pleasant surprise from their teachers. As school was dismissed, a large scoreboard was set up in the outer yard, and all the plays of the World Series were bulletined as fast as they were received by radio. About 1,000 boys watched the returns, and expressed delight at getting the scores and plays. The teachers felt that the plan was worth while, as it served to keep the boys out of the traffic-crowded streets where they would have gone for the results.

Formation of a broadcasting company by the six principal manufacturers of radio equipment in Great Britain is announced by Frank Gill, chief engineer of the International Western Electric Company and president-elect of the British Institution of Electrical Engineers. The company will have a capital of \$500,000. Present plans call for the erection of stations at London, Birmingham, Manchester, Newcastle, Cardiff, Glasgow, Plymouth and Aberdeen.

The authorities at Yale University announce that athletic events will be broadcast by radio. This means that anyone within a distance of fifty miles of New Haven, will be able to receive by radio, play-by-play, reports of all the university's athletic events. All that is necessary is a small Crystal radio-receiving outfit.

The Radio Corporation of America has purchased the White Oil Building at 64 to 68 Broad Street, New York City, which it now occupies as its headquarters. The White Oil Realty Company is the present owner of the property. The building is ten stories high and contains 43,000 square feet and is valued at close to \$1,000,000. It is within two blocks of the principal cable and telegraph forwarding offices and is near the Postal Telegraph Company's headquarters. The name of the building will probably be changed to "Radio House."

Southwest Texas is coming to the front in radio affairs, according to the various county fairs held recently. There have been more than a dozen county fairs so far where loud speaking radio apparatus carried music and world news to the rural residents for the first time from WJAE at San Antonio.

Lord Louis Mountbatten, cousin of the Prince of Wales, is visiting New York City with his bride, who was Edwina Ashley, heiress to the great fortune of her uncle, Sir Ernest Cassel, Lord Mountbatten, before the war a Battenberg Prince, is a lieutenant in the British Navy and he told reporters that he intended to specialize in naval radio.

A proposal of marriage by radio is reported by "The American," New York. John Smiley, a wealthy engineer, sent "Will you marry me?" by radio, across the Atlantic, to Miss Evelyn Greeley, moving-picture actress, who is touring Europe. However, it is reported, Miss Greeley will return soon to answer "Yes," in person.

Radio has played a real part in the "movies." Marshall Neilan uses it in his forthcoming picture, "Minnie." In this production, suggested by George Pattulo's story, "Her Man," radio is employed not only as a means of carrying the voice, but also as a medium of conveying power through the air and running distant automobiles, wind-machines, pumps, and other machinery.

The Hippodrome, New York, radio enthusiasts were particularly elated last week when Edward Demmler, master electrician of the playhouse, with a radio receiving set of his own development, was able to hear the attempts being made to relay a telephone message from San Francisco to London.

WJZ, at Newark, has invited the Republican and Democratic candidates for Governor and United States Senator in New York and New Jersey to speak from this station. The follow-

ing tentative schedule has been arranged: Governor, New York—Alfred E. Smith, Democrat, October 25; Governor Nathan L. Miller, Republican, November 1. Governor, New Jersey—Senator William N. Runyon, Republican, October 18; Judge George S. Silzer, Democrat, October 21. Senator, New York—Dr. Royal S. Copeland, Democrat, October 31; Senator William M. Calder, Republican, October 24. Senator, New Jersey—Senator Joseph E. Freylinghuysen, Republican, October 20; Governor Edward I. Edwards, Democrat, October 28.

H. V. Carpenter, dean of the State College of Washington, school of engineering, claims that ordinary telephone wires may be used instead of aerial antenna in radio reception without interruption of either service. Professor Carpenter claims that conversations over the ordinary telephone are not heard on the radio receiving set when telephone wires are used for antennae, nor are radio messages detected on the telephone, so there is no interference or interruption in the service of either. This is probably the biggest step yet taken in the popularizing of radio, for it eliminates the most difficult feature of the receiving station.

A radio-equipped flying boat broadcast news of the National Airplane Races, at Detroit, on October 9. Those who listened in on 507 meters received the first radio report of an aviation meet. A high-powered flying boat, christened the "Wilbur Wright" by Miss Katherine Wright, sister of the "fathers of flying," was equipped by the General Electric Company with a 50-watt radio transmitting set with a range of 100 miles. Reports from this aircraft were sent successfully on a wave length of 507 meters, a length that was not too great for even the small crystal sets to tune with. Soaring at a height of 3,000 feet, this flying boat observed the contestants in the various events and sent reports by radio on the progress of the races. Special receiving sets were placed about the flying field so that spectators were informed constantly regarding the position of the planes, even when they were out of sight.

A novel use of radio broadcasting has been announced by "Adventure." In a series of radio talks, L. Patrick Greene, of the editorial staff, will read the answers to a number of questions submitted by readers to the "Ask Adventure" experts, from WJZ, at Newark, twice a month. Nearly fifty experts having first-hand knowledge of the far corners of the earth have been answering readers by mail, but will now use radio. If "listeners in" wish to know about Alaska, India, Borneo, Central Africa or any other country, they are invited to mail their questions to the editor.

New York City becomes the world's radio central station, and the United States gains great commercial advantage by arrangements concluded by the Radio Corporation of America, which organization has placed under one head American, British, German, French and Argentine radio plants, representing an invested capital of \$170,000,000. Concluding stages of the negotiations, in progress several months, have been arrived at by radio between Edward J. Nally, president of the American corporation, who is in Paris; David Sarnoff, vice-president in New York City; Captain Powhatan Page, vice-president and general manager of the Pan-American Wireless Telegraph and Telephone Company of Buenos Ayres, who came here six weeks ago in furtherance of the plan, and officials of the British and German radio interests.

Chauncey Olcott, comedian, returned so seriously ill on board the "Orbita" of the Royal Mail Steam Packet Line that a radio message was sent to his physician, Dr. John A. Stillwell, of 9 East Forty-ninth street, New York, to meet the ship at the foot of Morton Street. The radio was sent from midocean.

A radio corporation, capitalized at 200,000,000 yen, approximately \$100,000,000, soon will be established in Japan, if plans formulated by the Nippon Yusen Kaisha, the Osaka Shosen Kaisha, the Industrial Bank, Suzuki & Co., Takata & Co., Mitsui & Co., Okura & Co., Fujita & Co., Viscount Shibusawa and other Japanese financiers receive the support of the government and are brought to completion. The plans have been laid before Premier Kato and have received this personal sanction. It is desired to form a company that will compare favorably with the Radio Corporation of America, the Marconi Company of Great Britain, and the Telegraph Company of France. The new company will concern itself principally with improving communication between Japan and America.

Radio and the Woman

By
Crystal D. Tector

ONE of the most attractive numbers sent out by WBZ, Springfield, Massachusetts, is the church service conducted by the Reverend Mrs. Frank L. Briggs. Mrs. Briggs is an ordained minister and served her husband's church as a regular pastor during his absence in France. Her choir is as follows: Hazel Rogers, soprano; Esther Carlson, soprano; Helen Page, alto; Dorris Armstrong, alto; Anna Carlson, accompanist. Truly, women and radio are doing their share to spread religion.

Another unusually interesting broadcast, in which a clever woman was the bright particular star, was the address of Miss Minnie Tracy, a prominent music teacher, who told of her work with the late Enrico Caruso. Miss Tracy was a personal friend of Caruso. Her address was replete with some wonderful reminiscences of the famous tenor.

A woman friend whose hobby is golf has become, also, an ardent radio fan—and all on account of a new golf ball with "a radio-active center." She tried to secure a brand of ball, she says, which she had used for years, and the radio ball she purchased because the dealer was out of her favorite kind. She says that this new ball, when hard hit, races yards farther than any other she has used.

The big alternator in the musical comedy, "Molly Darling," now playing at the Liberty Theatre, New York, really gave me a thrill. It was the first time that I had seen radio on the stage in a truly startling way. The management is wise in saving this piece of dramatic intensity until the last scene, for it is a very unusual climax to a snappy entertaining show.

Miss Jessie E. Koewing, recently gave a very interesting talk on radio before the Men's Club, Belleville, Ohio. Miss Koewing, as most every radio fan knows, is the announcer at WOR, Newark, New Jersey and by the bye, one of the best announcers in the country. After the talk, Miss Koewing was accosted by one of the members who told her that his seventeen-year-old daughter had made a wonderful receiving set entirely by herself. I wish that I might meet and interview this girl. Miss Koewing, in the rush of the night, did not get her name, but I would consider it an honor, indeed, if she would write me and tell me all about it.

WJZ recently broadcast a joint recital by Effie Briggs, soprano; Vincenzo Alpino, tenor, and Hazel Gruppee, pianist and accompanist. Miss Briggs began her musical career when only a child. Her dramatic ability, much in evidence in high-school entertain-

ments, suggested that some day she would develop into a celebrated Shakespearean exponent. She attracted the attention of several Bostonians who suggested that she prepare for a grand opera career. She has studied under Camille Bonsignora and other grand opera coaches. Miss Briggs is quite versatile, being able to sing in nine different languages. "Including radio?" asked Friend Husband when I told him of Miss Briggs's versatility.

They tell me at many of the New York department stores, that the most interested—and frequently, the most numerous—customers at the radio counters are the mothers whose young sons act as escort. Of course, it is the boys who actually want the sets, not the mothers! But it is mother who opens her purse to purchase the set, and, also, to ask innumerable questions in regard to the new magic. A well-informed radio clerk told me that several mothers told him that radio sets have tops and balls and other matters of boyish interest beat to a standstill as a suitable reward when Johnnie has been extra good.

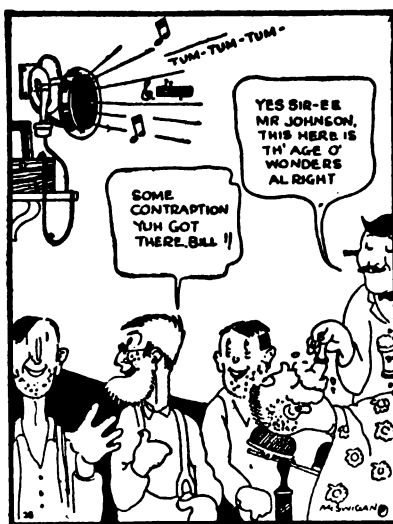
One of my correspondents—a lady who lives in Portland, Oregon—writes to ask if I can tell her what Major Edwin H. Armstrong looks like. I saw the major when he demonstrated his superregenerative set at Columbia University. In fact, I stood very close to him. He is a very interesting personality. Unless you watch them very closely, his blue eyes do not flash. He has an open interesting face, an erect figure, rather prominent mouth, and is beginning to show traces of baldness. But what impressed me most was his modesty. I doubt if I ever met a more modest young man in all my life. Looking into his face, I would say that he becomes wonderfully animated when trying to solve some deep problem.

I have been asked by several women's radio clubs to speak before them this winter. Really this is impossible. In the first place, I am a poor speaker; in the second, I dislike traveling; in the third, I prefer to write what I have to say. I am always pleased to tell my sisters, through the courtesy of RADIO WORLD, anything they may want to know—and may I be so bold as to add that some of my pages in RADIO WORLD this fall and winter, will contain matter that may be read to advantage before any club. You will always find some practical informative paragraphs every week that will be worth saving and that, when put together, will comprise a better lecture than I could deliver from the platform. We women are not good talkers as a rule.

Broadcast Bill's Radiolays

(Copyright, 1922, Westinghouse Electric & Manufacturing Co.)

THEY say the village barber shop's the most convenient place to settle all the troubles that affect the human race. The one we've got in our town's no exception to the rule, so as a natural consequence, the shop is always full. Since Mister Barber first invented tools fer cuttin' hair, the way the government should run has been decided there. The last time I went down to get my curly locks cut short, I helped them settle questions that we thought of great import. But gosh! with nine ahead of me I had to wait so long I said right then the next time I'd amuse the waiting throng in manner more befitting, so to speak, an' up-to-date than tryin' by our talking to direct the affairs of state. An' while I like to keep our land from goin' to the dogs, I'd rather have 'em tell me what's the market price on hogs. So yesterday, when I went in to get my weekl' shave, the barber shop executives had started in to rave about the possibility of war with China soon. I busted up the meetin' when I sez, "Let's have a tune." I'd brought my faithful radiophone along with me this time to listen to while waitin' 'stead of talk of war and crime. With set an' horn connected up, the music came in grand, an' while we



sat there waitin', Sousa's Military Band played four or five selections an' the time went by so fast that pretty soon I noticed I wuz "next!" instead of last. We had some right nice music an' as I wuz gettin' shaved, they told us in the latest news how Wall Street had behaved. "Doc" Dalton runs this barber shop an' I've a dern good hunch, he's goin' to buy a radiophone an' then surprise the bunch.

He asked me all about my set, an' how much I had paid an' if I thought a set like mine would help bring in the trade. Well you know me—I sez, "Why sure, I'd get one right away. Just look at all the extras this here one brought in today."

WJZ to Broadcast Football Games from Field

WJZ, Newark, New Jersey, has, through the courtesy of the Western Union Telegraph Company, arranged to broadcast the more important football games that will be played at the Polo Grounds this fall. The radio audience will not only learn every play the moment it is made, but will also be able to hear the cheering and the songs of the college men.

The schedule is as follows:
October 21—Fordham University vs. Georgetown University, Polo Grounds.
October 28—Syracuse University vs. Pennsylvania State College, Polo Grounds.
November 4—Lafayette College vs. Washington and Jefferson College, Polo Grounds.
November 11—Cornell University vs. Dartmouth College, Polo Grounds.
November 18—Columbia University vs. Dartmouth College, Polo Grounds.
November 25—Army and Navy, Philadelphia.
November 30—University of Pittsburgh vs. Pennsylvania State College, Pittsburgh.

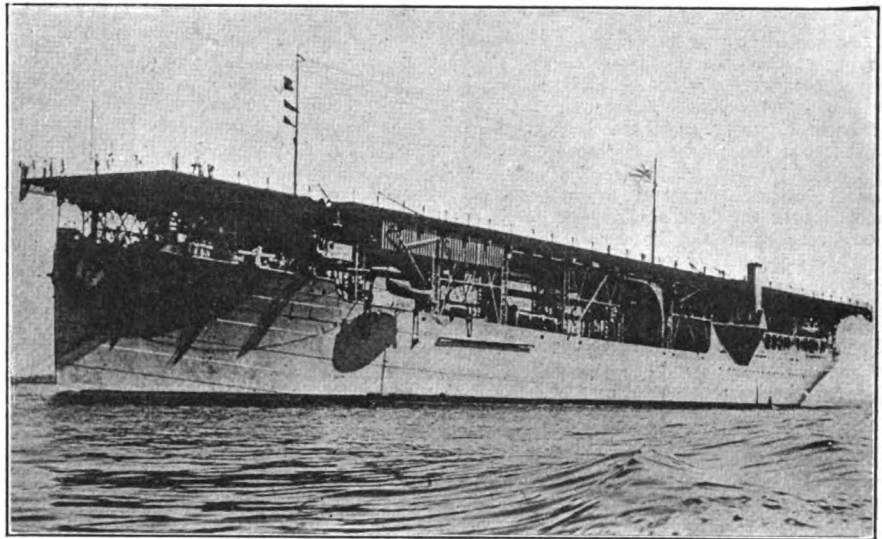
The Most Up-to-Date Things of the



(C. Kael & Herbert News Service)

(Left) A. C. Brown, who, forty years ago, invented the street fire-alarm, has perfected a device which does away with the necessity of wires or even an aerial from the fire-box to the fire station. By means of Mr. Brown's apparatus a high-frequency current is conveyed along the public electric-light mains and collected by a simple apparatus at the fire station, which in its turn sounds the alarm, switches on the fire-station lights, and, what is more, writes on the tap machine the exact place of the fire. The object is for the device to be fitted to all hotels, theaters, and large premises. The call is made by pulling a lever in the usual way.

(Right) The U.S.S. "Langley," the first radio-airplane carrier to be commissioned in the United States Navy. She departed from the Norfolk Navy Yard recently for her first duty at sea. The "Langley" will operate in Chesapeake Bay and vicinity for the purpose of carrying on experimental work in connection with aircraft operations from the landing platform which covers the entire ship.



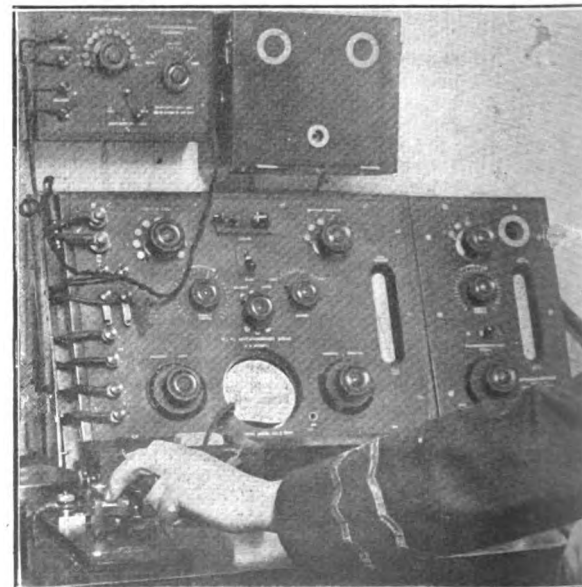
(C. Underwood & Underwood)

(Below) The only positive, yet the simplest, method of determining the condition of a storage battery, is to obtain the specific gravity of the electrolyte (acid solution). A fully charged cell should read about 1.280. A discharged cell should read about 1.150. The illustration shows how this is determined by means of a hydrometer.



(C. Kadel & Herbert News Service)

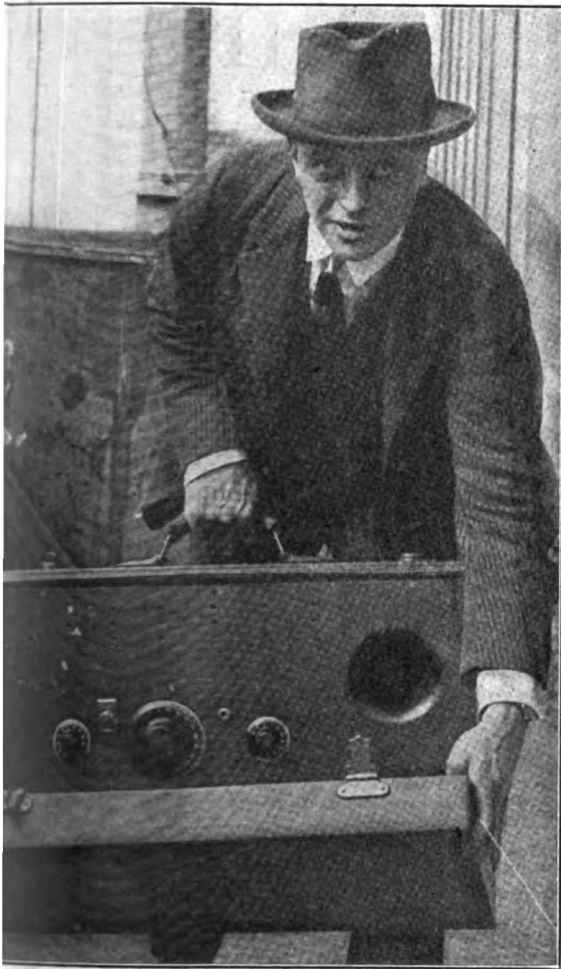
(Below) This is the new radio receiving set on board the ocean liner "Tuscania." It "hears" from a distance of 1,200 miles, and is one of the most modern of its kind. The chief operator, David E. Thompson, is photographed at the transmitter.



(C. Kadel & Herbert News Service)

(C. Foto
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The Past Week in Radio's Busy World

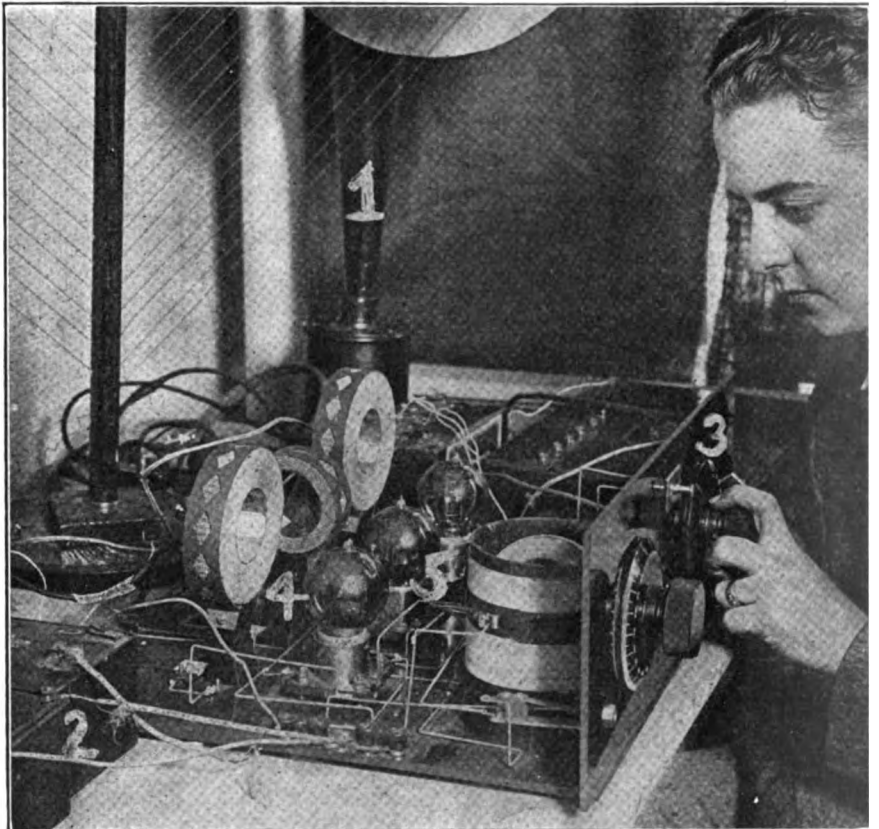


(New York, N. Y.)

radio outfit snug in a valise. It will even receive while you are in the subway. And if you are riding in the subway and you hear music when a chap sits down beside you, and plants his feet, you never can tell what is in the valise. This radio can be carried in a valise, and if set to receive, even if it will catch whatever part of the radio program is on. If you'll hear it. It is a six-stage audio-frequency amplifier, a complete sustained receiving apparatus, including loop aerial, a complete sustained receiving apparatus, including loop aerial and loud speaker. It can be operated anywhere. (New York, N. Y.)

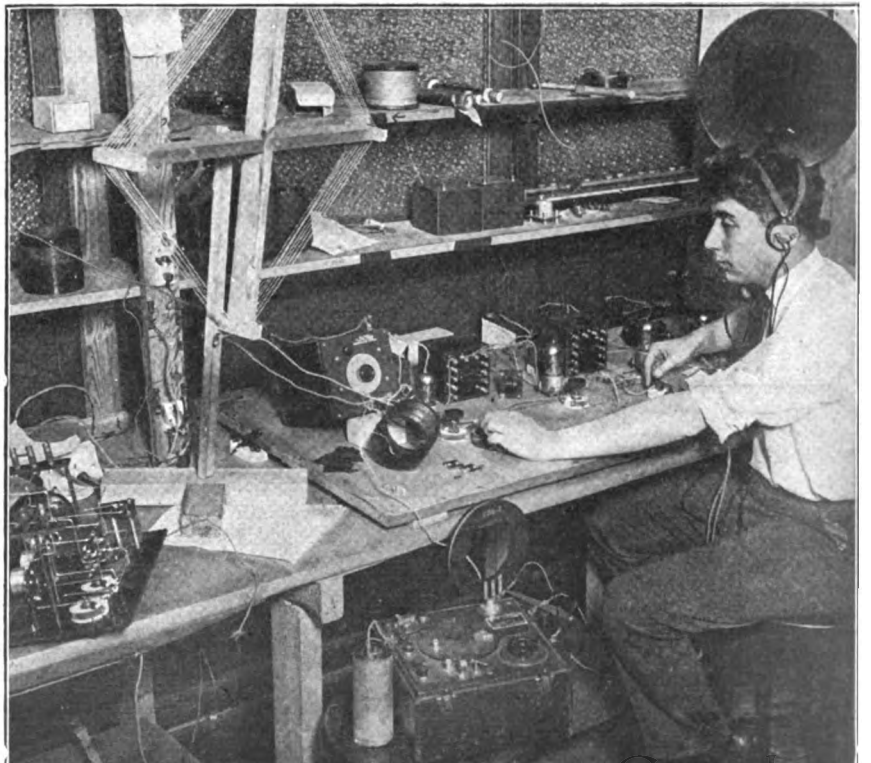


(Right) J. D. Freed, radiotrician, designing a radio-frequency receiving set to receive long distances on a loop aerial, and for modest distances without any aerial whatsoever. Mr. Freed (shown in the illustration at the right) claims that he has successfully overcome all the disadvantages of radio frequency circuits.



(C. Kadel & Herbert News Service)

The accompanying illustration shows Rutledge R. Mayo, of the United States Navy, with an Armstrong super-regenerative set which he built himself. By means of a special type vario-coupler, constructed by himself and placed in a certain position in the circuit, he successfully overcame the trouble that is being encountered by amateurs—that is tube noises and that whistle which is sometimes discouraging. In this three-tube circuit Mr. Mayo uses no rheostats or potentiometers. 1, represents the Western Electric loud-speaker; 2, the high-voltage B batteries necessary for the plates of the tubes; 3, the control or condenser dial; 4, the E tubes (Navy type) used throughout the circuit; 5, the vario-coupler. The loop aerial can be seen to the left on the table. Mr. Mayo has received WWJ, Detroit.



(C. Kadel & Herbert News Service)

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

Uncle Sam's Foreign Trade Expanding Because of Radio

UNCLE SAM'S "sell-it-by-air" plan, the first practical application of broadcasting to business, is developing rapidly, Department of Commerce officials state. Following the broadcasting from Boston, of the Department's trade opportunities throughout New England, many Chambers of Commerce throughout the country have asked for similar service for their broadcasting stations. Several of the high-powered radio stations have offered their services to the Bureau of Foreign and Domestic Commerce for this new and unique method of making public trade opportunities in foreign lands.

The broadcasting station of "The Times," Ridgewood, L. I., is anxious to serve the territory around New York City. Another station, WFO, Dayton, Ohio, desires to receive information on the world's markets that it may be broadcast to the exporters in the Miami Valley. A station at St. Louis has already begun to broadcast foreign trade notes, and the Chamber of Commerce, Buffalo, wants the data for use in two of its local stations.

It is understood that the Bureau of Foreign and Domestic Commerce, Washington, D. C., is considering sending weekly data to other localities where it will be distributed by radio to interested manufacturers and exporters.

American Industry Best in Two Years

A RECENT business survey issued by the Department of Commerce states that American industry is now marking up the best record for production since the period of depression two years ago. This increased output is general with all industries. Factory employment is larger than since December 31, 1920, which is held to be the chief factor in a more even distribution of buying power.

Service Above Profits

THE business world is going to yield more happiness to those who are engaged in conducting business, when more business men develop the true scientific attitude of mind. Once upon a time an investigator used to try to keep the results of his studies to himself so that he personally might profit by them. Nowadays research specialists give freely to the world whatever they have discovered that is worth while. They have placed service to humanity above personal profit. Some may consider it too idealistic to be carried through in the world of business, but the curious thing is that the business men who are practising this high idealism are making greater profits than they ever could by using a more selfish system.—Tom Dreier, in "Forbes Magazine."

Measuring Shadows

Time was when men climbed the pyramids with great effort and sweating (for it is hellish hot in Egypt) and then after all this effort, often inaccurately, measured their height.

One day an old, lame man with a large staff hobbled out on the desert, stuck his support in the sand and measured its shadow. Then he measured the shadow of the pyramids and knew exactly their height.

Some men measure the value of advertising by the loss of much money, sweat and toil. They pick out the oldest radio publication, or the one that claims the largest circulation, or the one that jams the largest number of advertisements together, while all the advertiser is really seeking in spending his good money is to get consumer results: Orders, cash returns.

Let us tell you how to simply measure the value of your radio advertising dollar by the shadow method; that is, the result your competitor is getting from his advertising in RADIO WORLD—the results others have had from keyed advertisements where the same copy has been tested in each of the radio publications.

This shadow measurement will give you an accurate measurement in advance of just the kind of results you may expect from RADIO WORLD. We KNOW and you can know it is the best buy in the radio advertising field.

Write today to

RADIO WORLD
the only national illustrated weekly
1493 Broadway New York, N. Y.

Heard at the Radio Counter

A Conversation Between Customer and Radio Clerk

"I WOULD like to know the difference between a regenerative receiver and a non-regenerative?"

"Well—you see, with the regenerative receiver, the plate circuit is broken and a coil, known as a tickler, is inserted in series with the plate and telephone circuit. This is not in the non-regenerative."

"Then, please tell me, what is its advantage?"
"It makes possible the reception of C-W, or continuous waves, which cannot be received on the plain nonregenerative set. It also amplifies the signal immensely."

"Well, I have a vario-coupler of the nonregenerative set, and would like to make mine regenerative. What must I do? What do I need?"

"You need a vario-meter placed in the plate circuit. This will do the trick. You also need another vario-meter in the grid circuit. This will make your set regenerative."

"Will this work also with the crystal-type receiver?"

"No. This will only work with the vacuum tube."

"Well, if I use a vario-meter, what will the wave lengths be?"

"The wave lengths of this vario-meter receiver should range between two hundred and six hundred meters."

"Let me see. I guess I'll take the vario-meter and try it out."

"All right—sir. Let me know the results."

(To be continued)

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

S O S Radio Corp., Rochester, radio equipment, \$25,000; H. H. Servis, R. L. Curtis. (Attorney, J. J. McInerney, Rochester, N. Y.)

Radio Products Broadcast Advertising Corp., Wilmington, Del., manufacture, \$500,000. (American Guaranty and Trust Co.)

Cairns Radio Mfg. Co., Manhattan, 250 shares preferred stock, \$100 each; 130 common, no par value; active capital, \$10,000; T. Cairns, C. Edouard, J. Eaton. (Attorney, G. L. Hess, 469 Fifth Av., N. Y.)

Clinchfield Mica Corp., Wilmington, Del., \$1,000,000. (Corporation Trust Co. of America.)

Uruguayan Telephone Co., telegraph and telephone wireless company in Uruguay and elsewhere, \$1,000,000; Fitz J. Porter, Otis T. Bradley, Leighton H. Coleman, New York. (Corporation Trust Co. of America.)

Capital Increases

Radio Craft Co., Brooklyn, \$10,000 to \$800,000.
Home Radio Corporation, \$10,000 to \$35,000.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and exhibitions. Keep us posted by mailing full information.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 4 to 22. U. J. Hermann, managing director, 549 McCormick Building.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31, Company, Fisk Building, New York, N. Y.

TRI-STATE TOBACCO GROWERS' RADIO SHOW, Covington, Ohio, October 21 to 23, inclusive.

INTERNATIONAL RADIO SHOW, Madison Square Garden, New York City, November 20 to 25, inclusive. E. C. Buchignani, director of publicity.

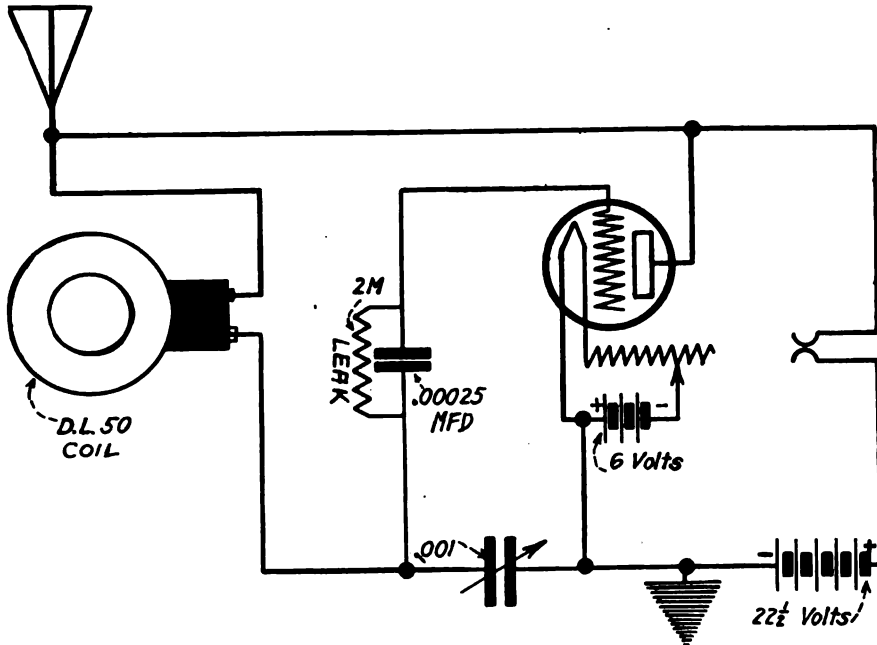
SOUTHEASTERN RADIO EXPOSITION, Auditorium Armory, Atlanta, Georgia, December 4 to 9, inclusive.

Jump in Radio Sales

ALFRED FANTL, financial writer for "The Tribune," New York, one of the close observers of commercial conditions in the United States, published the following in his department last week:

A sudden and large jump in radio sales occurred during the week, when many department stores sold as much in a single day as they had previously disposed of in the course of one week. The impetus, while in part due to fall revival of interest in radio, owes much of its suddenness to the enterprise of the press in reporting the world series via the air—a demonstration of radio's practical utility which could have no more susceptible portion of the public for the making of an impression at once instant and profound.

New Circuit for Experimenters



The above schematic diagram is a hook-up of a single-coil receiver. It is the work of Mr. W. Miller, Southern Methodist University, Dallas, Texas. The amateur who delights in experimenting should give this circuit a trial. A duo-lateral coil, No. 56, is inserted between the aerial and the ground. The grid condenser and leak are connected in the circuit of the coil and ground. The plate circuit is brought to one side of the aerial and, also, to one side of the telephone jack. Careful adjustment of the set is necessary. Radio World requests all amateurs experimenting with this circuit to make a report to its Technical Editor as to its receiving qualities as well as to the distance secured.

Facts You Should Remember About "Litzen Draht"

THE advantage of *litzen draht*, a wire made in Germany, for winding inductances with a very low resistance and having a large surface, is recognized. This wire is composed of a number of enameled copper magnet wires separately insulated from one another, and braided, the whole covered by a single-braided silk wrapper. *Litzen draht* is employed in research laboratories and particularly where high efficiency is required.

The following describes the number of wires, the size, and the number of feet per pound. These facts are of vast importance to every amateur.

4 Wires, No. 28 B&S (Brown & Sharpe gauge), made up in 4 strands of 6 wires each, enameled, with silk wrap. The strands are cabled around a hemp core and the whole covered with 2 wraps of green or white silk, 3835 C.M. (circular mill), No. 14 B&S; approximately 90 ft. to the pound.

30 Wires, No. 36 B&S, made up in 3 strands of 10 wires each, cabled and served with 2 wraps of silk, 750 C.M., No. 21 B&S; approximately 332 ft. to the pound.

90 Wires, No. 38 B&S, made up in 10 strands (3x3), enameled, with one wrap of white silk, 1415 C.M., No. 19 B&S; approximately 225 ft. to the pound.

48 Wires, No. 38 B&S, made up in 6 strands of 8 wires each, enameled, cabled with 2 wraps of natural, black or green silk, 775 C.M., No. 21 B&S; approximately 415 ft. to the pound.

48 Wires, No. 38 B&S, made up in 8 strands of 6 wires each, enameled, with 2 wraps of natural, black or green silk, 775 C.M., No. 21 B&S; approximately 415 ft. to the pound.

10 Wires, No. 38 B&S, enameled, stranded, with one wrap of silk 155 C.M., No. 28 B&S; approximately 1600 ft. to the pound.

20 Wires, No. 38 B&S, enameled, strand-

ed, with one wrap of silk, 310 C.M., No. 24 B&S; approximately 800 ft. to the pound.

120 Wires, No. 40 B&S, made up of 3 strands of 40 wires each, enameled, with 2 wraps of black silk over all, 1200 C.M., No. 19 B&S; approximately 250 ft. to the pound.

32 Wires, No. 38 B&S, 4 strands of 8 wires each, enameled, with 2 wraps of black silk, 500 C.M., No. 21 B&S; approximately 605 ft. to the pound.

48 Wires, No. 38 B&S, made up in 3 strands of 16 wires each, enameled, with 2 wraps of natural silk, approximately 400 ft. to the pound.

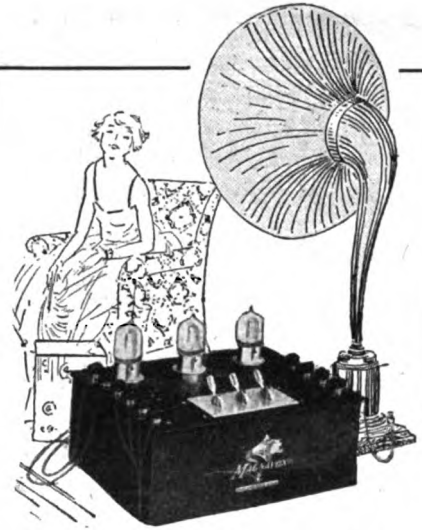
10 Wires, No. 40 B&S, stranded with 2 wraps of colored silk, 99 C.M., No. 30 B&S; approximately 3000 ft. to the pound.

162 Wires, No. 38 B&S, made up in 18 strands of 9 wires each, enameled, cabled, with 2 wraps of green or white silk, 2250 C.M., No. 16 B&S; approximately 125 ft. to the pound.

36 Wires, No. 38 B&S, made up in 6 strands of 6 wires each, enameled, cabled and served with 2 wraps of green or white silk, 566 C.M., No. 22 B&S; approximately 500 ft. to the pound.

Cleaning Files

MANY amateurs experience trouble when they attempt to use a file on some of the softer metals, such as lead, aluminum, copper, says "The Mail" New York. This is due to the metallic particles clogging the teeth of the file, thus rendering them ineffective in cutting the metal. In some cases the metal particles clinging to the file will scratch the object being filed, making a rough surface. This difficulty can be overcome by rubbing the surface of the file with ordinary stick chalk, such as is used for writing. The presence of the chalk on the surface of the file and in the crevices between the teeth is to prevent the filings from sticking and filling up the cutting surface. This same result can be obtained by dipping the file into hot water.



For best results equip your Magnavox Radio with

Magnavox Power Amplifier

THIS apparatus has been placed on the market in response to many requests for a power amplifier giving distortionless amplification of music and voice, previous amplifiers having been developed for signals only—where distortion does not show.

To accomplish the desired purpose, the Magnavox Power Amplifier had to be especially designed, and internal circuits, grid potentials and amplifying transformers are entirely different from those in other amplifiers. Any of the standard tubes can be used.

The use of the Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Radio. Switching from stage to stage is made easy by master switches, as illustrated.

Brushed bakelite panel, mahogany case, without tubes or high voltage batteries.

3-stage, AC-3-C, Price...\$110.00

2-stage, AC-2-C, Price... 80.00

The Magnavox Power Amplifier, Model C, was designed for use especially with the Magnavox Radio, and is made with the same insistence upon high quality and efficient service.

Magnavox products can be had of good dealers everywhere.

The Magnavox Company

Oakland, Cal.

New York Office, 378 Seventh Avenue

Q S T
RADIO FANS
 Perfection in Radio
 Headsets attained in
"ECHO HEADSETS"

give clear, distinct tones, reproduce perfectly the most sensitive radio signals in music, speech and code.



No matter how perfect or expensive your apparatus; no matter how strong or perfect the waves; without "ECHO HEADSETS" your results cannot be perfect. We ship phones the day your order arrives. Every pair tested, matched and guaranteed as sensitive as the most expensive headsets made.

Sold with money-back guarantee.

Sent C. O. D. by express, who will hold money for 48 hours' trial, if not satisfied express company will return money.

S. Pearson RADIO Co.

142 Maple Street
 Richmond Hill Long Island, N. Y.

Every Member of a Radio Set Is an Auxiliary Policeman

IT is announced that arrangements have been made to equip the metropolitan police force with a comprehensive radio outfit. This is the happening of the expected—not to say the inevitable, says Henry Smith Williams, in "The American," New York. Radio has such obvious possibilities as a police agency that its use in this field must become universal.

Already important beginnings have been made. Out in Chicago, for example, the police department has been using radio-equipped automobiles for some time. Patrol wagons have been equipped, experimentally, with wireless outfits that keep them in touch with headquarters at all times. It is reported that perfect communication has been established, the tests being satisfactory in every way.

When a crime or disorder is reported to headquarters by ordinary telephone, word can at once be flashed by radio in every direction and a universal alarm given in a fraction of the time previously required. The entire police force might thus be on the lookout for a criminal attempting to escape in an automobile, and the probability of interception of the fugitive enhanced enormously.

An obvious difficulty that suggests itself is that the ether may be vibrant with other messages. Broadcasting stations, for example, are busy at almost all hours of the day, to say nothing of commercial and amateur stations.

The difficulty is to be met in New York—and doubtless the same expedient will be adopted elsewhere—by allotting to the police department a special wave length that is not to be used by any other radio station in the vicinity.

The wave selected for the metropolitan district is 400 meters. It remains to be seen whether messages on this wave-length will interfere with the 360-meter wave used in general broadcasting. If it does, a larger wave, perhaps 500 meters, will be employed.

With radio-receiving telephones of the newer type, equipped with loose-couplers and condensers for accurate tuning, there should be no difficulty in shutting out the police messages, or vice versa. But less elaborate sets, not being able to tune sharply, may mix up concert and lecture with reports of robberies and murders in distracting fashion. But at worst this will serve as an incentive to the radio fan to improve his apparatus.

Meantime, every owner of a receiving radio set becomes potentially a member of an auxiliary police force.

Radiofacts

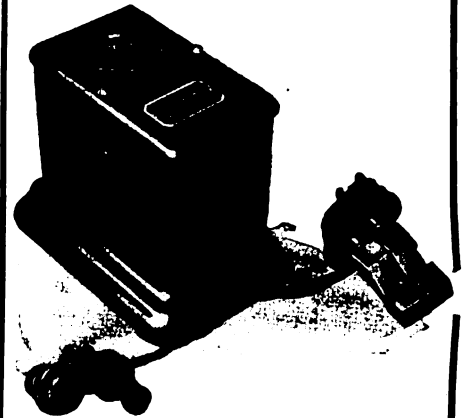
Transmitting sets are essentially the same as receiving sets with the exception that they must have a source of power, and of course the apparatus must be so designed that it will carry this power.

The microphone is the most important electrical mechanism in the transmitting studio. It plays a part similar to the transmitter of the ordinary telephone by picking up sound waves, causing the diaphragm to vibrate and create corresponding changes in the current flowing through the circuit.

The capacity of a storage battery is governed very largely by the quantity and quality of lead and oxide of lead used in its construction.

Two things must happen to the radio frequency currents before they get to the phones. 1st—They must be allowed to move the diaphragm of the telephone. 2nd—They must move it at audible frequencies—below, say 4,000 cycles per second which is the top note on a piano.

Reliable and Beautiful
RADIO-A
RE-CHARGER



THE RADIO-A is a highly efficient dependable piece of apparatus, absolutely fool-proof, easily attached by simply plugging into ordinary 110 volt lamp socket. In case of current failure, the unit cuts out automatically until current is resumed, without discharging battery.

It is designed expressly for re-charging radio filament batteries, but may be used for automobile or any other storage battery of reasonable size and capacity.

Price, \$18.50

Dealers and Distributors

Here's a Winner! Write us for full particulars.

Simply screw into any 110 volt lamp socket and connect the terminals to your battery. Impossible to hook-up wrong—RADIO-A charges either way.



A compact portable Re-charging Unit that will fully charge a 100 A. H. Battery overnight, for from 5c to 10c, according to prevailing rates.

LAST A LIFETIME

King Electric Mfg. Co., Inc.

1681 FILLMORE AVENUE
 BUFFALO, N. Y.

35c each, 3 for \$1.00

NA-ALD
 GENUINE CONDENSITE
 DIAL


The dial that runs true. Numerals engraved on bevel and knob so shaped that fingers do not hide them. Thin edge with clear graduation make accurate reading easy. Concealed set screw in metal insert. Will not warp or chip. Finish and enamel permanent.

3" dial 35c
 2 1/4" dial for rheostat potentiometer 35c
 3 1/2" dial 75c

Send stamps for complete literature.

ALDEN - NAPIER CO.
 52 Willow St., Dept. L. Springfield, Mass.

If you did not get copies of Radio World No. 1 to No. 26, send us \$3.00. Or we will send you this paper for one year, (\$6.00 for 52 issues) and start it with our first issue, which will be mailed you as soon as possible after receipt of order.



**NA-ALD
SMALL SPACE
V. T. SOCKET**

35c each, 3 for \$1.00.
Moulded genuine Celconite.
Requires but small space
for mounting. Readily ac-
cessible binding posts. No
excess metal to interfere
with efficiency. Unaffected
by heat of bulbs or soldering iron. Phosphor
brone contacts. Nickel plated brass binding
survive. Slash out slot. Price possible because
of large production.

Special proposition for
dealers and jobbers.

ALDEN-NAPIER CO.
Dist. L.
52 Willow St. Springfield, Mass.

**FOR SUCCESS
WITH THE
ARMSTRONG
SUPER
REGENERATIVE
CIRCUIT**



which requires constant
fixed capacities of .005
and .0025 m. f. d. use

MICON
Tested Mica Condenser

the only guaranteed noiseless condenser of absolutely
constant capacity. Made in .005 and .0025 m. f. d.
capacities, especially for this circuit. It may be had
in all sizes from .000025 to .01.

Our special process eliminates any possibility of error
in capacity or loose plates. This renders MICON
absolutely noiseless, which is essential with the Arm-
strong Circuit.

MICON .0025 m. f. d. \$0.50
MICON .005 m. f. d.75

If your dealer can not supply you, send us his name
and \$1.25 and receive the two MICONs postpaid,
and a complete circuit diagram of the new ARM-
STRONG Super-Regenerative Circuit absolutely free.

CHAS. FRESHMAN COMPANY, INC.
Sole Manufacturers
290 Hudson Street New York City

are broadcast. The stations listed by the Navy League to date are: The four Westinghouse stations, Springfield, WBZ; Newark, WJZ; Chicago, KYW; and Pittsburgh, KDKA; General Electric, Schenectady, WGY; Detroit Free Press, WCX; Southern Radio Corp., Charlotte, WDT; Richmond-Crosby, Memphis, WKN; St. Louis Post Dispatch, KSD; Tulano Univ., New Orleans, WAAC; The Times Union, Jacksonville, WDAL; Reynolds, Denver, KLZ; Spokane "Chronicle," KOE; "Desert News," Salt Lake, KZN; Kansas City "Star," WDAF; Atlanta "Journal," WSB; Dallas "News," WFAA; Oakland "Tribune," KLX; Great Falls "Tribune," KDYS; Honolulu "Star-Bulletin," KDYX.

Listening-In Association Formed

A DECIDED increase in popular interest toward radio is promised. The larger broadcasting stations have installed more elaborate transmitting apparatus and equipment; all stations have profited by their experiences the past few months. Listeners-in will increase in number. All listeners-in—dependent as they are on the nature and variety of broadcasts for their entertainment, and on the quality of the receiving apparatus used—would desire naturally a medium for the exchange of their views and comments.

The National Radio Listeners-in Association of America is an organization formed in Washington without capital and with no commercial interest. Its object is to encourage cooperation between operators of broadcasting stations and the greatly increasing numbers of listeners-in included in the term "general public."

The bi-monthly meetings have satisfactorily affected changes in such matters as increased range, improved modulation and details of performance pertaining to individual artists appearing on programs.

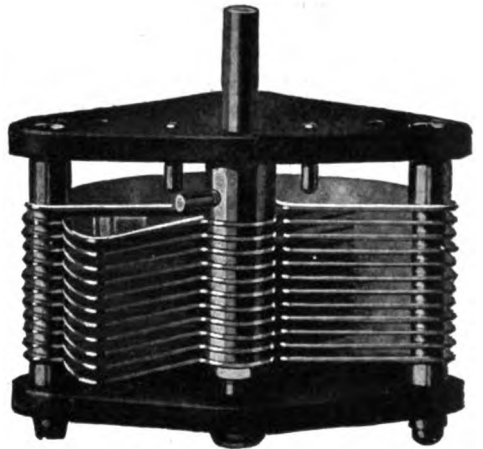
First results noted locally, encourage the members of the association to suggest similar action in other communities, welcoming any request for assistance and seeking helpful suggestion.

Comment or suggestion in the interest of the public and radio are cordially invited.

The officers of the new association are: L. C. Hedges, president; James W. Cook, vice president; O. J. Hodge, chairman, board of critics; M. D. Meyerson, chairman of publicity; H. W. Ennes, corresponding secretary; William A. Eaton, treasurer.

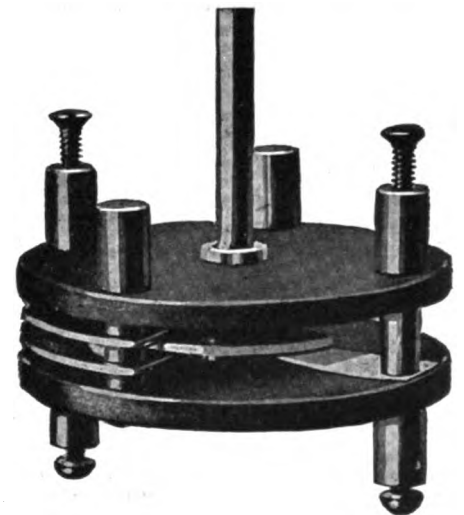
Address: 901 Varnum Street, N. W., Washington, D. C.

**"RADIO"
VARIABLE
CONDENSERS**



These condensers are the Standard of Quality. Carefully tested, inspected, balanced and adjusted to give maximum satisfaction.

- 3 plate Vernier \$1.50
- 23 plate 4.00
- 43 plate 5.00



Sent prepaid on receipt of price. Special discounts to Radio Clubs.

Jobbers and Dealers write or wire for the biggest proposition in Radio—TODAY!

**FREDERICK H. PRUDEN
INCORPORATED**
LERNER BUILDING
903 Bergen Ave.
JERSEY CITY, N. J.

Twenty-One Stations to Broadcast Navy Numbers

IN co-operation with the Navy League, 21 broadcasting stations will include special Navy numbers in their programs on Navy Day, Friday, October 27. At some stations, speakers will narrate on the history and the prowess of our Navy; at others, Navy musicians and vocalists will render musical selections, while a few will broadcast programs now kept secret in order to surprise the listening radio enthusiasts. The only government station on the list is the well-known NOF, at Anacostia, where most of the governmental programs, including the famous Marine and the Washington Navy Yard Band Concerts

YOUR NEWSDEALER

will deliver RADIO WORLD to your home. In order to be sure of getting RADIO WORLD regularly, and of not missing a single issue, we suggest that you either subscribe direct or through your newsdealer at \$6.00 a year (12 issues) \$3.00 six months, and \$1.50 three months. Or instruct your newsdealer to deliver RADIO WORLD regularly to your home each week. Dealers will take standing orders and make deliveries of paper whenever requested. Radio World, 1493 Broadway, New York.

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD

1493 Broadway, New York City.

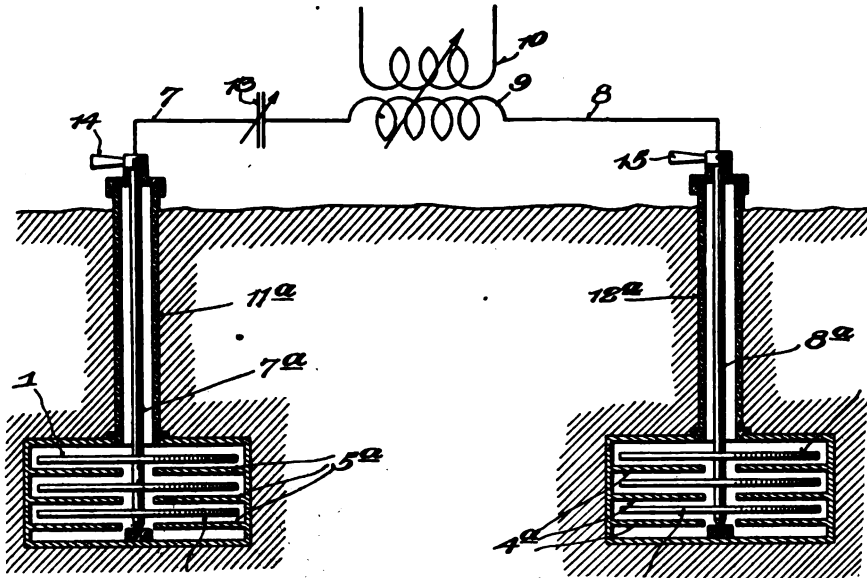
Please send me RADIO WORLD for months, for which

Please find enclosed \$

SUBSCRIPTION RATES:

- Single Copy \$.15
- Three Months 1.50
- Six Months 3.00
- One Year (12 Issues) 6.00
- Add \$1.00 a Year for Foreign and Canadian Postage.

Radio Patents



Schematic diagram showing a modification of the ground antenna of the Hanson-Jones invention, with means for varying its capacity constant.

Underground Antenna

No. 1,429,240. Patented, September 19, 1922. Patentees: Earl C. Hanson, Washington, D. C., and Edward F. Jones, New Orleans, La.

THE object of this invention is to provide an underground, or subterraneous, antenna-system applicable for installation within a limited area; also, to provide for varying the consonants of the antennae by directly modifying the capacity of the antenna collectors.

Experiments have determined that under-the-earth antenna construction, such as Mr. Hanson has devised, possesses feature of distinct advantage over underground systems heretofore employed. The concentrated capacity-area gives the same effective antenna-surface as long, buried single-wire conductors, and gives substantially the same signal energy as the long, buried conductors. It has been found that placing the capacity antenna areas a distance of, approximately, fifty feet apart, radio signals have been received from considerable distance and at high audibility.

Radio waves progressing in the earth's crust will induce a charge on the antenna capacity-areas due to the electrostatic component of the radio wave

and the antenna circuit will oscillate due to the phase relation of the charges impinging upon the capacity areas. Under certain conditions, satisfactory results are obtained by using smaller antenna capacity-areas and, therefore, the variable antenna capacity-system may be utilized for a wide range of wave lengths. Where stations are required for operation on predetermined wave lengths definite capacity areas may be employed. However, where it is necessary for stations to communicate with numbers of stations operating at various wave lengths the means may be used to change the effective area of the capacity to obtain syntony with the cooperating station.

In the practical operation of the Hanson system, it may be found advantageous to have the antenna capacities placed directly beneath the station and allow the rotating handles of the variable antenna-capacities to project through the floor so as to enable the operator to readily control the capacity values for various wave-lengths. The system is not limited to operation over only a small band of wave lengths, but is applicable for long-wave operation such as is employed by high-power oceanic stations.

ing stage. The invention, in many of its aspects, is equally applicable to the amplification of signals in any order of frequency.

A further object of the invention is to increase the amplification to telephone currents, or to carrier currents, over that obtainable by the usual vacuum-tube amplifying circuits, by the use of feedback circuits.

In general, the invention consists in the modulation of an alternating current, of a frequency, say, of 1,000 cycles per second or higher, by the incoming signal impulses, the amplification of the modulated alternating current and the demodulation of the amplified current.

* * *

To Prevent Loss of Energy

No. 1,429,453. Patented, September 19, 1922. Patentees: Harold J. Power, Somerville, Mass.

HAROLD J. POWER, vice-president of the American Radio and Research Corporation, Medford Hillside, Massachusetts, has been granted letters patent on an inductance device which should prove useful in that important phase of radio. In certain electrical current carrying instrumentalities, of

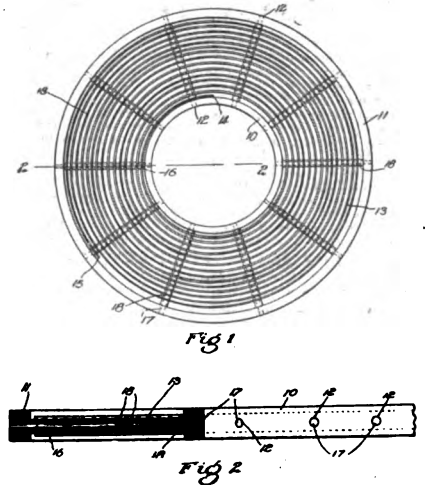


Figure 1 is a top plan view of an inductance device arranged in accordance with my invention, and Figure 2 is an enlarged vertical section on the line 2-16 of Figure 1. At 10 and 11 are shown inner and outer supporting members of any suitable insulating material.

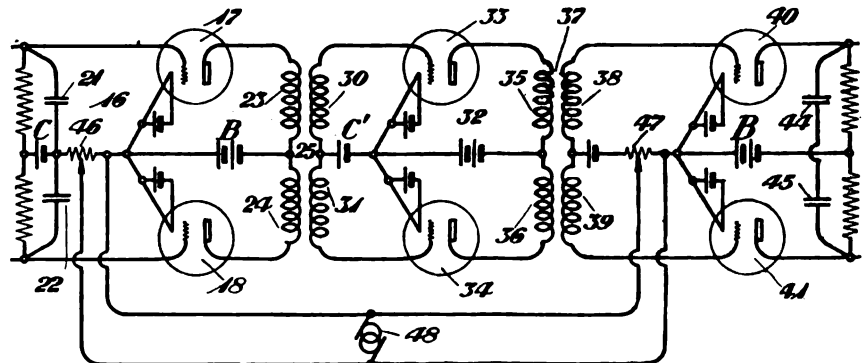
which inductance devices furnish an example,—and especially those employed in connection with such high-frequency currents as are present in wireless or radio installations—it is important to prevent the loss of energy from the conductors through their insulating supports, and to so compactly arrange the devices that little space is occupied and, further, so that two or more of the devices may be brought into close relation to produce a mutual effect.

Low-Frequency Amplifier

No. 1,428,154. Patented, September 5, 1922. Patentees: Lloyd Espenschied, Hollis, N. Y.

THIS invention relates to the amplification of low-frequency signals, such, for example, as ocean cable, telegraph signals or those emanating from the propeller or engine noises in submarine detection. Such signals have a large, or predominating, direct current or very low-frequency component which is not transmitted or inefficiently transmitted through the ordinary repeating coils used in the local circuits of thermionic amplifiers. An object of the present invention is to provide an arrangement for amplifying signals of this character which will amplify all low frequencies, including the direct current, without the necessity of a metallic connection between the successive stages of the amplifier and without the

attendant difficulty of preventing the output battery of one stage from affecting the input circuit of the succeed-



Schematic diagram of Mr. Espenschied's low-frequency amplifier.

Cut Out This Radio World

Do you like clear tone—sharp and distinct—If so try

MARSH'S

Vernier Variable Condenser, Capacity .00057 to .00078 mfd.

Fully Guaranteed

This 23 plate condenser lists at \$9.50. To place before the Radio audience a limited number will be sold at \$4.75. Complete—Dial Knob and Screws.

F. P. Marsh, 145 Nicholl St. New Haven, Conn.

To F. P. Marsh, 145 Nicholl St.

New Haven, Conn., U.S.A.

Ad and Mail with \$4.75

Radio Will Write History

ACCORDING to Mr. Lloyd Jacquet, A writing in the "Evening Mail," New York, history will be written during the three weeks from December 12 to 31, by the members of the American Radio Relay League, when the second attempt will be made to "speak" across the Atlantic Ocean. During that period, writes Mr. Jacquet, we "shall probably see amateur radio assuming international proportions."

A series of preliminary tests for the purpose of determining what American and Canadian transmitters shall be given a place in the final tests with an individual schedule and code letters, will be conducted from October 25 to November 3, inclusive. To qualify for the final tests a transmitter must cover a distance of at least 1,200 air line miles during the preliminary tests.

The preliminary tests will cover a period of two and one-half hours (9.30 p. m. to midnight, central standard time) which is divided into ten periods of fifteen minutes each. Transmission will take place by inspection districts. One district transmits at a time, and all others remain silent endeavoring to copy as many of the transmitting stations as possible. After the tests each night, the receiving stations are to send a confirming record to all transmitters heard at a distance of 1,200 air line miles or over.

When filing application for entry in the final tests, a transmitter shall include at least one 1,200-mile record, or show documentary evidence that its signals have reached out 1,200 air line miles during the months of September or October.

The amateurs who succeeded in being heard in Ardrossan, Scotland, where the official listening post was installed, constitute a memorable and historical list. They were:

Spark stations—1 AAW (not yet located). 1 ARY, Burlington, Mass. 1 BDT, Atlantic, Mass. 2 BK and 2 DN, Yonkers, N. Y. 2 EL, Freeport, L. I. 3 FB, Atlantic City, N. J. 8 BU, Cleveland, O. 9 ZJ, Indianapolis, Ind. 3 BP, Newmarket Ontario.

United by Radio

A remarkable incident was credited to radio when two old army pals were united and an old debt "paid in full," through WGI, the high-powered broadcasting station of the American Radio and Research Corporation, Medford Hillside, Massachusetts—adds one more laurel to her long list.

When Professor Connor, of Emerson College, Boston, gave a reading by radio from WGI, last week, he was not aware that among his audience was a man he had been seeking for over three years, a pal of his army days. They had parted at the Army Hospital, Staten Island, New York, and had gone their separate ways without an opportunity to strike hands in parting. Neither had heard of the other until Sergeant Kepple, listening in at Wilkensburg, Pennsylvania, to the radio program from WGI, heard the voice of his army chum with the result that the following night-letter was received by Mr. Connor the next morning:

Professor Joseph E. Connor, Mansfield, Massachusetts.

Been trying to locate you since discharged from Army. Last night heard your radio readings. Am sending postal order amount one hundred dollars paying your kind loan at Army Hospital, Staten Island. Many thanks, old son-of-a-gun. Didn't know you were professor. Would have borrowed two hundred. Your erstwhile sergeant,

KEPPLE.

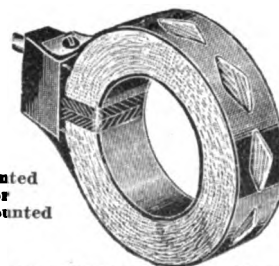
Professor Connor says he is going to use the hundred dollars for expenses to Wilkensburg to visit Sergeant Kepple.

OUR SPECIALS

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IT WILL PAY TO BUY NOW

Armstrong Super-Regenerative Complete Parts



Mounted or Unmounted

Complete Plugs for Coils 50c

DUO-LATERAL COILS (Unmounted)

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- DL 1250\$1.35
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Complete, with leads.....\$2.50

VARIOCOUPLER

Special, good type.....\$4.50

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.001 Mfd., 3 at ea.....\$2.55

FIXED CONDENSERS

- Best Mica, .005 Mfd.....40c.
- Best Mica, .0025 Mfd.....40c.
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B BATTERIES

- Best Guaranteed, 22 1/2 V.....65c.
- Large size, 22 1/2 V.....\$1.85
- 45 Volt\$2.25

SOCKETS FOR VACUUM TUBES

- Bakelite Base.....60c.
- Murdock50c.
- Amrad35c.

VACUUM TUBES

- UV 200\$5.00
 - UV 201\$8.50
- A 10% Discount is Allowed on Tubes

RHEOSTATS

6 ohm, with Moulded Knob.....50c.

CONTACT POINTS and STOPS

- Best grade nickel, with brass nut.....10c. doz.
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- Fine Moulded type for Rheostat.....50c.
- Large Moulded type.....75c.
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EXIDE STORAGE BATTERIES

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Fits any phonograph and phone.....75c.

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- Federal, 2200 Ohms.....\$5.00
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SAMPLE SETS AND PARTS, slightly shop-worn, some like new, on our BARGAIN TABLE. CALL and INSPECT.

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Contact strips of laminated phosphor bronze press firmly against contact pins, regardless of variation in length. No open current trouble possible. Socket moulded from genuine Condensite. Practically unbreakable. Special protected die, with exterior reinforcement. Unaffected by heat or bulbs or soldering iron. All excess metal eliminated, aiding reception. May be used for 5 Watt power tube. Highest quality throughout. Price, 75c. Special proposition for dealers and jobbers.

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Here's a Saving for Your Customers

The "Suneco" Adapter

enables them to use the Aeriotron WD-11 dry cell tubes in any socket without re-wiring.

Eliminates the storage battery.

Send for circular W containing full description. Your customers will want this.

Sun Equipment Company
67 Exchange Place New York

Guaranteed 2500 Ohm Head Set



\$4.75 Complete

Attractive discount to manufacturers, jobbers and dealers.

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23 Springfield Avenue Newark, N. J.

CRYSTAL SET \$4
 "THE LITTLE WONDER"
 \$2.50 UNMOUNTED

Wonder in name and a wonder in performance. Cannot be equalled for the price. Catches distinctly everything within 25 miles.

Send for FREE catalog, describing our "Little Wonder" set and listing radio supplies.

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 ELECTRIC SUPPLY CO.
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UNIT RADIO SETS

Our sets approved and installed in Borough President's Offices of Queens, New York City.

PRICE and QUALITY our premier consideration

Detector Units.....	\$6.00 to \$13.00
Amplifier Units.....	13.00 to \$9.00
Tuner Units.....	15.00
Detector and 1 Step.....	26.66
Detector and 2 Step.....	39.00
Detector and 3 Step.....	52.00
Tuning Unit Detector and 2 Step.....	62.00

Dealers write for proposition
 Immediate Delivery

American Radio & Electric Co.
 1133 Broadway, New York City

TUNE IN DISTANT STATION

F. R. S. Complete Two-Stage Long Distance Receiver

Set includes two Federal Transformers Condenser, two variometers, variocouplers, three V. T. sockets, filament rheostat, dial, Read 'Em binding posts, switch points; in attractive cabinet and drilled panel; complete, ready to hook up. A \$125 Radio. **\$40**

F. R. S. All-Wave Combination

Molded Variometers.....	\$6.00
Molded Variocouplers.....	\$5.00
Molded Bank Winding.....	\$5.00

Bank winding is interchangeable for use with other Variometer or Variocoupler.
 This is the only all molded universal combination giving five units in three.

F. R. S. RADIO CORP.
 409 East Fort St. Detroit, Mich.

NOVO "B" BATTERIES FOR RADIO

22½ - 45 & 105 VOLTS

NOISELESS DEPENDABLE GUARANTEED

ASK YOUR DEALER

NOVO MANUFACTURING CO.
 424-438 W. 33rd ST. NEW YORK

531 SO. DEARBORN ST., CHICAGO.

Creed System to Speed Up Code

RADIO code-communications from ships and land stations, which radiophone users frequently hear as they tune in the broadcasting concerts, are transmitted by hand, generally at a speed ranging from twenty to thirty words a minute, says "The Times," New York. Since the early days of wireless various methods of automatically recording messages at high speed have been developed in order to facilitate the clearing of heavy traffic in the shortest time possible, especially between long distant points. The high-powered trans-Atlantic transmitters and receivers are in constant operation, day and night, handling the hundreds of radiograms and press reports between Europe and the United States. To use a speed of thirty or even forty words a minute would require many hours to get the latest press news and business messages across the sea. One of the latest methods of speeding up radio communication is know Creed system, which is applicable at the present time for commercial work at a speed of 180- words a minute.

One of the greatest problems in the operation of printing or recording radio apparatus is the necessity of accuracy of the signal form; that is, the duration of the dots and dashes. The accuracy required for mechanical or automatic receiving must be carried to a much higher degree than if the reception is through a headset and the human ear, and more particularly so when high telegraphic speeds are used. For the operation of the high-speed mechanism it is necessary to insert a mechanical relay between the valve circuits. A relay in this case is an instrument actuated by the radio currents after they are amplified to sufficient strength to cause the relay to operate and control other instruments in the circuit. The new relay used in connection with the Creed system was developed in England and has features which overcome many of the difficulties and deficiencies existing in mechanical relays. Its salient points are: stability of adjustment, firmness of contact, pressure and absence of rebound, sensitivity, shortness of transit time and ability to work at high speeds.

In connection with the Creed system the signals are transmitted in the ordinary continental Morse code. The impulses are picked up by the antenna, wires are passed through special vacuum tube amplifiers which build up the signal strength sufficiently to actuate the relay, capable of following the dots and dashes perfectly up to 200 words a minute with a current as low as one-quarter milliampere. The relay in turn operates a perforator which punches the dots and dashes on a paper tape. This tape is run through an automatic typewriter which records the messages in print on another tape. The new features of this relay are ability to follow at high speed and at the same time work with entire fidelity on such a feeble current. The inertia of all the mechanical parts as well as the electrical magnetic circuits have been so finely calculated that the maximum efficiency, theoretically possible, is produced.

That Armstrong Circuit

So much interest has been displayed in the special article "TESTED INVENTION OF MAJOR ARMSTRONG AMPLIFIERS SET 100,000 TIMES," by John Kent, that appeared in RADIO WORLD No. 13, dated June 24, 1923, the publisher decided to put aside a number of copies for those who were not able to get this issue when published. Copies will be sent, postpaid, on receipt of 15c. or send in your subscription, \$6.00, for one year (52 issues) \$3.00 six months, or \$1.50 three months, and subscription will be started with the issue containing the article about Major Armstrong's Amplifier.—RADIO WORLD, 1498 Broadway, New York.

AGENTS

Wanted in every city and town to sell radio apparatus. Good commissions. A few stocking agencies open to reliable parties.

DELANCEY, FELCH & COMPANY
 13 Meeting St. Pawtucket, Rhode Island

GOING—and Going Fast

We have only a few left and they are going fast, but while they last we will continue to sell them at the reduced price.

VT 1 Detector and Amplifier.....\$7.50
 VT 2 Detector and Amplifier.....\$8.00

The above tubes are the genuine army J's and W's, respectively.

"RADIO BUILDER" PLANS FREE!
 By Mail, 5c.

LIBERTY RADIO CO.
 106 Liberty Street New York City

Radio Supplies

Variocouplers, Variometers, Headsets, Transformers, Sockets, Rheostats, Etc.

Guaranteed Crystal Set \$4
 25-Mile Or Money Refunded PRICE,
 Send fifty cents for 20 efficient blue-print hook-ups.

Any Radio Set Made to Order or Repaired

Sunbeam Electric Co.
 71 THIRD AVE. NEW YORK

"MIRAD"

"Quality Radio Priced Right"

3 Plate Variable Condensers.....	\$1.50
Mirad Variocouplers.....	3.75
2000 Ohm Double Head Phones.....	6.00
1500 Ohm Single Head Phone.....	3.00
(Money back guarantee.)	
Mirad 23 Plate Condenser.....	3.95
Mirad 43 Plate Variable Condenser....	4.95
Mirad Detector Unit.....	26.00
Mirad Two-Step Amplifier.....	26.00
Postage Paid	

Dealers' Sample of Above 25% OFF

Miracle Radio Mfg. Co.
 INTERURBAN BLDG., DALLAS, TEXAS

PHONOTACH

Makes Your Phonograph a Radio Loud Speaker

(Trade Mark)
 Adjust it in a minute.



Patent applied for

A New and Better Loud Speaker
 at a very low cost

The PHONOTACH connects the receivers with the tone arm of your phonograph.

Utilizes the scientifically designed tone amplifier of the talking machine to secure mellowness and beauty of tone.

Price only \$2.00
 Send for one today—At your dealer, or by mail.

W. A. MILLS
 103 Park Ave., New York, N. Y.

The "Why" of the Farmer's Happy Life

FER years an' years th' most serious drawback t' farmin', next t' th' hard work an' element o' chance, has been that it isolates a feller an' keeps him out o' touch with th' affairs o' th' world.

Fer many years most farmers had t' manage t' git along fer weeks an' months without hearin' from th' outside world.

It wuz hard fer 'em t' remember who th' president o' th' United States wuz, an' they didn't know whether ther friends an' relatives wuz dead or alive unless a letter or newspaper wormed thro', or by chance they got t' town.

Then come th' telephone an' rural free delivery, an' th' farmer wuz fairly able t' keep a line on his relatives, European affairs, and th' price o' eggs.

Then th' automobile bobbed up an' is a big factor t' day in bringin' th' farmer's relatives t' his very door, an' also in whizzin' him an' his family t' town for a band concert or a hall show.

But drivin' t' town ever' night, or havin' th' home full o' relatives soon gits t' be a chestnut, an' besides it eventually runs into money.

We believe that next t' th' harvestin' machine an' a pump in th' kitchen th' best an' so fer th' cheapest thing that's happened fer th' farmer in many a day is th' invention o' th' radio 'phone.

The' radiophone's performances already have proclaimed th' end o' isolation. Th' farmer no longer has t' drive t' town, or entertain a house full o' hungry relatives, or depend on a day-old newspaper fer his news o' th' outside world.

Th' seas an' lakes an' continents, burnin' deserts, frozen wastes, an' mountain peaks, have all been over passed.

Th' farmer an' his family may now know when a car is stolen from in front o' th' courthouse, or when a schoolhouse is burnin' up, or when a treaty is signed, as soon as th' ether waves kin deliver th' news t' ther vocal loud, or speech amplifier.

After a hard day o' toil th' farmer, without even changin' his collar, or rollin' down his sleeves, kin tune in an' take his pick out o' ever' thing in th' air.

An' all about him sits his family t' hear what's goin' on in th' world in th' way o' news, singin', music, an' oratory.

If they tire o' th' 'Wabash Blues,' they kin tune in a lecture on onion culture, or th' treatment o' hog cholera, by some expert in Detroit.

Maybe he kin pick up a saxophone solo from Hurley, Wisconsin, or a bagpipe sextette from fer-away Scotland.

Maybe his congressman is sendin' out words o' cheer, or there is a fire in town.

It's no uncommon thing t' jest innocently tune in on a fine helpful sermon from Pittsburgh, or Wheelin', an' it's no trouble t' tune off o' it.

But ther's no longer any excuse fer folks that are imprisoned on remote farms t' git behind on th' affairs o' th' world—not t' be able t' whistle th' latest airs, t' know when th' President misses a chance to play golf, t' keep track o' th' bonus bill, an' all th' latest gossip about prosperity.—Abe Martin in "Farm Life."

Experienced Stage-Fright When Broadcasting

WHEN the red light is turned on you'll know 'you've got the air,' said Herbert S. Houston, publisher of Our World, on his return to New York from a trip West, to the Advertising Club News. "This was the signal," he went on to say, "for my first experience in broadcasting an address. It was in the big radio station of the St. Louis 'Post-Dispatch' and I was broadcasting an address on 'What Europe Means to the Mississippi Valley.' I think I can truly say that the only time I was ever

seized with stage-fright was this particular time when I wasn't on the stage—but instead, talking through a microphone to a vast invisible audience.

"A few minutes after I concluded my address a telephone bell rang and an attendant said that I was wanted on the phone, much to my surprise. George Burbach, the advertising manager of 'Post-Dispatch,' had called in from many miles out in the country to say that he had just heard my radio address and that he heard every word distinctly and perfectly. It all seemed most marvellous—even in this age of marvels—that one could broadcast an address by radio and then be called on the long-distance telephone to be informed that the address had carried across."



Patent Applied For

SOMETHING NEW!

Variable Condenser Built Right

Made in the most popular sizes, with aluminum plates, cast end brackets, with a 1" diameter Bakelite bushing therein. (A perfect insulator high in dielectric strength). Dealers write for discounts. Ask to see our Rheostat and Vacuum Tube Socket.

LOMBARDI RADIO MFG. COMPANY

67-71 Minerva Street, Derby, Conn.

P. O. Box 44



Hard Rubber Composition PANELS

Conform to Navy Specifications

A High Resistance Panel, Guaranteed Not to Warp, and Drilled Cleanly Without a Burr. Highly Polished—Edges Ground to Size.

Standard sizes, 7x12x1/16, 7x12x3/16, 7x24x3/16, 10x12x3/16, and 12x12x3/16, in stock for immediate delivery. Orders for special sizes received in the morning, shipped the afternoon of the same day. Binding posts, dials, and knobs to match. We have a complete line of Coils, Variometers, Varlocouplers, Sockets and Rheostats.

Largest Discounts.

Jobbers and Dealers! Write for proposition and Free Sample!

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WANTED—A Reliable New England Representative.

For CORRECT RADIO MAILING LISTS Use THE POCKET LIST

of Radio Manufacturers, Jobbers and Dealers in the United States and Canada. Issued Quarterly—January, April, July and October. October, 1932, issue expanded to September 15th, 1932. Classified under three different headings—Manufacturers, Jobbers and Dealers—and alphabetically arranged by states, cities and towns and names of firms. Containing approximately 15,000 names and addresses.

We have been exceptionally careful to see to it that every Manufacturer, Jobber and Dealer is listed and under the PROPER CLASSIFICATION. Most mailing list concerns charge more than \$100 for a list of this kind and, as a rule, those supplied are far from being correct. Compare this list with any other, and you will find it to be the very best obtainable anywhere at any price.

October issue ready for distribution September 25th. Price \$5.00 per copy, or \$10.00 per year (four issues, including monthly supplements which keep the list absolutely correct and up to date at all times). October edition limited. Send your order with remittance today.

F. D. PICKENS, 1021 CARRINGTON STREET, JANESVILLE, WISCONSIN

"TUNING IN"

TO THE RIGHT TUNE IS VERY SIMPLE WHEN YOUR CONNECTIONS ARE SOLDERED WITH THE NEW

"POST SOLDERING IRON"

(The Iron with the Platinum Heating Unit). Removable Soldering Tip



1/2 Actual Size
LIST \$6.00

Designed especially to cover every requirement for delicate work. The smallest practical, efficient instrument on the market. Attaches to any socket. Universal current. Fully guaranteed. From your dealer, jobber or write

POST ELECTRIC COMPANY

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Sidbenel Radio Equipment Mfg. Co.
 Dept. "B," 1663 Jerome Ave.
 NEW YORK, N. Y.
22 to 500 Volt "B" Batteries
 Write for free catalogue on parts

Answers to Readers

I have a three-coil regenerative set. May both variable condensers in this set have 43 plates? Is there any difference in the primary

condenser if placed in the aerial, circuit instead of the ground lead? Will a plate battery having variations of 1½ volts give sharper tuning?—Joseph Lamkin, Minneapolis.

The variable condenser in the aerial circuit works best with a 43-plate variable condenser which is .001 mfd., capacity. The other variable condenser is of the 23-plate type with a capacity of .0005 mfd. It makes no difference whether the 43-plate variable condenser is placed in the ground or aerial circuit; both function the same. A variable plate-battery may increase the signal strength, but it will not give sharper tuning.

I notice in all schematic diagrams that the secondary circuit is connected to the negative side of the A battery. Diagrams that I have received from the De Forest company connect the side to the positive pole. Which is correct? I also note that the phones are connected to the positive side of the B battery. Can you explain this?—Paul Keller, Springfield, Mass.

It makes very little difference with which side of the A battery you connect the secondary circuit, but it seems to function best on the negative side. It makes no difference which side of the B battery the phones are connected in.

I have a home-made crystal set, an 80-foot aerial, and 2,000-ohm receivers. Sometimes I can hear the concerts clearly; but, at other times, nothing is audible excepting code. Is my circuit O. K.? Can you suggest any changes?—Russell Williams, Jacksonville, Fla.

Your set is not connected in the most efficient manner. Connect one end of the coil-winding to the ground lead, and, also to one end of the phone condenser. Connect the other side of the phone condenser to one side of your detector, and the other side of the detector to one side of the slides on the tuning coil. The other side of the tuning coil goes to the aerial lead. This circuit will prove more satisfactory. Of course the telephones must be connected across the phone condenser to make things audible.

Where can I buy "peanut tubes?" Can they be used in a regenerative set, using spider-web coils? What causes the regeneration in a plate variometer since there is no inductive relationship with the secondary of the vario-coupler as with honey-comb coils?—James Cudahy, Williamsport, Pa.

"Peanut tubes" may be used in any place where any detector-tube may be used. In the variometer type of a regenerative set, re-



Tillman's Potentiometer Fast Seller

One of the finest products on the market. Has the following special features:


1. MADE ENTIRELY OF BAKELITE
2. FREE MOVING AND SILENT LEVER
3. THREE UNIT BINDING POST

Other high class items.
 Price \$1.65 Prepaid, cash with order or C. O. D.

RADIO FREQUENCY SETS

Four Tubes good for 900 miles on Loud Speaker, Completely Assembled..... **\$95.00**
 Antenna Light Wire Plug..... **\$1.75**
 Radio Frequency Transformer..... **2.00**

GENERAL MERCHANDISE COMPANY
 MANUFACTURERS AND DISTRIBUTORS
 142 MARKET STREET NEWARK, N. J.



GREWOL DETECTOR

Nothing Like It
 Nothing as Good

\$2.00

The Grewol Detector has taken its place among the standard, nationally advertised parts. In a class by itself because it does what no detector has yet been developed to do and still sells at a popular price.

Always Set and Ready
 Glass Encased
 Super-Sensitive

Asked for by name, sold by reputation.
 If your dealer cannot supply you, send \$2 and we will fill your order.
 Your Dealer has Grewols

RANDEL WIRELESS CO.
 Sole United States Distributors
 9 CENTRAL AVENUE NEWARK, N. J.

(Actual Size)

Spirola Concert

TRADE MARK PATENT PENDING

THE COMPLETE LOUD SPEAKER

—No "units," headsets, extra batteries or adjustments required. Complete with cord, ready to connect in, in place of your headset.

LOUDNESS—Just a sample of actual performance. In our testing laboratory, using a small outdoor aerial and an ordinary set with two stages of amplification (the ideal set for average conditions unless near a broadcasting station) we have received broadcasting stations more than six hundred miles away, so loud it can be heard a hundred feet away. Or again, while this compact little instrument (it stands less than eight inches high) is designed for home use rather than for large halls—yet with the same set stations thirty miles away come in somewhat louder by direct comparison than a full sized phonograph playing a loud record with a loud steel needle.

And **TONE**—While we welcome comparison on loudness, what will really impress you most about your SPIROLA CONCERT is the tone. We have absolutely eliminated distortion and all metallic, "tinny" quality. Violin, orchestra music, voice, even the difficult piano come to you through your SPIROLA so clear and natural you can hardly believe they are not in the same room.

Beautiful cabinet type, choice of dark oak or mahogany finish, bronzed throat; at your dealers or prepaid anywhere in the U. S., Canada or England **\$12.50**

We are so sure you will be pleased with your SPIROLA CONCERT that we absolutely guarantee it. If you wish to return your SPIROLA for any reason whatsoever, do so within ten days and your money will be immediately refunded. Made and sold by



"Spirola Speaks"

L. H. Donnell Mfg. Co., Dept. B, Box 70, Ann Arbor, Mich.

GENUINE WESTERN ELECTRIC V-T-1 Detector and Amplifier \$7.25

All tubes thoroughly tested and guaranteed.

Finch Radio Mfg. Co.
 303 5th Avenue New York City

REPRESENTATIVES WANTED!

RADIO WORLD wants young hustling subscription representatives in every college, school, factory and big business concern throughout the country. Send us your name and address for full particulars. RADIO WORLD, 1493 Broadway, New York City.

generation does not depend on an inductive relationship but does depend on simply tuning the plate circuit to exact resonance with the grid circuit. When the two circuits are in resonance, the high-frequency resistance is greatly lowered with the results that much more energy is allowed to circulate.

Who is WCG, 2 AKH, 2RM? What is the meaning of QTA?—Samuel Lebowitz, New York City.

WCG is the Bush Terminal station, 36th Street and Second Avenue, Brooklyn, New York; AKH is the station of D. Hopkins, 450 East Fourth Street, Brooklyn, New York; 2 RM is the station of F. A. Mayer, 828 55th Street, Brooklyn, New York. QTA means, "Kindly repeat your message."

Would four wires, 25 feet long, amount to the same and give the same results as one 100-foot aerial?—Bob Moore, Brooklyn, New York.

Using four 25-foot wires will not give you the same results as a hundred-foot aerial in one stretch. Change from the 25-foot aerial. Erect the hundred-foot aerial in one length.

I would like to see a diagram of a single-slide tuning coil showing the connection and slider.—Harold Kent, Kingston, New York.

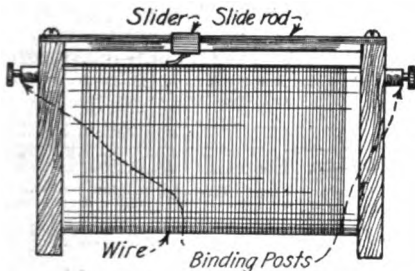


Diagram of single-slide tuning coil requested by Harold Kent, Kingston, N. Y.

The above diagram shows a single-slide tuning coil with a slide rod and two connections. This is used in conjunction with the crystal detector.

On what schedule and wave does the Anacostia station operate?—Harry Leavy, Hillside, New York.

The Anacostia radiophone station, Anacostia, D. C., operates on two schedules a week, Wednesday and Friday. Both schedules are transmitted on 412 meters commencing at 8.30 p. m. Eastern standard time and ending about 10 p. m.

I am enclosing a circuit to which I would like to add two stages of radio frequency and two stages of audio frequency now in use. Please furnish wiring diagram as mentioned, recommending the transformers to be used. This is a wonderful circuit, and, I believe, second to none. As a detector, I have heard voices from stations a thousand miles distant.—W. Miller, Dallas, Texas.

Applying radio frequency would mean that a complete change of equipment and wiring would have to be done. Why employ radio frequency when you can hear the distance you mention? Probably radio frequency will not give you this range. Stick to what you have and do not bother with radio frequency at present.

To receive continuous waves, do I need the rectifier—crystal or vacuum-tube? Should it be audible in the phone receiver without rectifying the wave received? If not, why?—Frank Paseta, Buffalo.

You cannot receive continuous waves with a crystal detector unless you have an external heterodyne-system in order to make the received signals audible in the telephone. It cannot be done with a vacuum tube unless you use a regenerative receiver with a vernier control, so the receiver may be turned into a self-heterodyne. Heterodyne in this case means, simply, a local source of power

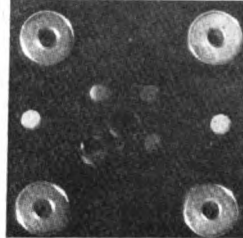
production which will create waves of radio-frequency either just below or just above the frequency of the incoming wave. The two waves will then clash or, in other words, be out of phase with each other 500 times every second. This will produce an audible note, corresponding with the dots and dashes in your telephone receivers, of a frequency of 500 cycles per second.

Universal Phone Connector

Can be used with any type receiver. Makes possible the use of four sets of phones. Eliminates energy loss. Heavily nickel-plated, and guaranteed to give complete satisfaction.
Price 75c a pair
Dealers, Write for Liberal Discounts
Universal Phone Connector Company
Room 238, 1400 Broadway, New York City

"METRO SOCKETS"

for Westinghouse Aerotron 1½ volt dry cell tube. This socket is perfectly finished using a 2" square highly polished moulded base. This base is supported with insulated legs. Springs are of nickel silver insuring perfect contact. Price.....69c.



MOULDED BASE

Single V. T. Socket—Brass tube heavy nickel plated and countersunk contacts\$1.00

FIBRE BASE

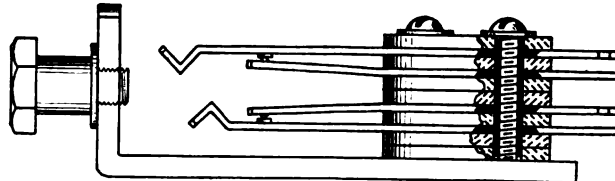
Single V. T. Socket.....\$0.75
Double V. T. Socket..... 1.50
Triple V. T. Socket..... 2.25

"METRO JACKS"

Nickel silver spring, coin silver contact points, all insulation is high grade bakelite. High class finish, made in 5 sizes:

- No. 1—Single Open \$0.55
- No. 2—Single Circuit45
- No. 3—Double45
- No. 4—3 Spring Filament Control..... .95
- No. 5—5 Spring Filament Control..... 1.15

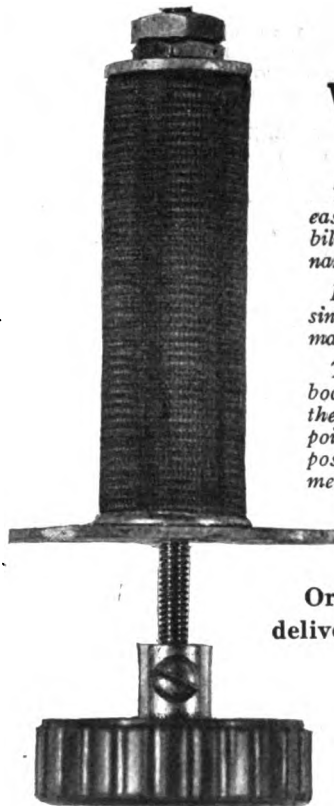
We also make regular V. T. Sockets with fibre and moulded base.



METRO ELECTRIC MFG. CO., INC.

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Every One On His Own Wave Length

WITH the advent of cooler weather, which is to bring with it tremendous demands for radio broadcasting, there is arising a certain amount of bitter feeling against the amateur who either is transmitting code or testing his home-made broadcasting station, says "The World," New York. In the larger cities these amateurs are becoming so numerous, and are in many cases so disregarding the government regulations regarding wave lengths, that they rapidly are becoming hindrances to the thousands of persons who desire to listen to the programs being broadcasted by the larger and more efficient stations. Now there is no getting away from the fact that the amateurs have as much right to operate as have the broadcasting stations; they have as much right to fulfil their desires for pleasure as have the owners of receiving sets, and have as much right to improve their work as have the more powerful plants. But it must be remembered by them that there are government regulations forbidding them operating on other than certain wave lengths and that when they violate these regulations the chances are they are infringing upon the pleasures of their neighbors. No one believes any of the amateurs who are preventing others enjoying concerts are doing so intentionally, and it has been proven that a call on the air or on the wire phone will result in the amateur either returning to his correct wave or standing by until after the close of the program with which he is interfering.

Identifying Mark for WGY

THOSE who have listened in recently on the programs of WGY, the General Electric Company's radio-broadcasting station at Schenectady, New York, have observed a whistle between numbers. Some fans have thought the whistle was due to an imperfection in their receiving outfits; others, observing that the whistle came only from WGY, were convinced that there was something wrong with the transmitting outfit. Neither theory is right.

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This musical note, or whistle, will become characteristic of WGY—an identifying mark, if the audiences approve. If listeners in dislike the device, it will be discontinued. Many people have reported that they have lost the station between numbers, and before tuning in again the next number is well underway and they have failed to get the announcement. There is sometimes a slight delay between selections, a delay which seems minutes to the man at the receiving set though it is actually only seconds. He thinks he is out of tune and begins to retune. The musical note persisting during the intermission enables him to know whether he is still in tune with the station.

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Fans Crowd to Hear Talk on Superregeneration

IN all of the annals of amateur radio clubs, the most crowded meeting ever held by any of these clubs came off last Monday night at the meeting of the Radio Association of Greater New York, says "The Globe," New York. At this particular meeting, R. W. Tait gave a highly interesting talk and demonstration of his super-regenerative set. The meeting place was full to overflowing and it is understood that a hundred or more people were turned away.

It is generally recognized that the broadcast listener is sadly in need of education, and the only way that this can be accomplished is through the radio clubs. The Radio Association of Greater New York has set the pace in this matter for the New York district and will, from time to time, arrange other talks of equal interest to every one who has a radio set.

The club in particular is affiliated with the American Radio Relay League and is also connected with the Second District Executive Radio Council. It has been in existence for several years and has a very large membership. This club is probably the only one that has a real dyed-in-the-wool lady operator for a secretary. This young lady, Miss Marguerite M. Powers, has, we understand, a commercial license and is the proud owner and operator of a C. W. transmitter, call letters 2BVX.

If you are interested in radio you should investigate this live organization with the object of becoming a member. The dues are almost nothing, and a club set will undoubtedly be installed in the near future, all of the necessary apparatus having been donated, but no suitable place for installation has as yet been secured. The Radio Association of Greater New York numbers among its members some of the best known radio men and amateurs in New York City, and the beginner will probably be able to secure a valuable radio education by joining the club. Meetings are held every Monday night on the top floor of the public library at 535 West 179th street.

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Radio World has published a number of pictures, diagrams and descriptive articles regarding the New Armstrong Super-Regenerative Amplifier. The numbers containing this material are dated June 24, July 8, July 15, August 5 and September 16. They will be sent postpaid on receipt of 15 cents each, the five copies complete for 75 cents. Or you can subscribe, \$6.00 year; \$2.00, six months, and have your subscription start with the number dated June 24. RADIO WORLD CO., 1493 Broadway, New York.

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ALTHOUGH it does not come directly under the matter of train control, radio train dispatching really comes under this classification, writes Raymond Francis Yates in "The Evening Mail," New York. As early as 1910, Earl Hanson, who is a very-well known radio inventor, was employed by the Santa Fe Railroad to perfect a system of this nature. Hanson rigged up aerials on the cabs of a number of locomotives, and the engineers were communicated with en route. Although very encouraging results were obtained, the railroad officials are hard to please and the experiments were abandoned. With our modern radiophone equipment it would seem that there shouldn't be much of a problem to radio train-dispatching at the present time. The engineer at all times could be within listening distance.

Numerous attempts have been made to establish direct telephonic communication with engineers, but the systems used were impractical. If there is one great need that radio can fill, this would seem to be the one. If the engineer in the wreck had been given a warning message in time he could have brought his train to a stop, and a great disaster would have been avoided. Of course, if the man had fallen dead, and no one knows whether he did or not, all the speaking radio in the world would be of no avail. On an occasion like this, radio control would be the only thing that could be resorted to.

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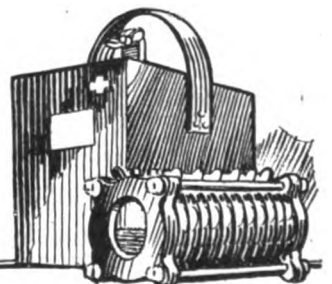
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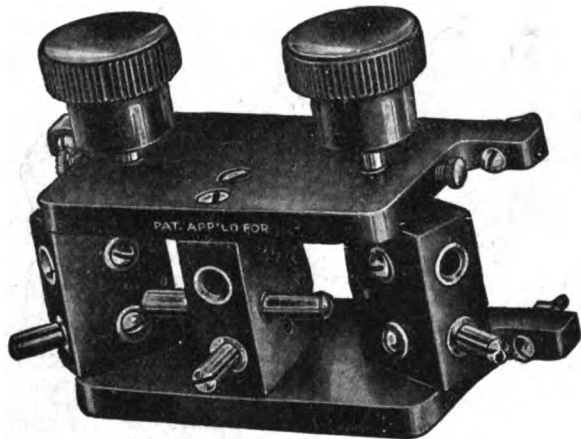
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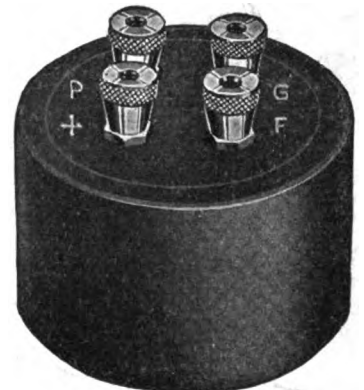
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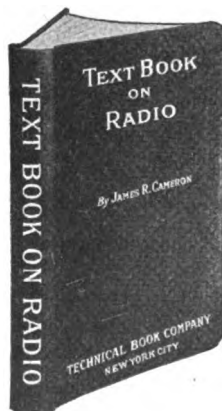
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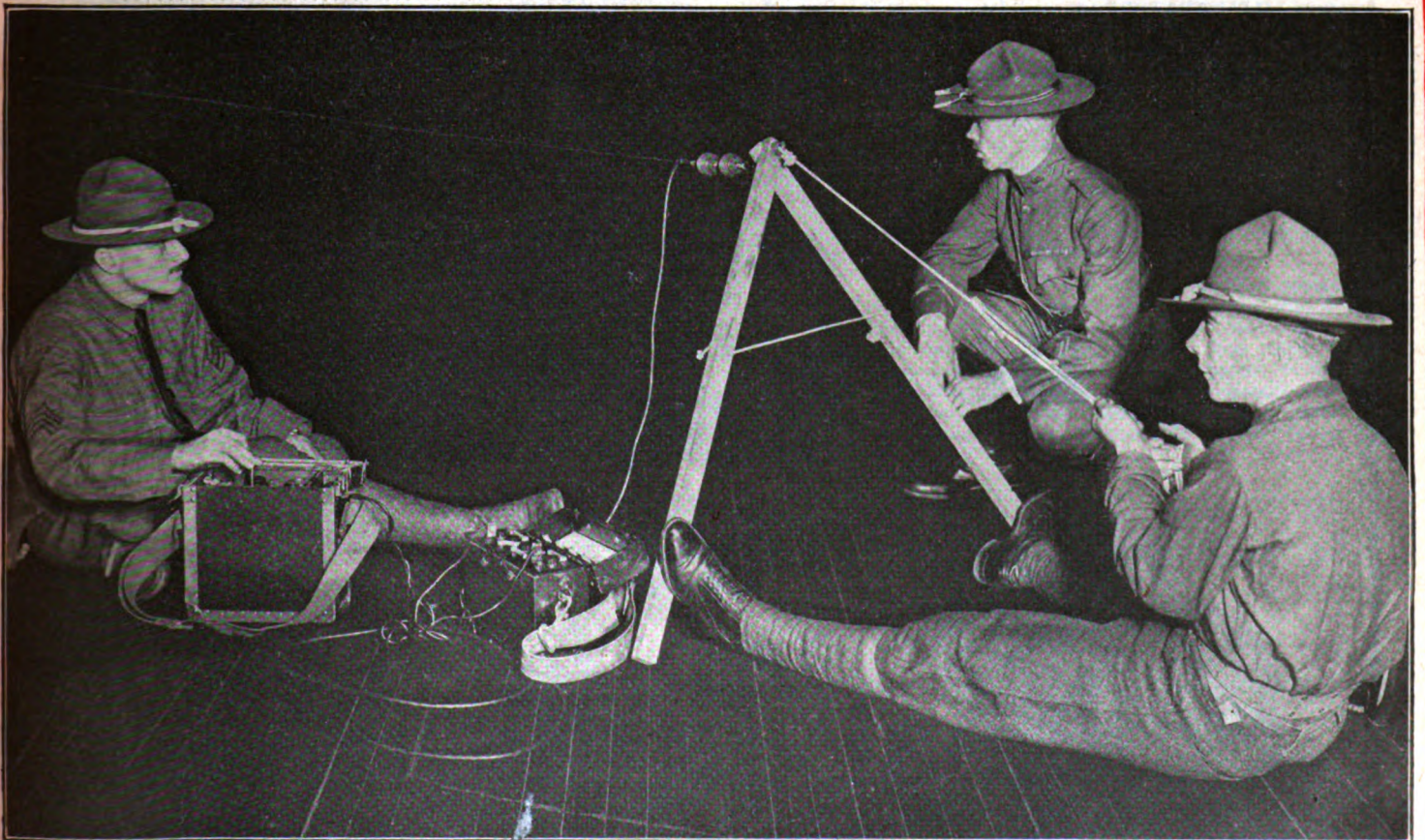


RADIO WORLD

(Trade Mark)

ILLUSTRATED. WEEKLY

Army Antenna Erected in 90 Seconds!



(C. International News-Reel)

The recent reorganization plans of the National Guard of New York provide for the latest in radio equipment. The above is an illustration of the type of low-visibility antenna used by the Signal Corps, Headquarters Company, 71st Infantry. The set is three feet high and can be erected in ninety seconds. This low antenna is specially adapted to the radio work of a battalion in a forward position.

(See story and additional photographs on page 16)

WHAT YOU NEED FOR AN ARMSTRONG
SUPERSENSITIVE RECEIVER

See Page 4
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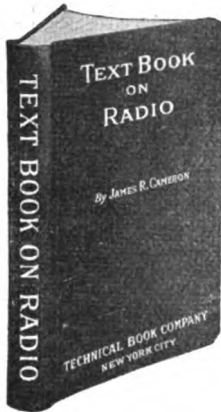
Most Complete—Interesting —Information Book
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National Radio Week

VOLUME TWO

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the act of March 3, 1879.]

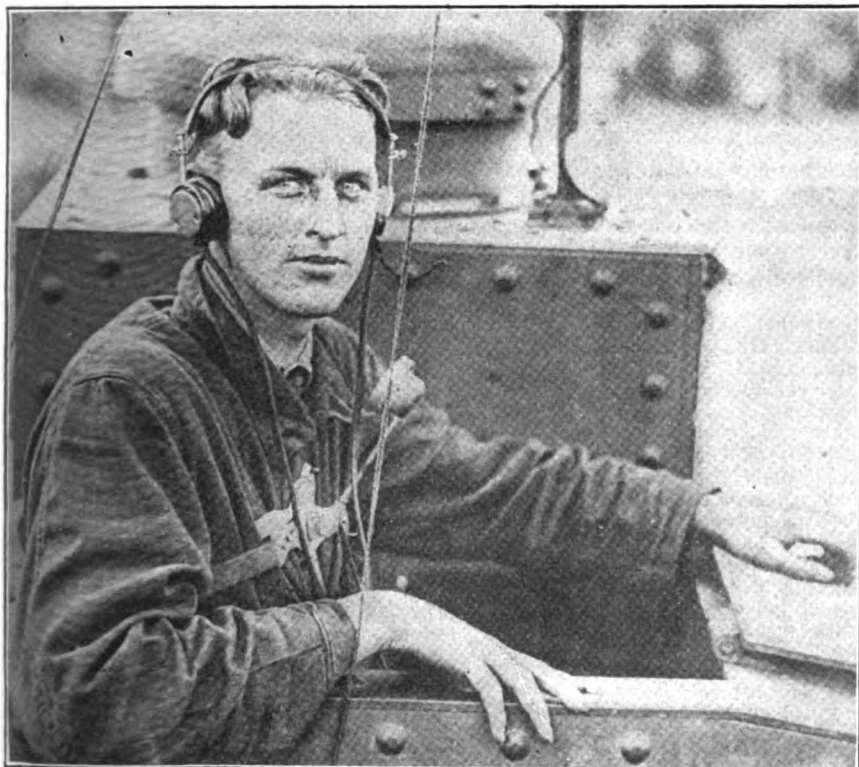
A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. II, No. 5. Whole No. 31

October 28, 1922

15c. per copy, \$6.00 a year

New Wonder of Warfare! Tanks Directed by Hidden Radio Operator



(Both photographs C. Pacific & Atlantic Photos, Inc.)

THERE is no end of romance in the story of the radiophone. It is an invention that came back, so to speak, in a big way after an ignominious career. But such a wonderful thing as speaking and receiving through space, without wires, tubes, cables or other physical connections, was almost certain to fall into the hands of unscrupulous promoters, long before the serious, honest experimenters had an opportunity of evolving something more than a crude, laboratory demonstration. So we find that, a dozen years ago, the radiophone was nothing more than a crude device, making use of a sputtering, uncertain electric arc as a "generator" of the high-frequency machine. The high-frequency, so uncertain as to be almost hopeless, was modulated or varied by means of some form of carbon microphones. This instrument, as anyone familiar with its construction knows, is quite unsuited to the handling of heavy currents.

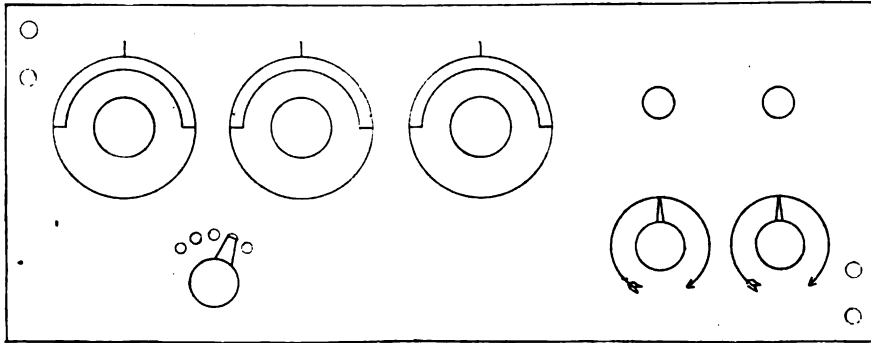
A series of experiments were being conducted for the United States Signal Corps with a view to proving the practicability of radiotelephony in military communication. After numerous attempts the vacuum tube came into play. It opened a new era in telephone work. The vacuum tube is nothing short of an electrical acrobat. It can do all sorts of tricks—tricks no other electrical device has been able to perform.

Today the vacuum tube is producing most remarkable results, and the latest achievement in the United States Army is the equipment of steel clad "tanks" by radio. With radio it is possible to direct war tanks in the direction they should go! The photograph at the left is the interior of a tank, showing the operator with his radio gear. The lower picture is that of a number of tanks being directed by radio to operate in certain war areas.



A Simple Superregenerative Receiver

By Harold S. Potter



How the front panel will look when completed. The dials should appear on the panel in this manner. The two dials to the right are the rheostats for the tubes; the three large dials are the tuning devices. Drawn by Harold S. Potter.

SUPERREGENERATION is the carrying on of the familiar phenomena of regeneration, beyond the point where it usually must cease, due to the circuit starting to oscillate, making the signals mushy and unintelligible.

When the new system was first placed before the public, great claims were made for it, many of which have since proved unfounded. It was not, as was then claimed, the equal of the seven-tube superheterodyne, for long-distance, short-wave reception. However, for short-wave reception over moderate distances, it is the thing. It is the solution of the apartment-house dweller's troubles, as it makes possible the reception of broadcast entertainments on a small-loop antenna without any outside connections whatever. Formerly this could only be accomplished by the use of a considerable number of tubes, which meant a considerable outlay, but now it may be accomplished with but two tubes.

Superregenerative sets have been built using one, two and three tubes. The one which I am about to describe is of the two-tube type and best for general use.

Many amateurs are under the impression that the superregenerative system is an expensive one to use. This is incorrect, as may be seen by the following list of parts and their cost:

1 bakelite panel 7x18x3/16 inch..	\$3.00
1 wood base 9x18x3/8 inch.....	.50
1 43-plate variable condenser....	4.50
1 23-plate variable condenser....	3.75
2 tube sockets	2.00
2 rheostats	2.00
1 D. L. 1500 coil (unmounted)...	2.75
1 D. L. 1250 coil (unmounted)...	2.25
1 3 1/2 inch rotor.....	.50
1 length cord tubing.....	.10
3 3-inch dials	3.00
1 1-inch radius panel switch.....	.50
12 binding posts .....	.60
1 phone condenser .....	.30
Wire, brass, screws, etc.....	.50
Total	\$26.25

The panel may be of bakelite,

formica, celeron or hard rubber; but hard rubber is not to be recommended, as it is apt to warp. It may be purchased cut to size and squared up. The dimensions are 7 x 18 x 3-16 inches.

Figure 2 shows the details of the panel layout. If any other make of instrument is mounted on the panel in the place of those listed, allowance must be made for their different dimensions. The holes should first be located by the use of square and ruler, then spotted with a center punch.

The panel should be given a coarse-grain finish by rubbing lengthwise with a piece of No. 2 emery cloth until all shine is removed. A small quantity of olive oil should then be rubbed into the panel. A rich gloss finish will result.

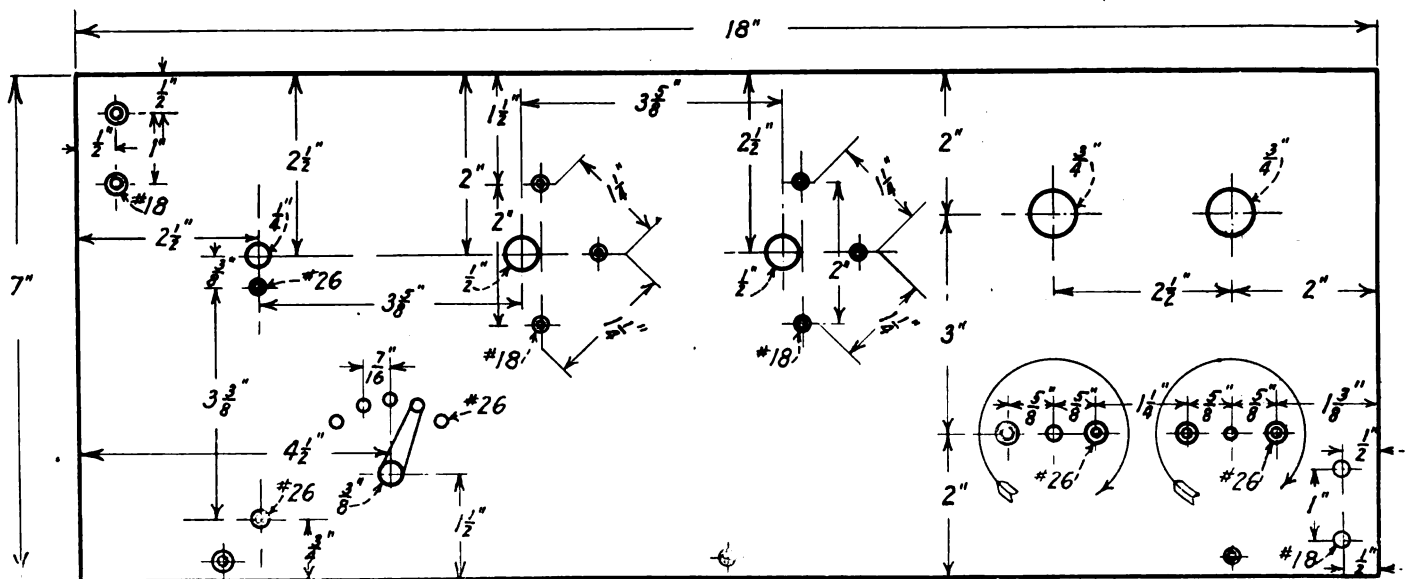
Closely allied to the panel is the base, which is of 3/8-inch hardwood, 9 x 18 inches. Three screws pass through countersunk holes at the bottom of the panel, into the front edge of this base, holding them firmly together at right angles to one another. This base is used for mounting the duo-lateral coils, the tube bases, the battery-connection strip and the tickler bearing.

Two variable condensers are mounted near the center of the panel.

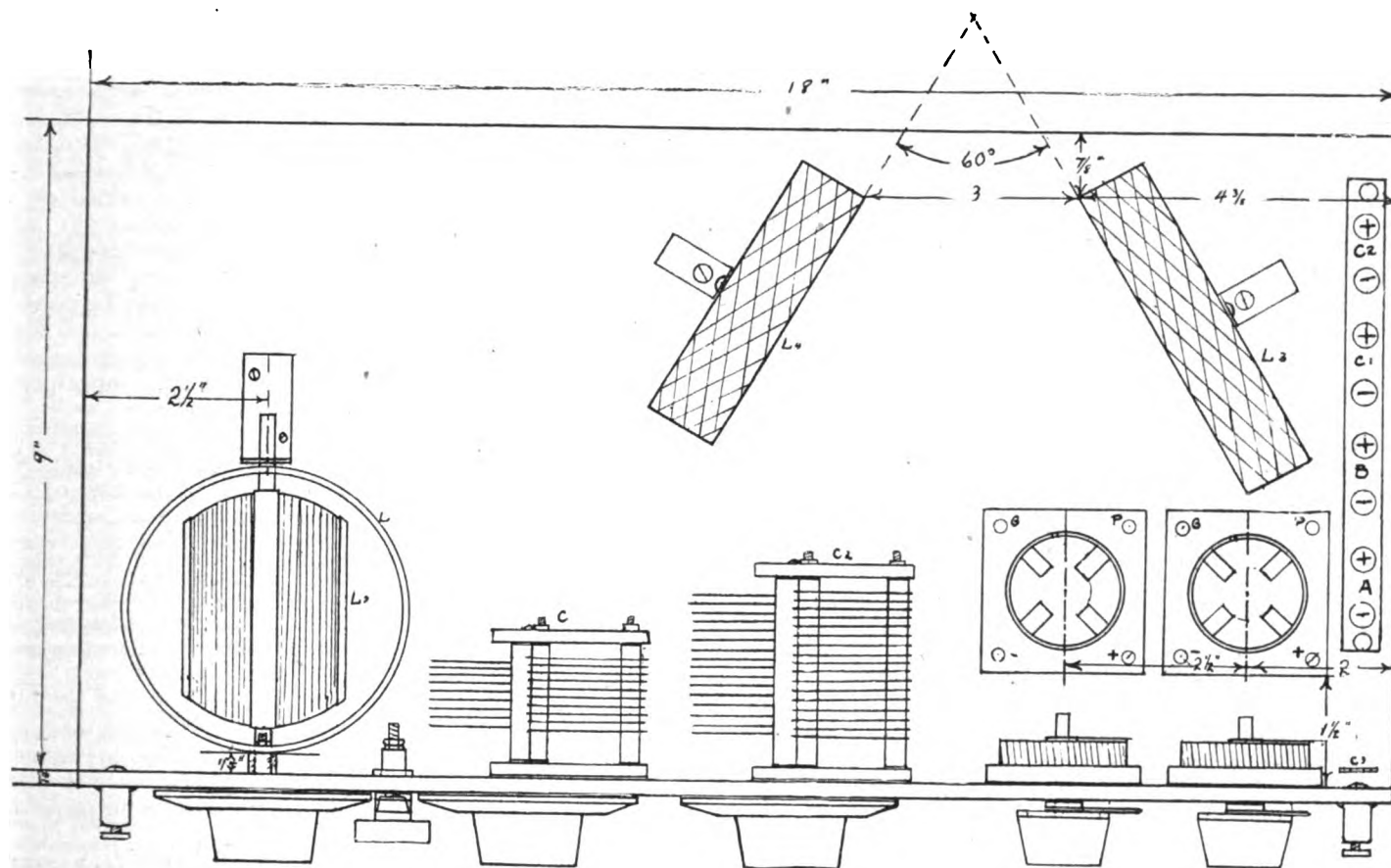
Referring to Figure 3, C is a .0005 mfd. condenser used across the inductance to tune the input. See Figure 5.

C₂ is a .001 mfd. condenser used across the D-L. 1,500 coil. It should be shunted by a .001 fixed condenser, giving an effective capacity of .002 mfd.

The input tuning inductance and the



View of the front panel, showing all necessary dimensions for the construction of this superreceiver. Careful attention should be given to each section. Suggested by Harold S. Potter. Drawn by S. Newman.



Looking into the receiver. This is the "layout" of the equipment, not the position of the various instruments such as the condensers, rheostats, vario-coupler and honeycomb coils. It carries its complete dimensions. Drawn by Harold S. Potter,

(Continued from preceding page.)
 tickler are mounted together in the form of a vario-coupler, the tuning inductance being the fixed member. The form for this inductance is a piece of cardboard tubing 4 inches in diameter and 4 inches long. Starting $\frac{1}{2}$ an inch from the top end, wind for 2 inches with No. 24 D.C.C. magnet-wire, tapping every $\frac{1}{2}$ inch, giving 5 tap leads in all, including the start and finish. These taps are connected to the points of the tap switch, shown in Figure 1, below and between the coupler and condenser dials.

A hole is drilled through one side of this tube, $\frac{1}{4}$ inch down from the top, and another $3\frac{3}{8}$ inches below it, to match the two holes in the panel, and are used for mounting. Two $\frac{3}{4}$ inch 6/32 flat-head nickel-plated machine screws serve to support the inductance. A couple of battery terminal nuts slipped over the screws serve to keep the inductance $\frac{1}{4}$ of an inch from the panel.

The tickler is made by winding a $3\frac{1}{2}$ inch rotor ball with a single layer of No. 28 S.C.C. magnet wire, giving about 96 turns in all.

A $\frac{1}{4}$ inch brass shaft passes through this ball and is supported by a brass angle bracket at one end, while a $\frac{1}{4}$ inch hole in the panel, shown in Figure 2, serves as the other bearing. Great care should be taken in mounting and making the brass angle support to get the hole to line up properly with the

bearing hole in the panel, as otherwise the dial will not run true.

In making connections to this tickler winding use flexible leads in order to allow the ball to run smoothly.

In the variation frequency-generator circuit 2 large honeycomb coils are used. One is a D.-L. 1500 coil, in the grid circuit. This is shunted by the variable condenser previously mentioned. It is mounted back of the tube bases, as shown at L3, Figure 3.

A D.-L. 1250 coil, L4, is connected in the plate circuit, Figure 5.

In Figure 3 is shown the correct relative positions for these inductances, 3 inches apart at their nearest points, and at an angle of 60 degrees to one another. This I found to be the best position in my set, and slightly different coupling may work best on another set; but once they are placed the inductances need not be moved. Figure 4 shows the details of the coil mountings. The brass support is made of strip brass $\frac{1}{2}$ inch wide and $1\frac{1}{16}$ inch thick. The dimensions are shown in the detail drawing. A hardwood plug should be fitted to the center of each coil. But one screw is used to fasten each support to the base, so the angle of the coils may be changed, if need be, by simply loosening this screw.

A most important part of any tube set is the rheostat. The tubes in my set are mounted at the lower right-hand end of the panel, below the peepholes.

Just back of the rheostat are the

tube sockets. These are all bakelite. It is well to remember, when picking a tube socket, to get one which holds the tube snugly and has strong contact-springs, in order that a good contact with the prongs on the tube may be assured.

A mica phone condenser having a capacity of .0025 mfd. is shunted across the phone binding posts at the lower right-hand corner. It may be seen in Figure 3 (C₂). It is supported in place by the wires which connect to it.

At the right-hand end of the base, Figure 3, is a strip of bakelite $\frac{1}{2}$ inch by $6\frac{1}{2}$ inches by $\frac{3}{16}$ inch thick. On this connection panel 8 small binding-posts are mounted, to make connection to the A, B, and C batteries. These posts are placed $\frac{3}{4}$ inch apart. Two $\frac{3}{4}$ -inch roundhead brass wood screws secure the connection panel to the base, while two battery terminal nuts slipped over the screws between the panel and the base keep it raised $\frac{1}{4}$ inch above the base, making room for connecting to the binding posts.

Regarding the dials, any 3-inch 180-degree dial having a $\frac{1}{4}$ -inch shaft-hole may be used. When buying dials be sure to pick ones which are flat and true if even, smooth-running of controls is desired. Also, be sure to get bakelite dials—not those made from molded "mud" composition,

(Continued on following page.)

which have a habit of chipping and splitting.

The handiest binding post to use is the type having a hole drilled through for the wire or phone tip and a set screw. For the sake of appearance, get a small nickel-plated post, not a clumsy brass one.

Only the antenna, ground, and phone posts are on the panel. All battery connections are made to the

well to enclose the set in a cabinet. If you are not handy with tools this should be purchased ready-made.

For those who care to build their own the following particulars are given. The inside dimensions of the cabinet are: 7 inches high, 18 inches long, and 9 3/16 inches deep. Quarter-inch oak, mahogany, or some other hard wood may be used and finished in any manner desired. The top of

cept under-almost perfect atmospheric conditions. However, interfering noises may be eliminated by using a loop antenna. I use a loop 3 feet square, wound with 10 turns of No. 18 bare copper wire spaced 1/2 an inch apart.

Fine results may be obtained on a loop as small as 1 foot square; in fact, little difference in signal strength will be noticed when changing antennae. About 50 feet of annunciator wire may be wound into a loose coil and dumped on the floor, the ends connected to the set. Surprisingly good results will be obtained.

It is almost impossible to give instructions for the operation of this receiver. Adjustment of L2 and of C2 cuts out the howling and whistling which is common to this circuit when out of adjustment. The various stations are tuned in by varying C1 and the tap switch. The final adjustments are then made with the rheostats and with C2.

The above hints will prove helpful, but the builder must learn the meaning of the many indescribable sounds characteristic of this circuit. A little practice will mean more than pages of instructions.

In conclusion, this offers a great field for experiment to the dabbler in superregeneration, as the circuits yet developed have their limitations and there is much improvement to be hoped for in the reception of spark signals over long distances by this system.

And now, you "bugs" who try this set or are experimenting with superregeneration: How about a line or two telling of your results? I would be glad to hear from anyone on this subject.

Claims Receiving Record

If Any Radioist Can Beat Mr. Merklein's or Would Like His Hook-up, Write Him.

Editor, RADIO WORLD: Speaking of receiving broadcasting a la D X, I believe I hold the record. On the night of October 16, at 11:15, I happened to tune out WJZ, and tuned in WDAF. Later I received WSB. Station WDAF is located in Chicago; WSB in Atlanta, Ga.

The concerts came in very clear, and only on one tube. My outfit is of the two-variometer type, and the design of wiring is my own: Two Steps of Audio, frequency—VV 201—detector; VTI—first step; VT2—second step; 110 volts on amplifiers; 4 wire "L" type aerial, 40 feet long and 50 feet high.—Best 73, J. A. Merklein, 7513 Third Ave., Brooklyn, N. Y.

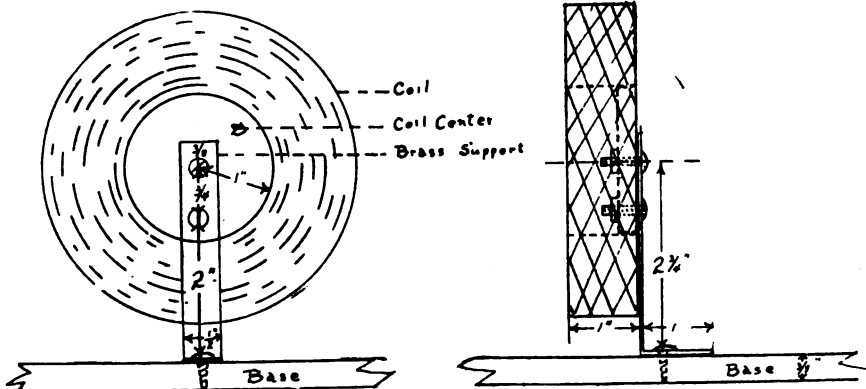
Perfection at Last

Madge: "Do you know anything about this radio fad?"

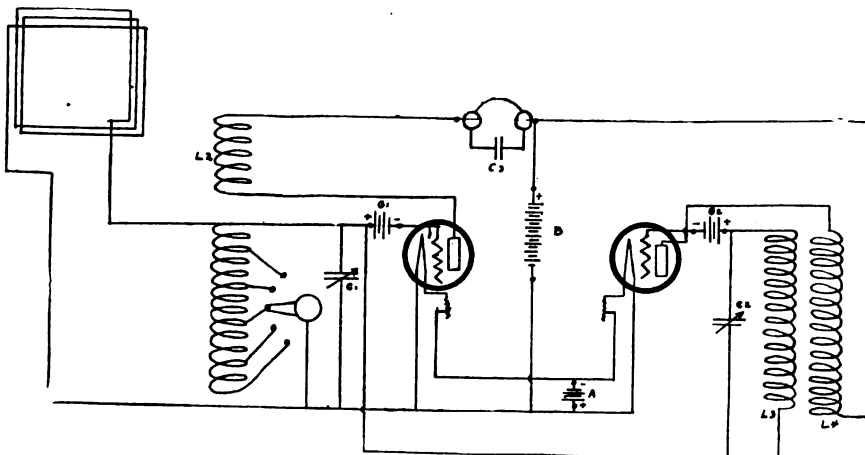
Marjorie: "It must be just lovely, dear. I understand that you can listen in."

—"The Sun," New York.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.—Adv.



The honeycomb or duo-lateral coils. This diagram shows how they should be mounted. Note the position of their layout. Dimensions are given to assemble them. Drawn by Harold S. Potter.



Schematic diagram of the internal wiring of the complete set. When wiring, it is best to solder all connections that can be soldered. Follow each connection closely as you go along. Remember, one wrong connection will make the set inoperative. When finished examine the wiring. Drawn by Harold S. Potter.

connection panel back of the main panel.

Next comes the wiring. The neatest thing for this purpose is square, tinned-copper wire. If this is not available, No. 14 bare copper wire may be used. In order to make a neat job bend and fit each connection before putting it in place. Make all connections short and avoid long parallel wires, as these tend to produce howling and cause energy losses. Solder all connections.

Be sure to follow the wiring diagram in Figure 5 carefully, as all connections must be correct if results are to be obtained. Carelessness may mean a couple of burnt-out tubes, so it is better to be certain than sorry.

In order to protect the instrument from dust, dirt, and injury, it will be

the cabinet should be hinged to allow for easy inserting and removing of the tubes, and for changing connections. The battery wires should be led in through holes in the side of the cabinet.

A 6-volt, 80 to 100 ampere-hour storage battery will be needed to light the filaments.

For the plate battery, several B-battery blocks of 22 1/2 or 45 volts should be connected in series to give the proper voltage.

The grid, or C batteries, consist of several flashlight cells in series. The necessary voltage may vary from 5 to 25 volts, depending on the tube used and on the plate voltage. I found that 10 volts worked best on my set.

A super-regenerative set cannot be used on a regular outdoor antenna ex-

Takes Radio Circles by Storm

National Radio Week Acclaimed by All

Radio World's Proposition, That Seven Days Be Given Up to Boosting Radio, Strikes Ten with the Trade, Fans, and Amateurs

LAST week's issue of RADIO WORLD (No. 36, October 21) had no sooner reached the newsstands and subscribers than the editors realized that it had landed as a bombshell in radio circles. Telephone calls, messages, and letters soon made it apparent that RADIO WORLD'S announcement that November 26 to December 2 be set aside as a National Radio Week—to create greater public interest in radio, to increase the output of manufacturers, to increase sales by distributors and dealers, to create a wider interest among fans—is about the biggest thing that has hit the radio game since it was started.

It so happened that a luncheon in the interests of radio was held at the Bankers Club, New York, the day preceding this announcement. This luncheon was attended by Hon. Frank H. Hitchcock, J. H. Beyers, H. Gernsback, Laurence A. Nixon, and other men interested in radio promotion. When RADIO WORLD'S proposition was announced, it was so generally regarded as a matter of vital importance to every person and firm interested in radio, that the editor of RADIO WORLD immediately agreed to permit his suggestion to become a general plan of the radio world at large and to permit a committee to decide on the best and most advantageous time for the celebration of National Radio Week.

Consequently, a second meeting will be held Tuesday, October 24 (this page is going into type on October 18), when the proposition will be discussed at length and the final date decided on.

The full report of this meeting will be published in the next issue of RADIO WORLD.

The first letter to be received by RADIO WORLD commending its plan was from Edward M. Morgan, postmaster of New York City. His and other letters follow:

* * *

Laurence A. Nixon, managing editor, says "The Radio Dealer" says it's "smashing good!"

A smashing good idea! It will create a greater interest in radio, boom business, and bring new enthusiasts into our fold.

* * *

Edward M. Morgan, postmaster of New York City, an ardent Co-operator:

As to the proposition that there be a National Radio Week, there is no doubt in my mind but it would be most useful; for it would unquestionably promote the science and industry of radio; and whatever does this will be for the welfare of the nation, since every advance that facilitates the communication of information and intelligence makes for enlightenment and progress. It would have a special utility to the post office at the time suggested, November 26 to December 2, since

it would permit the broadcasting of messages urging early Christmas mailing.

* * *

H. Gernsback, editor, "Radio News," one of the first to commend the idea, writes:

Allow the writer to compliment you on the idea of a National Radio Week. This is a splendid idea, and if enough publicity matter can be broadcast so that the public will become aware that there is such a movement, we are certain that it can only help the entire radio industry.

Personally, the writer thinks that the last week in December would, perhaps, be most appropriate, because it has been found, in past years, that there is more interest in Radio displayed just before and after Christmas than during any other time of the year.

* * *

Kendall Banning, editor, "Popular Radio," is with us:

I am glad of the opportunity not only of endorsing but of actively participating in any movement that will help to establish the radio industry in the high position which it must eventually attain. Your suggestion for a National Radio Week is a step in that direction, and I shall be glad to do what I can to make it a success.

* * *

Paul V. Godley, famous radio engineer of the Adams Morgan Company, New Jersey, says: it will result in good:

I see no reason why such an arrangement as a National Radio Week should not result in some good being done. I must confess at this time, however, that no ideas of value occur to me in connection with your plan, although I shall watch its effect with interest.

* * *

What have YOU to say or suggest? What can YOU do to boost National Radio week in your town? What plan can YOU devise for some novel form of radio entertainment or display. Can YOU get up a radio party that will be pleasant and profitable and introduce strangers to radio?

Suggestions forwarded to RADIO WORLD on this important event will be welcome and will be afforded space in our editorial columns.

But—don't miss next week's RADIO WORLD. (Dated November 4, on sale November 1.) It will contain the very latest and most important news regarding National Radio Week.

Be a National Radio Week Booster

Latest Important Radio News of the Week

THE success of a sixteen-hour test of electron tubes in place of large alternators in transmitting wireless telegraph messages across the Atlantic from the Radio Corporation plant at Rocky Point, L. I., has led Dr. E. F. W. Alexanderson, chief engineer of the corporation, and inventor of the alternators which will soon be supplanted by the tubes, to predict that the transmission of power from Niagara to New York through the air by means of tubes was a possibility of the future.

It is reported that the Prince of Wales has become an ardent radioist and has induced his father, King George V, to install a set in St. James Palace.

Receipt of wireless messages inside a steel car of a fast-moving train with no outside aerial was successfully demonstrated by the Pennsylvania Railroad on the Broadway Limited, from New York to Chicago. The tests were conducted by

Arno Zillger, of Philadelphia. The aerial used was an inside loop device, small and compact, and placed on a table. It was 18 inches square. The radio set was assembled after the train left New York, enroute to Chicago, and immediately was tuned into WOR, Newark. The entire concert was heard during the run to Philadelphia, where a second one was picked up. Broadcasting, even from the Great Lakes, was picked up all the way to Chicago.

A charge that the Radio Corporation of America, the General Electric Company and others have entered a conspiracy to obtain a monopoly of wireless service and prevent individual use of the radio is made in a suit filed in the United States District Court today by John O. Yelzer, Jr., of Omaha, Nebraska, who asks an injunction to restrain the defendants from interfering with his right to broadcast. He alleges that his own radio station was closed recently because he was operating slightly above the 360-meter wave

length, and that the first amendment to the Constitution, which says: "Congress shall make no law abridging the freedom of speech or of the press," is being thereby violated. A jury to determine damages, which he alleges to be \$25,000, is requested, with treble damages under the Sherman anti-trust law and an attorney's fee of \$25,000.

* * *

The Knoxville, Tennessee, automobile club, in conjunction with the other clubs of the state, will broadcast nightly the number and description of all stolen automobiles.

* * *

Chicago newspapers report that half the audience of the recent Radio Show in that city was composed of boys and young men, and that the most interested attendance was at the booth of the National Radio Chamber of Commerce, where experts gave the youngsters advice as to what was wrong with their instruments.

Radio Legislation Slated for December

By *Washington R. Service*

CONGRESSMAN WHITE, of Maine, "father" of the Radio Bill calculated to improve radio in this country commercially, in broadcasting, and for amateurs, has returned to the Capitol and believes that the bill will be taken up by his committee early in December.

The enactment of this long-looked-for legislation will benefit all branches of radio, but officials of the Department of Commerce say that it will not entirely eliminate interference in broadcasting. There are some features in connection with radio which cannot be corrected by legislation, it is pointed out by experts of the government, such as the mastering of one's own set.

Good Sets Badly Tuned

Even if there were enough waves to give each station an exclusive band—and there are not nearly enough—interference would still be encountered, or at least reported, by fans endeavoring to receive the news and entertainment offered by 522 stations, many of them in one community. This would be so because many receiving sets are not capable of fine adjustment and cannot be properly tuned to a specified wave length.

Though possessing excellent sets, many enthusiasts are not able to tune properly; they do not know how to manipulate their sets and eliminate interference within a prescribed band. Already reports have been received by the Department of Commerce that broadcasting on the new 400-meter wave is interfering with that on the 360-wave, which should not be the case with 40 meters between.

If transmission is good, first-class receiving sets should be capable of tuning within a variation of from 5 to 10 meters, inspectors say, unless one station broadcasting is in the immediate vicinity of the receiver.

Although Secretary Hoover will probably receive authority in the radio bill to limit the number of transmitting stations, it will be difficult to accomplish this in congested areas where several broadcasting stations are already located. Municipal authorities and organizations of listeners-in may have to aid the Secretary, when the time comes, by indicating which stations are the best and what services are most desired. The listeners-in are organized in Washington and such a body might become a censor of the air, so to speak, endorsing satisfactory stations and reporting those which are

unsatisfactory, thus aiding in establishing better service. In any event, it is hoped that both wave lengths and time schedules will aid the broadcasting in congested districts.

Must Learn How to Receive

Distributors of radio equipment capable of fine adjustment should instruct purchasers carefully and, when possible, assist them in setting up their sets and tuning in. It is evident that a large percentage of those interested in radio must be educated in the use of their sets, and this may develop on the broadcasters who are interested in having their programs clearly heard or on radio associations. The Bureau of Standards has been giving information along this line for some time.

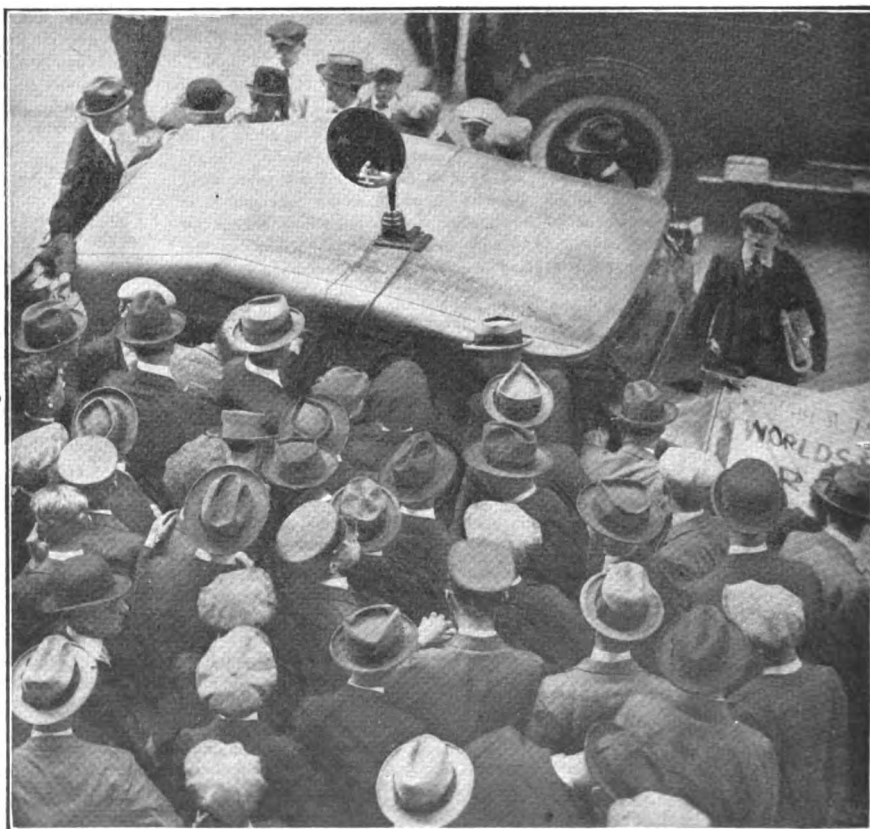
It is expected by Department of Commerce experts that the loop receiver, possessing directional qualities, will aid in the selection of broadcasts and help in eliminating the other stations' programs, when used in conjunction with tube receiving sets. The cost is not excessive in comparison to an aerial, and as the indoor coil can be installed in a corner of a room, the disfiguring overhead aerial may eventually disappear from housetops. It is part of the question of experimentation and education in radio.

How Radio Is Supplementing the Ticker in Wall Street

THE amplifier is responsible for many radio achievements. For instance, the recent "spanning" of the Atlantic using 1 kilowatt of power, or less, would have been impossible had it not been for the highly efficient receiving equipment and amplifier employed. An ordinary set would not respond to such signals, and the transmitters, under such circumstances, would be incapable of forcing sound over so great a distance. Yet with the proper receiving set and super amplifier the signals from such a weak station were found to span the intervening space with a marked degree of success. This serves to prove that no matter how weak a transmitter may be, its waves are driven through space and kept going farther and farther—endlessly.

The advantage of employing a radio-frequency amplifier is this: It amplifies only the wave and not the many little irregularities and imperfections which exist in the usual receiver and amplifier equipments. No matter how many steps of radio frequency may be piled up to aid the detector, the signal which has failed to actuate the detector will NOT be heard. With radio-frequency amplification, on the other hand, there is no critical point, and even the weakest signal is built up to the desired degree before it is passed on to the detector, there to be rectified to audio-frequency current, which, if desired, may be passed on through one or more stages of audio-frequency amplification.

The illustration at the right shows a self-contained, six-stage radio-frequency receiver which provided the thousands who flock daily into that short, yet long, thoroughfare known as Wall Street, N. Y., with news of the moment. It was an experiment, but it worked out wonderfully. The radio set is mounted on an automobile, a 16-inch loop aerial providing the necessary completion of the circuit. The broadcast matter was carried to the crowd by means of the loud-speaker mounted on the shed of the car.



(C. International News-Reel)

Radio Guides Rescuers to Steamer Burning in Mid-Pacific

By Peter Gray

New York Evening Post
FOUNDED 1801

Friday, October 13 1922

governing the application of the Volstead law to American and foreign ships.

Radio Saved 217 After Ship Burned

Navy Vessels, Yachts, Liners, Picked Up City of Honolulu's Calls

West Faralon Reached Blazing Ship 4 Hours After Her Company Had Taken to Boats

(By the Associated Press)
SAN FRANCISCO October 13—The radio man's bride on space, and that hardly less potent thing the fellow ship of those who go down to the ship responsible to-day

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How the "New York Evening Post" "played up" the heading of its story of the "City of Honolulu" disaster.

WHILE she was 670 miles off San Pedro, California, fire broke out in the second-class cabin of the giant ocean liner of the Los Angeles Steamship Company's new Honolulu service, the "City of Honolulu," once a pride of the North German Lloyd. In some unaccountable way, the flames so advanced on the crew—which did heroic work in battling them—that in two hours it was found necessary to abandon ship. But before that command had been given by Captain R. H. Lester the vessel's radio had sent far and wide the call that means disaster, distress, and the possible loss of human life on the high seas.

Two ships, "Enterprise," of the Matson Line, and "Thomas," a United States Army transport, westbound, from Hawaii, picked up the signal and turned towards the position the operator had given. A pleasure yacht, the "Casiana," cruising to Honolulu, with her owner, E. L. Doheny and party of friends aboard, caught the appeal and turned her bow that way. Los Angeles caught the signals and Navy vessels stood by to race with death to the scene of the fire.

San Francisco caught the signals,

waited awhile until the radio operator on a distant ship had turned that vessel, too, towards the scene. It was that ship, the "West Faralon," M. M. Walk, master, that swept down the sea lanes to the "City of Honolulu" and effected the rescue.

But she did not get there until more than four hours after the flames had forced the captain, his first officer, the chief engineer, and the radio operator, who had stayed behind to serve to the uttermost the passengers confided to their care, to leave the blazing hulk. The officers stayed to advise, suggest, and confer; the radio operator stayed to keep the "West Faralon" advised lest she miss the boatloads of passengers floating near by and the rescue be delayed.

The chief radio operator of the "City of Honolulu" was W. H. Bell, of Oakland, California, who was making his first trip. The assistant operators were H. D. Hancock, Venice, California, and N. C. Kumler, Yakima, Washington. The three men remained at their posts so long as it was humanly possible. Mr. Bell is twenty-four years old.

Commenting editorially on the successful and remarkable part radio played in saving the lives of the passengers and crew in this latest of sea horrors, "The Times," New York, says:

Fortunately there was time to lower the boats and get everybody into them but the chief officers and the radio operators, whose duty it is to leave last and only when they are driven from their posts.

There must have been anxious moments for those in the boats, calm as the sea was. No smoke, no sail in sight. Many women and some children were among the passengers. Those vast waters appalled them. If help did not come soon, all knew the boats would not ride out a heavy sea. The comfort was in the thought that immediate response would be made to the radio signals—the nearest ship would come to the rescue under forced draft. Even so, it might be a race between her and the winds of the Pacific that at this time of the year sometimes rage on the briefest notice. But four ships, including the army transport "Thomas," picked up the call. It was the good luck of the freighter, "West Faralon," to be only fifty miles from the flaming ship and the waiting boats. She was perhaps four hours getting to the scene. Quick work was made in taking the castaways aboard. Sailors never spare themselves when a rescue is to be made.

In the old days of shipwreck without benefit of radio a rescuing vessel would probably have had to continue on her voyage to her first port of destination with the salvaged on board, but now there can be an interchange of messages between shore and ship. So it was arranged to have the "West Faralon" transfer the saved from the "City of Honolulu" to the army transport, permitting the freighter to proceed to the Dutch East Indies. As usual, the officers and radio operators of the abandoned vessel behaved with a gallantry and coolness expected of Americans beset by danger at sea. When the battle with the flames was lost the operator sent out his "Good-by" nonchalantly, and down into the boat he went, with the captain bringing up the rear of the little party.

The story is one to stir human emotions to the utmost—to make mankind thankful that radio is playing so important a part in the affairs of the world.

Vacuum Type of Arrester Safe

THROUGH proper publicity, the fear of danger in connection with radio sets has been greatly alleviated; indeed, to such an extent that some people have become exceedingly careless in rigging up their aerial and ground systems. Some believe that by simply disconnecting the aerial and letting it hang free they are assured of perfect protection. Though it is improbable that any damage would be done, this procedure is the least safe of all. Other people disconnect the aerial wire from their instruments and connect it to the ground lead. This is a safe but inconvenient method. One might forget to disconnect, with the result that some part of the set may be damaged.

The best method to pursue is to permanently connect some sort of lightning arrester—such as a vacuum, or air, gap—in the circuit between the aerial and ground. With such an arrangement, it is not necessary to change any connections during a storm or to think of grounding the aerial. Two metal plates mounted on an insulating base, so that the points are about 1/8 inch apart, will provide ample protection and be easy to make.

There are a number of worthwhile types of arresters on the market. Provide yourself with one and be absolutely safe. The lightning arrester forms a positive protection against lightning troubles and will operate indefinitely without attention.

The Radio Primer

For Thousands of Beginners Who
Are Coming into Radio Circles

*Weekly A B C of Radio Facts and Principles
Fully and Tersely Explained*

By Lynn Brooks

WHAT are the essential features of construction of the audio-frequency amplifying transformer?

The audio-frequency amplifying transformer consists of an iron core, around which are wound several thousand turns of fine insulated wires. The windings are in two parts—primary and secondary.

* * *

What is meant by primary and secondary?

The words are used to designate the two windings of the transformers. The primary winding is the winding into which the current is fed. It is generally marked on transformers by the letter P. It may be determined also by looking at the transformer. The smaller winding of the two is generally the primary, while the larger is the secondary. The secondary winding is marked S. It is the winding from which the transformed current is taken.

* * *

What is the iron core made of?

The iron core is made up of a large number of thin sheets of a special iron arranged in a square, or rectangle, thus forming a complete path for the magnetic force which is produced in the iron when the transformer is connected into the circuit of any radio-receiving-set.

* * *

What is the function of these transformers?

To change the audio-frequency variations in the plate circuit of the detector tube into the similar but greater variations in the grid circuit of the first amplifier tube. As a potential on the grid determines the strength of the signals heard by means of the phones in the plate circuit, the transformers make it possible to greatly strengthen these signals by increasing, or boosting, the potential impressed from the plate circuit of one tube onto the grid of the next.

* * *

What is meant by amplification?

Amplification means to magnify or enlarge. In radio it refers to the magnification of the strength, or loudness, of the signals received and detected.

The transformers just described are used in radio as magnifiers.

* * *

How are the radio signals amplified?

By the use of additional vacuum tubes and amplifying transformers. Instead of inserting the head phones in the output, or plate circuit, of the detector tube, the currents in this circuit are passed into a special transformer called the amplifying transformer. After passing through the transformer the signals are conducted to the grid of an amplifying tube. Being of a greater potential when they enter the tube through the grid, these currents liberate a large plate-current. Thus, if the head phones instead of being inserted in the detector plate-circuit are inserted in the amplifier plate-circuit, the signals heard will be many times louder.

* * *

How many times may detected signals be amplified?

Experimentally, without limit; practically, the strengthening of the signals is limited to two amplifying tubes.

* * *

Can amplifiers be used with regenerative sets?

Yes; but it will be found advantageous to insert a small bypass condenser around the primary winding of the first transformer.

* * *

What is the reason for this condenser?

The high-frequency resistance, or impedance, of the transformer winding is so great as to form a barrier against the passage of the retuned currents. A condenser allows the high frequency, or—as they are more often called—radio-frequency currents, to pass around to the grid without encountering this barrier.

Take Care of Your Phones

One thing that is important—dropping phones. This is apt to break the ear-caps and possibly injure the windings. It may injure the phones entirely. Receivers are built like a watch and should be given as careful attention. Take care of your phones and they will last you a long time.

How Crystals Change the Speed of Radio Waves

Thousands of radio beginners have come into the radio field since summer. They will find "The Radio Primer," published weekly in RADIO WORLD, a regular source of instruction and aid. For this reason, RADIO WORLD will republish, from time to time, some of the valuable primer articles that appeared in its early issues. These articles, by experts, contain a vast amount of radio information that cannot be duplicated. Every beginner will find them necessary to the building of sets and cooperative with the new material being printed.

BECAUSE of a peculiar property which they have of letting only part of an electric current pass through them all radio waves, when they pass through the air, are in the form of a wave, one-half of which is traveling in a positive direction while the other half is traveling in a negative direction, said a writer for this department in RADIO WORLD No. 6. This is illustrated in Figure 1. Now a crystal of one of the substances men-

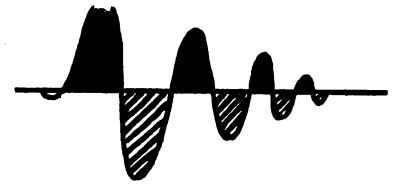


Figure 1. Diagram of radio wave as it passes around through tuning coil and condenser. Solid-black part represents positive wave; cross-sectioned part the negative wave.



Figure 2. After passing through detector, wave of Figure 1 has been reduced to this form. The negative wave has been strained out by the crystal.

tioned above has a fondness for the positive kind of electricity, but won't have anything whatsoever to do with the negative kind. The crystal opens wide its door to the waves that are positive, but the door is slammed in the face of the other waves. This exclusiveness of the crystal is a fortunate thing for us. If the radio waves are trotting around our receiving circuit at a tremendous speed and we insert a detector in their path just one-half of all the waves will be rectified.

"Shielding" the Set

UNTIL the coming of the modern regenerative receiver, the term, "shielding," as applied to radio apparatus, was quite unknown. The regenerative receiver, however, being supersensitive to all electrical influences, has been found to require protection against external electrical disturbances. Shielding accomplishes this. It is the process of surrounding the entire receiver, and, frequently, the individual circuits therein, with a metallic surface. This generally takes the form of a copper lining in the cabinet and on the rear of the panel itself. Shielding takes care of the energy loss from the windings which tend to induce another current in the same manner that radio waves induce electric currents in a receiving antenna.

How to Make Your Aerial Function

By Horace Beers

ALTHOUGH any alternating current will cause a disturbance in the ether regardless of the size or shape of the circuit, in order to create the maximum disturbances possible with the power available, it is necessary to erect an aerial.

An aerial or antenna, as it is sometimes called, is a system of wire or wires stretched above the surrounding objects and connected to the radio set. The aerial is used for both receiving and transmitting, a switch or other transfer method being used to connect it to one or the other, according to the station sending or receiving the messages.

The wire used in aerials is either bare copper, phosphor bronze, or copper-clad steel. The ends of the wires are insulated with special insulators and the wire led into the house through an insulating tube known as a "bulk-head" insulator.

The problem of installing an aerial presents considerable difficulty to the beginner, but as a general rule, by bearing in mind just exactly what function an aerial performs, the problem is simplified. The average receiving set will operate with perfect satisfaction if a single wire—about size No. 14—100 to 150 feet in length is used. It is not absolutely necessary to have a fixed length. The wire may vary between 150 feet and 300 feet, and satisfactory results will be obtained.

The function of an aerial is to collect the electro-magnetic energy sent out from the transmitting station and convey it, through the receiving set, to the ground. As any conductor will perform a similar function, it is desirable that the aerial be suspended above surrounding objects. The electro-magnetic energy then reaches the aerial wire before it reaches any other object with the result that the receiving set receives more energy than would be the case if the wire were below surrounding objects.

In laying out an aerial, always endeavor to keep the wire level. If this is not possible, fasten the end from your receiving set as high up as practical and let the end from which the wire reaching to the receiving set is taken, be the lower end. Do not attempt to stretch the wire too tightly; it is of no particular advantage. It only raises the center of the wire a few feet and puts it under a severe strain which may result in breakage. This is especially true if sleet or snow collects on the wire.

In stretching the wire, try to eliminate as many bends as possible. Bring

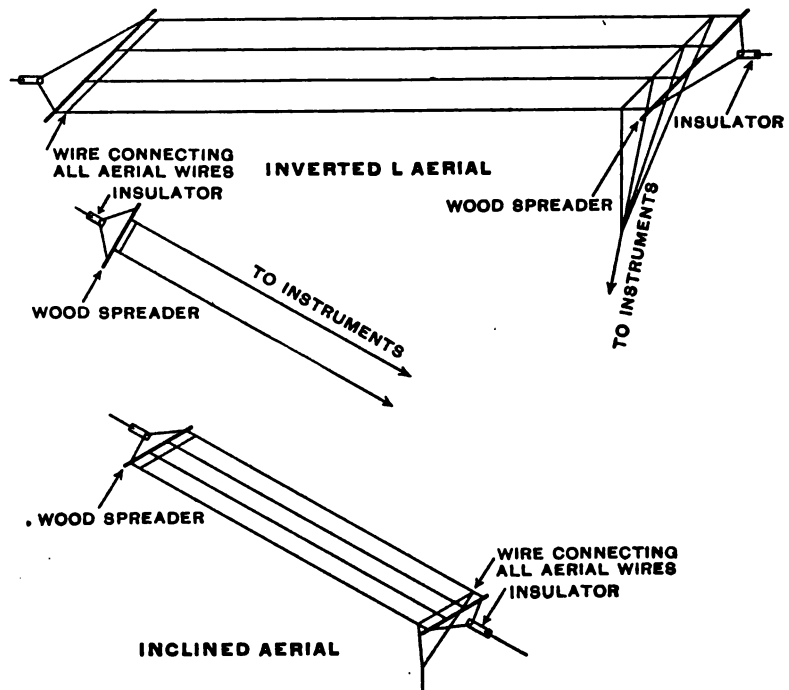


Diagram of various types of aerials. The 4-wire aerial shown at the top is the inverted-L type, which may be used for receiving as well as transmitting. The two lower aerials are the inclined type. They may be used for transmitting messages.

the conductor leading to the set directly to your window without fastening it to the building. It is of great importance to keep this wire away from the surrounding objects, as there is a capacity effect between the wire and surrounding object which robs the aerial of some of its energy.

It is not possible to give specific di-

rections on the erection of aerials. Each particular house presents its own problem. With a little ingenuity an amateur may construct easily an efficient aerial in any place. In connecting aerial wires, be sure that perfect contact are made. When possible, always solder the connections.

This is important.

Accessories May Be Used to Increase Wave Lengths

THE average receiving set is usually capable of operation over only a comparatively narrow band of wave lengths. This should not be considered as a great fault, because sets can be more efficiently designed to operate over a narrow wave-length range than over a wide one. But occasionally it is desirable to hear stations that operate on wave lengths higher or lower than those afforded by the tuning apparatus of a set. Sometimes an aerial may be too long to work with a certain set to hear the shorter waves and some means must be provided to cut down the natural period.

An accessory that may be attached to a set to increase its wave length in order to hear some of the longer wave stations is called a "loading coil." This is connected in aerial and ground.

When a two-circuit receiver is used, another coil must be connected in series with the secondary in order to balance the two circuits. When a loose coupler is used, a moderate amount of loading may be used in the primary circuit without any in the secondary, as the secondaries of these instruments are usually wound with more wire to compensate for the slight loading. If a shorter wave than the natural wave-length of the aerial is wanted, some sort of condenser may be connected in series with the aerial circuit. This condenser is usually of the variable air type, though it can be of the fixed variety. Where a short-wave condenser is used, a single pole switch may be provided so that when it is not needed it can be short circuited without any trouble.

How to Avoid Interference when a 360-Meter and a 400-Meter Station Are Operating Simultaneously

By *C. W. Horn,*

Superintendent of Radio Operations, Westinghouse Electric & Manufacturing Co.

THE U. S. Department of Commerce, in order to assist radio broadcasting, has specified two wave lengths on which broadcasting may be conducted. These wave lengths are 360, the one in general use up to this time, and 400, just recently allotted. While these wave lengths are 40 meters apart, there will undoubtedly be considerable confusion on the part of those owning radio receivers who are situated in close proximity to one of the stations. For the purpose of assisting those who are so unfortunately located that two such stations are picked up by their receivers simultaneously, I will describe a number of methods which, if applied, should greatly assist those desiring to get either one of the two waves without being too greatly interfered with by the other. There is one case, however, which will be very difficult to assist, that is where the receiver is exceptionally close to a broadcasting station. By close is meant within a few thousand yards.

The assignment of two wave-

lengths so closely together will have the effect of stimulating construction of radio apparatus which will be capable of tuning more sharply, and it is the old case of "necessity is the mother of invention." Therefore, while there may be some inconvenience at the present time, this should be overlooked in order to help the radio game by creating a condition which will stimulate the construction of better apparatus and which will permit, perhaps, in the future the assignment of more wave lengths, thus creating a better situation in the air.

One of the greatest faults that the writer has found in connection with the installation of radio-receiving apparatus is that it is believed that the more wire and the larger the antenna, the more will be received. Exceptionally large antennae make it more difficult to tune sharply, and for this reason it is advocated that very short single-wire antennae, approximately 75 feet long measuring from the apparatus to the far end, be utilized, such single-wire antennae to be stretched

away from all metallic objects and run straight and clear of all obstructions.

Secondly, do not run the antenna or the lead-in over metal roofs, along water spouts or drains, or parallel to telephone and power wires.

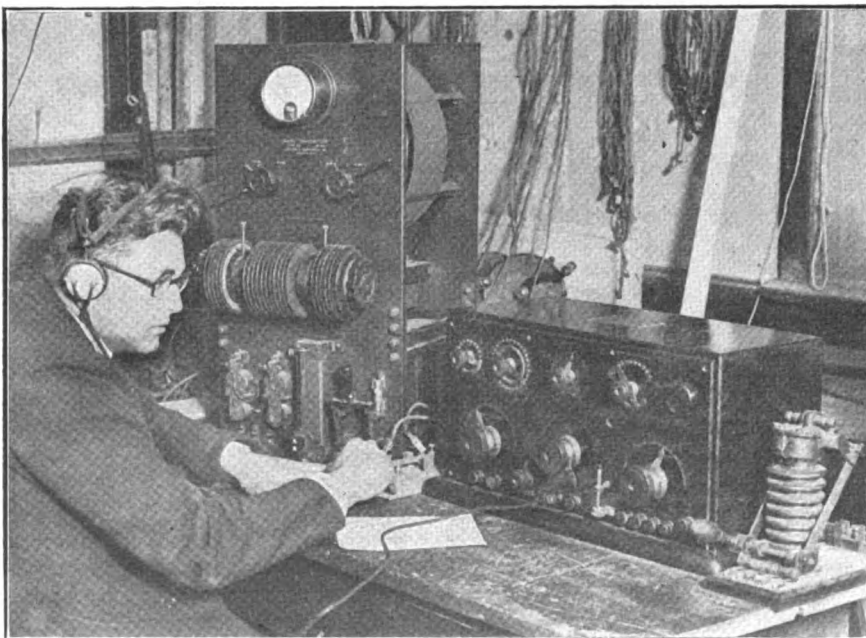
Frank Conrad, assistant chief engineer of the Westinghouse Electric & Manufacturing Company, has made measurements and drawn resonance curves which show that a short low antenna tunes much more sharply than a large and long antenna. This holds true both for coupled and single-circuit tuners.

Another method to pursue in overcoming interference, especially where vacuum-tube receivers are used and where the receiver is located close to a broadcasting station, is to make use of the well-known directional properties of the loop antenna. A very simple loop may very easily be constructed by winding a half dozen turns of wire, spaced about one inch apart, on some framework, which can be rotated. It will then be easy to tune out a station which has a difference of 40 meters in wave length, especially so as a loop antenna forms a closed circuit which can be more sharply tuned than an open antenna. Both ends of the loop should be connected across the antenna and ground terminals, and no other ground or antenna used.

Radio enthusiasts who are more fortunately located—that is at but a short distance from a broadcasting station—may tune, without any difficulty, in either one of the wave lengths mentioned. They should, however, bear in mind that a single-wire antenna, not too long and kept free from obstructions, and not running near grounded metallic objects, will tune sharper. Where the amateur has a transmitting apparatus it is desirable to have a fairly large antenna, with more than one wire. If such is the case, he should use a separate wire for receiving.

The ideal condition will be when stations can operate independently on either side of two wave lengths without interfering with each other. Because the receiving apparatus is an important factor these suggestions are given in order that owners of receiving apparatus may have the necessary information to increase the efficiency of their apparatus.

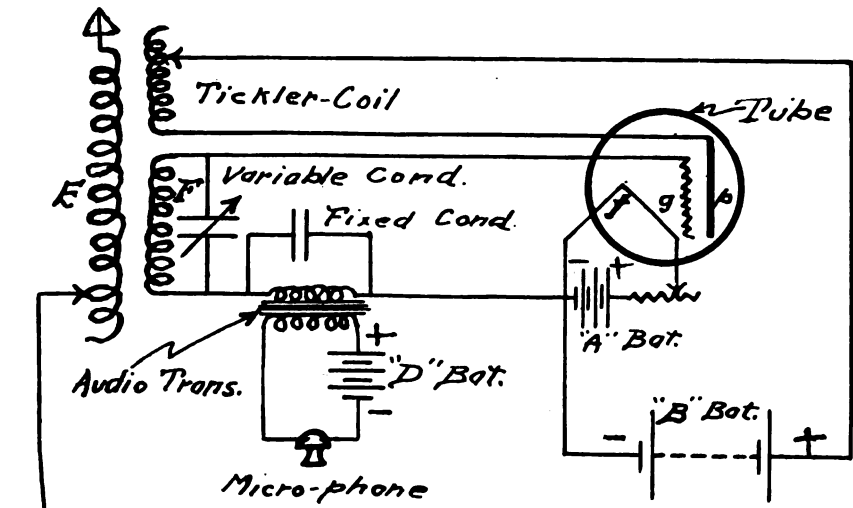
In a New York Y. M. C. A. Radio School



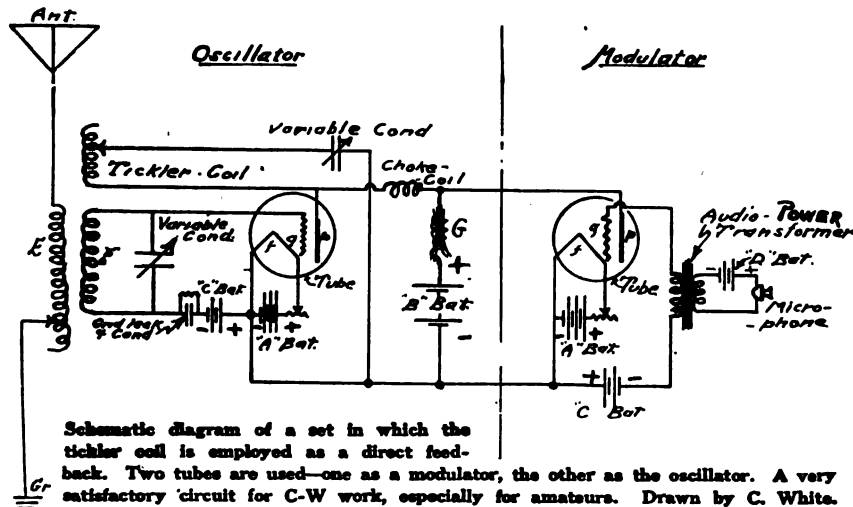
(C. Kadel & Herbert)

Operator William Pacquet sending a message in the radio school of the Y. M. C. A., New York. This school possesses some of the most up-to-date radio apparatus in the country. It is utilized for practice on commercial transmitting and receiving. The transmitter is at the left; the receiver at the right.

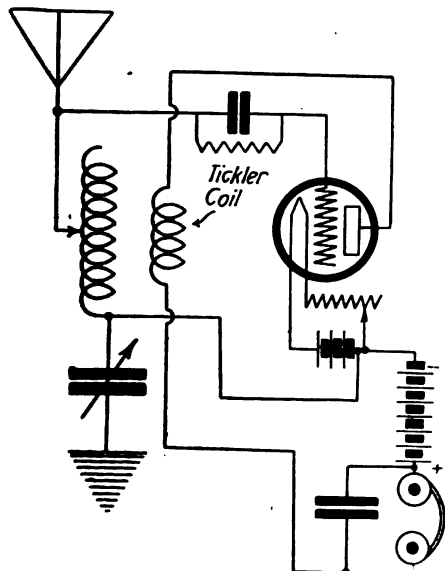
Another R-W Page of Hook-Ups



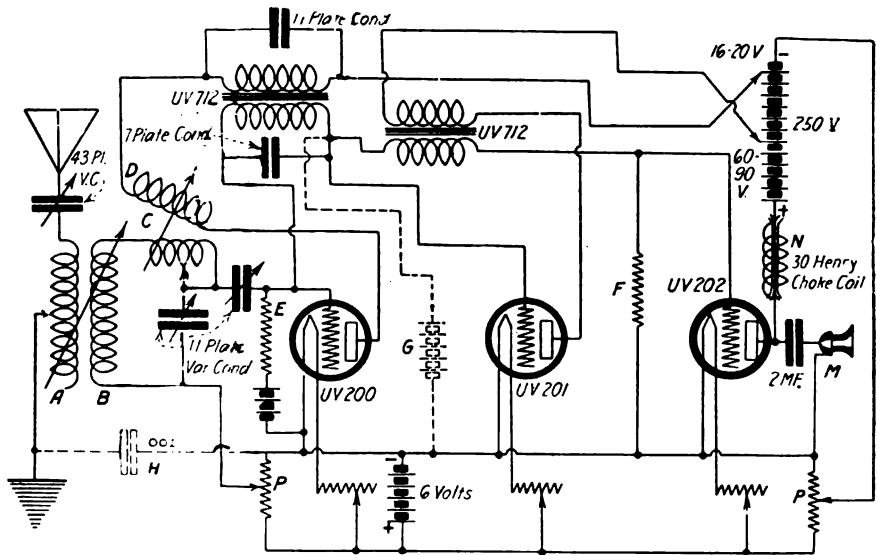
Schematic diagram showing common type of transmitter used in low-frequency tube sets. In this circuit, the microphone modulates on the grid of the tube. This is a very good telephone transmitter. Drawn by C. White.



Schematic diagram of a set in which the tickler coil is employed as a direct feedback. Two tubes are used—one as a modulator, the other as the oscillator. A very satisfactory circuit for C-W work, especially for amateurs. Drawn by C. White.

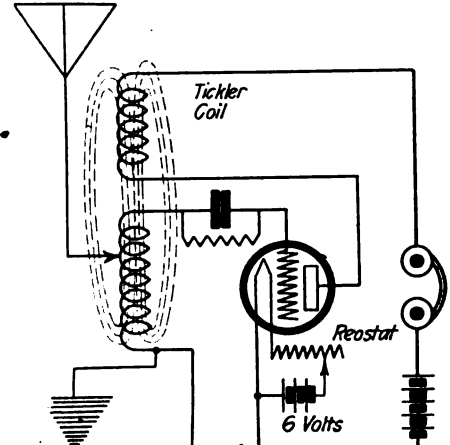


A unique method of employing regeneration is detailed in the above circuit. This is of the single circuit type. It also utilizes a tickler coil and is hooked in the circuit. Suggested by John Kent. Drawn by S. Newman.

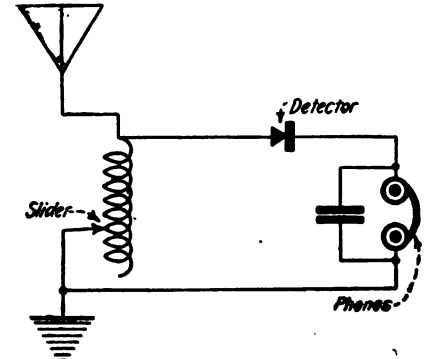


Schematic diagram of a practical circuit, employing the following apparatus: A-B is a vario-coupler; C-D is also a vario-coupler having a wave length from 180 to 900 meters. The tickler is wound with 125 turns of wire (bank wound). E is a variable grid-leak, $1\frac{1}{2}$ to 3 volt bias. F is a fixed grid-leak of about 1 megohm. G-H shows optional connections, the grid bias being from 6 to $22\frac{1}{2}$ volts. M is a loud speaker. N is a door-bell transformer (primary open) using 110 volts as chokes. Suggested by Dr. O. S. Kelly. Drawn by S. Newman.

Realizing that the most interesting phase of radio with the average "fan" is the testing out of hook-ups, Radio World will publish, from time to time, a page of the most interesting diagrams, some of which have already appeared in its pages. An editor guides his policy by the wishes of his readers, and the number of requests for back numbers containing these diagrams indicates that there is an insistent demand for them.



Schematic diagram of a regenerative circuit employing a tickler coil as means of regeneration. The dotted lines show how the magnetic lines of force act about the primary winding of the receiver and the tickler coil. Suggested by Fred Chas Ehlert. Drawn by S. Newman.



Single-slide tuner employing, as means of detection, a crystal detector. This type receiver is capable of receiving broadcast programs about twenty-five miles. Suggested by Horace Beers. Drawn by S. Newman.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

N. O. 64 BROAD STREET, New York City, the building to be purchased by the Radio Corporation of America for \$1,000,000, is known in the radio world as the "heart of world-wide wireless," as from here there are more circuits handled than in any other place or country in the world. The building itself is ideally located for the purposes of the company, because it is in the center of the financial and commercial district of New York from which a large percentage of the traffic handled originates. The building is within two blocks of the principal cable and telegraph forwarding offices and particularly near the Postal Telegraph Company's office with which the Radio Corporation has recently entered into a traffic arrangement whereby the Postal Company collects and distributes trans-Atlantic radiograms from and to all points in the United States. The building is ten stories high and contains 43,000 square feet. It is known as the White Oil Building, but the name, in all probability, will be changed to "Radio House." It will be remodeled to meet the needs of the corporation and to house the executive, sales, and engineering departments of the corporation, now located in the Woolworth Building.

* * *

Dr. Samuel Wesley Stratton, for the past twenty-one years director of the United States Bureau of Standards, and one of the leaders in radio legislation and standardization, was elected recently president of the Massachusetts Institute of Technology. He will take up his new duties on January 1, 1923.

* * *

During the next six years more than three hundred billion dollars will be spent in the additional electrification of America, said Frank E. Watts, New York, editor of the "Electric Record,"

He Telephoned by Radio from San Francisco to London



(C. International Reel Photo)

H. GORDON SELFRIDGE, JR.,

Son of the London merchant, was photographed in San Francisco, while telephoning by radio to his father, in London, 6,000 miles away.

in an address to the annual convention of the National Association of Electrical Contractors and Dealers. "The possibilities of electrical development are unlimited," said Mr. Watts. "Eight million homes in the United States are now wired for electricity, six million are not. Half of those will be wired within the next few years. How rapidly the central power stations are expanding is indicated by the fact that, last year, the light and power companies spent \$750,000,000 in new development. And in the next six years they will spend a total of four billion dollars to extend their electrical service to the homes and factories in America."

* * *

President Alfredo Zayas of Cuba has formally inaugurated radio broadcasting in Havana. His speech announcing this important event was delivered in the national palace and shot out into space from the sending station of the Cuban Telephone Company. Special transmitting apparatus was installed in the palace to carry the president's voice from that place to the radio room of the telephone company. The wave length used was 400 meters. The station was erected by the International Telephone and Telegraph Corporation of New York. Experimental tests made in Havana developed the fact that amateurs in the United States as far north as New Jersey were able to hear phonograph records broadcast from Cuba.

* * *

Captain Pownatan Page, vice-president and general manager of the Pan-American Wireless Telegraph and Telephone Company of Buenos Ayres, who has been in New York City negotiating international radio connections for his \$156,000,000 South American plant, says that a misapprehension has arisen through a paragraph which said "the combined plants represent an invested capital of \$170,000,000." "This is perfectly true, of course," Captain Page said, "but certain readers appear to have inferred that cooperation in operating resources involved also a combination of this huge capital under one board—in short, that the world's leading radio concerns had formed a trust. What I desire to make plain is that the figure \$170,000,000 represents the combined capital of all the radio interests mentioned, which is in no way affected by the international cooperative plan. Each company is as separate and distinct in its own sphere as before and absolutely directs its own affairs. The finances of the various radio companies concerned are not combined, as appears to have been understood in some quarters."

* * *

The United States Government now maintains ten broadcasting stations for the purpose of sending out crop and market news.

* * *

A feature of the Closed Car Show at the Grand Central Palace, was a radio-equipped automobile which operates without antenna and ground wires, a condenser made up of a copper screen and the chassis forming the wave collecting system. This car, a limousine, had the distinction of being the only machine at the show so equipped. One plate of the condenser, a copper screen, is fixed between the roofing and upholstery, thus completely concealing it from view. The metal parts of the machine, being all joined together, form the other plate of a large condenser, having air and passengers as a dielectric, the separation being about five feet. The preliminary tests of this apparatus proved that such an application of radio reception is highly feasible and very satisfactory.

* * *

It has been suggested that the President of the United States set aside ten minutes each day for a personal radio talk with the American people.

* * *

By operating on two different wave lengths, one 450 metres and the other 350 metres, a two-way radio talk was successfully carried on between Portland, Oregon, and Los Angeles, California.

* * *

Broadcasting descriptions of missing persons is now one of the most important uses to which radio is being put.

* * *

Radio insurance is now being offered, covering fire, lightning, breakage and theft.

* * *

French children are turning from mechanical toys to miniature radio sets. These tiny sets are being turned out in large quantities by French manufacturers.

Radio and the Woman

By
Crystal D. Tector

I WAS in the train from New York City to New Rochelle, the other day, and two women were chatting in the seat behind me. One of them remarked, "Well, women are in everything, to-day, even radio." She almost took my breath away—indeed, I nudged Friend Husband with sufficient force to jar him from his afternoon paper and, turning, looked the speaker squarely in the eye. I presume that the look on my face betrayed my surprise; but, realizing that I had put myself in a position to be criticized, I mustered every bit of courage at my command and asked: "Are you interested in radio, madam?"

* * *

"Oh, I have to be!" she exultantly exclaimed, as soon as she realized that I did not intend to be rude by my sudden intrusion.

Then we "got together," as the men say, and most formally introduced ourselves; and I whirled F. H. about in his seat and introduced him too. And my new acquaintance proved to be a most charming person—an instructress of radio classes in girls' private schools. Her brother, she said, was radio officer on a steamer in the Pacific, and he had told her so much about radio that she "just took to it as a duck takes to water," as she tersely put it. All that she knows her brother taught her; but she is putting the knowledge to the most practical use—making it earn her a living.

* * *

And why shouldn't radio appeal very strongly to women? It does seem to me that but few of its elements—if any—are beyond the reach of our sex. And, this week, I am pleased to show you a picture of Clara Kimball Young, who we all know as one of the most attractive of "movie" stars, actually putting together her own set. No doubt, any woman who cares to go deep enough into the mysteries of radio will be able to do the same thing. When we take into consideration the fact that little children are among the most ardent radio fans—that they seem to master its apparent intricacies—there is no reason why we grown-up women should hesitate to become fans, too.

* * *

I am told that radio is one of the most attractive things ever put before the little ones. I am told that no mother—or father, for that matter—should deny the little ones their right to become



(Melburne Spurr, photographer, Los Angeles)

"Clara Kimball Young actually putting together her own set. Any woman who cares to go deep enough into the mysteries of radio will be able to do the same thing."



(G. Paine & Atlantic Photos, Inc.)

Miss Betty Bates, the California violinist, and the transmitting set into which she played music that was carried by radio to Havana.

Betty Bates, the San Francisco violinist, whose music, played in the City by the Golden Gate, was heard in Havana. Over 13,000 fans reported having heard her. Her music was sent over a 5,000-mile radiophone circuit connecting Havana, Cleveland and San Francisco. Miss Bates is a violinist of considerable merit whose playing by radio was a broadcasting event.

* * *

Here is a little advice in answer to many inquiries:

In all radio-frequency amplifying circuits it is absolutely necessary that a potentiometer be used across the A battery which lights the filaments of the tubes. This stabilizes the entire circuit and enables the operator to put the proper amount of negative on the grids of the radio-frequency tubes. This function will be further assisted by placing a by-pass condenser of at least .001 mfd. capacity across the grid lead and negative side of the potentiometer.

* * *

(The following letter is self-explanatory. We are pleased to gratify our correspondent's wish, though if her communication had arrived an hour later the presses would have started.—The Editor.)

Dear Mr. Editor:—I have just received this week's copy of RADIO WORLD and I am so enthused over your suggestion for a National Radio Week that I immediately phoned Friend Husband to his office and told him that we would certainly give a radio party during that week—a really big party to which mostly strangers to radio will be invited. You may count on me for all the help I can give. I think that the different broadcasting stations should announce it in some good slogan like, "Are you prepared for National Radio Week?" once a day, until the event gets started.

Yours for "The Big Week."—C. D. T.

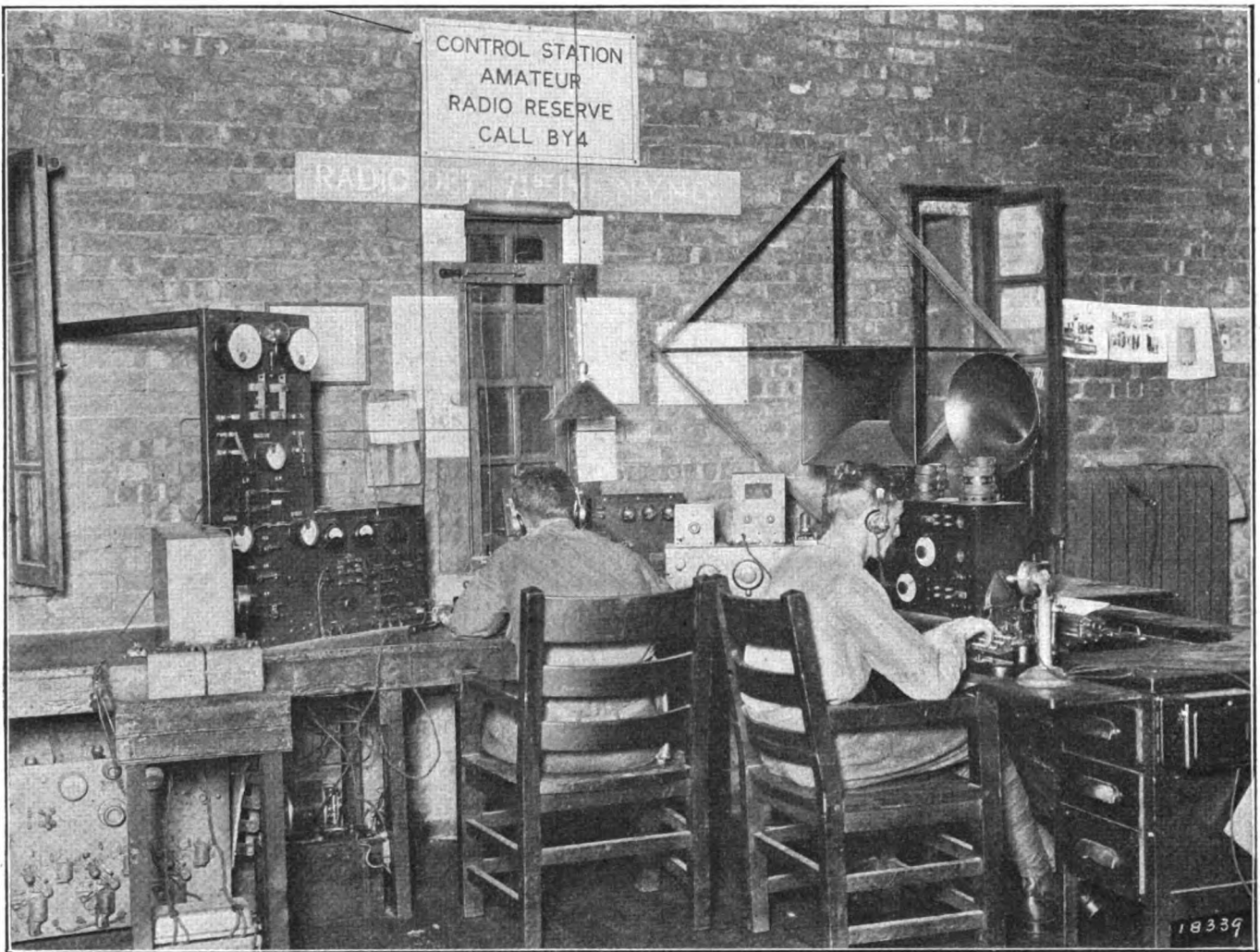
interested in this wonderful science. Just what is the particular psychology that makes it appeal so strongly to children, I do not know. Perhaps some of you mothers can tell me. Nevertheless, it is a fact that radio does possess some far-reaching interest for the little ones that—like electricity itself—cannot be explained.

* * *

I am glad to see that the broadcasting programs have their quota of women artists. But I want to tell particularly about Miss

Latest Radio Equipment for N. Y. N. G.

By Walter Miller



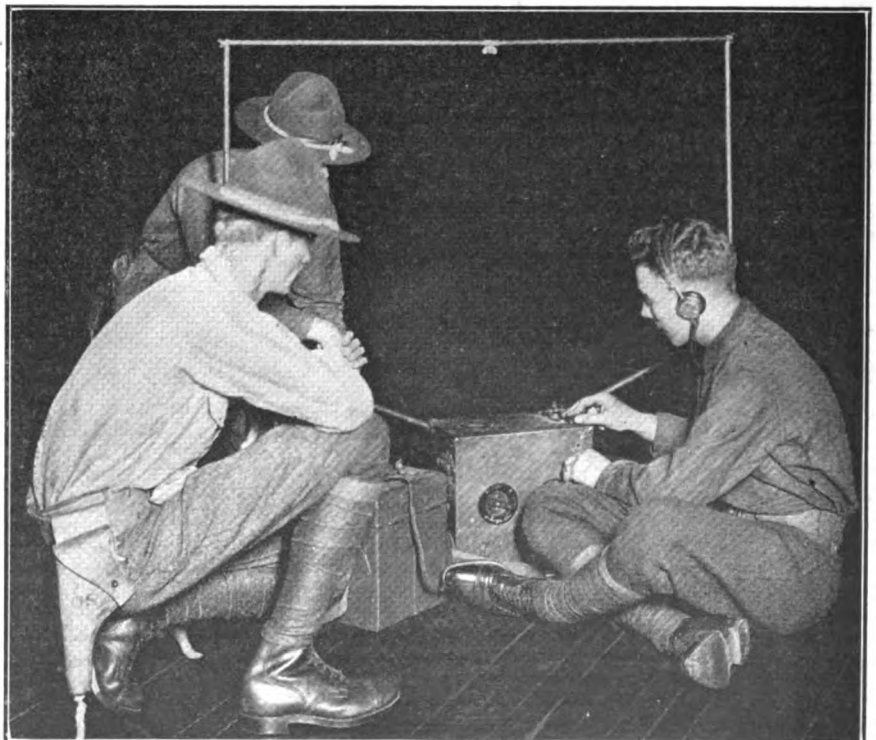
(Both photographs C. International News-Reel)

THE newest radio aids used by the radio detail of the 71st Infantry, National Guard of New York, are shown in the accompanying illustrations and the illustration on the front cover of this week's issue of *Radio World*. The 71st Infantry is a licensed station with the call BY4. Sending and receiving is accomplished at the same time by using the loop antenna for reception and an outdoor cage-antenna for transmitting. BY4 sends both telephone and telegraph signals and has been heard throughout the Eastern United States.

The upper illustration shows the interior of the radio room of BY4. The lower illustration shows how sending and receiving are accomplished simultaneously, on seventy meters, by the loop set. A break-in system is used which gives instantaneous message traffic without the necessity of throwing a send-receive switch.

Instructors who have qualified as experts in their respective lines, are in charge of the various classes; and the men of the battalion are enabled to enjoy the best of instruction and training.

Lieutenant Grant Layng is in charge of the radio work of this detachment of the 71st. An excellent opportunity is open in this organization for radio operators and other technical men who desire a radio education; but because of the limited number of men designated for the detachment those selected finally must qualify thoroughly both technically and in a military sense. Drills and classes are held on Tuesday night and Friday night of each week. Applicants should apply to the Armory, Park Avenue and 34th Street, on either night.

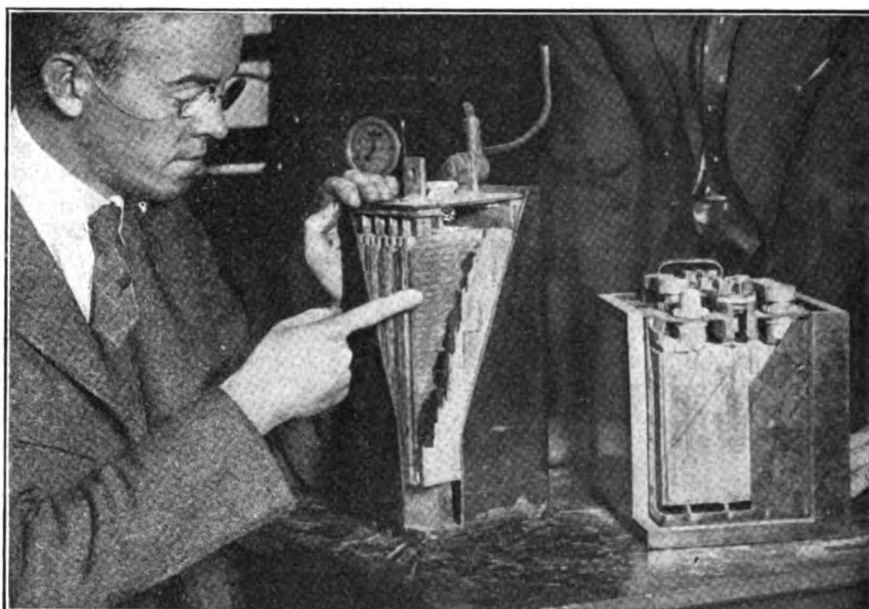


"Close-ups" of Recent Radio Devices



(C. Kadel & Herbert News Photos)

One of the most important elements in radio is the proper circuits in working out a telephone broadcasting-station. During the recent World Series it was most important that all the circuits were of the correct value. In order to accomplish this, each line had to be tested out. The above photograph shows the new special-type of voltmeter for testing the voltage by which messages were sent to WJZ for broadcasting.



(C. Kadel & Herbert News Photos)

In radio work, the storage battery plays an important part. One of the first things the amateur is taught is an understanding of its functioning, and, also, how to take care of it. The storage battery is a necessary element in radio and one must know its main parts. The above photograph shows C. A. Peterson, director of the Department of Electricity, at the Y. M. C. A., New York, explaining a new battery.

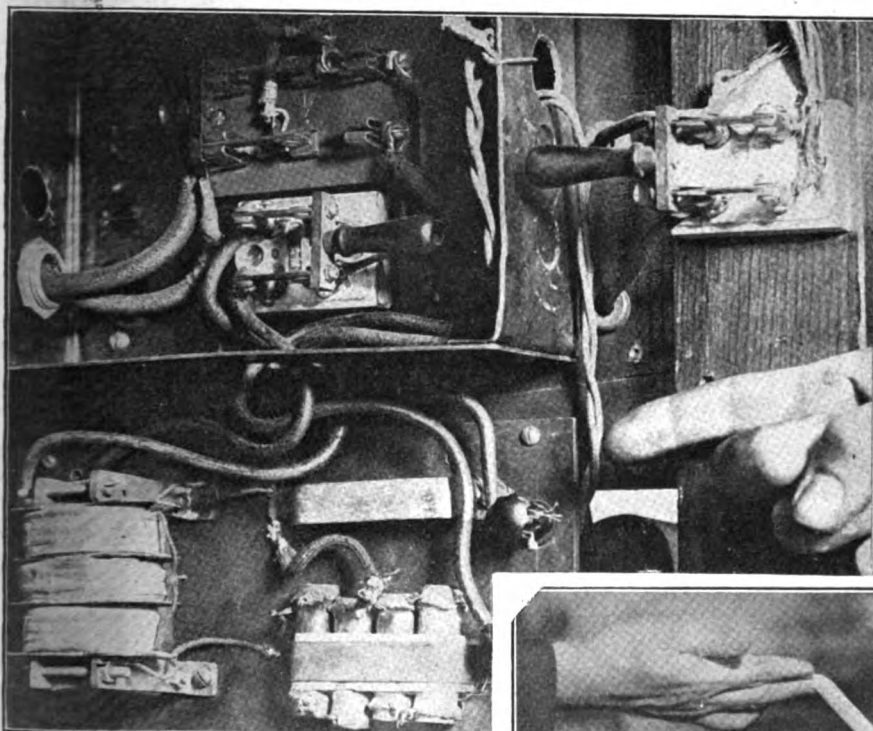


(C. Kadel & Herbert News Photos)

John Frazier photographed speaking into the very latest thing in microphones. Mr. Frazier was sent by the Westinghouse Company, Pittsburgh, to assist New York City experts in the broadcasting of the recent World's Series. His object was to see that no energy was lost in the transmission lines.

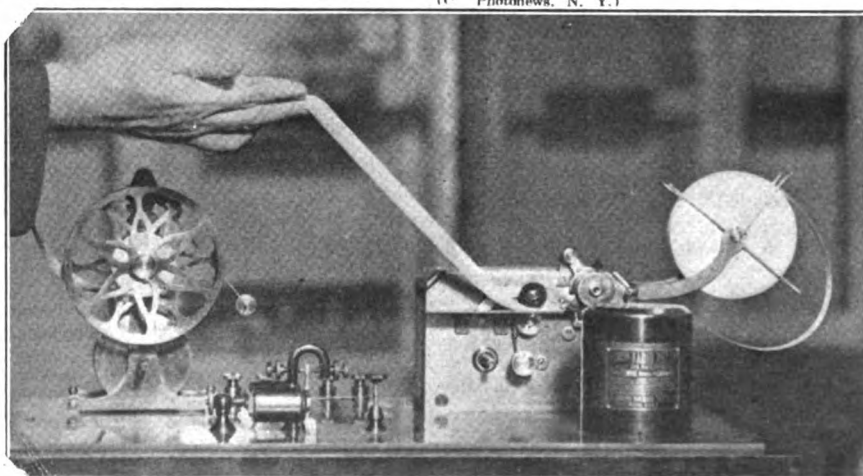
The photograph below shows the Finch radio relay. It is a very recent radio invention which automatically receives and records code messages on paper tape—messages which may be read as reports are read on a stock ticker. All that is necessary is to connect the radio relay to a radio receiver. It will record and retransmit messages simultaneously.

(C. Photomews, N. Y.)



(C. Kadel & Herbert News Photos)

This little device tucked under a table in the operating room of WJZ, Newark, plays a most important part in the successful broadcasting of big news events. The telegraph wire carrying the news enters WJZ at this point, and the above device, consisting of resisting coils and transformers, eliminates all distortions on the line. This is a great relief, as it lessens all that unnecessary tinkering which is experienced in the phones when receiving. From this point, the line enters the speech amplifier and from the speech amplifier it is transferred to the modulators, thence to the aerial. Contrary to the belief of many, a second microphone is not used in broadcasting an important news event, such as the recent World's Series.



Secret Lines of Radio Communication

By Carl H. Butman

WASHINGTON, D. C.—Back of the commercial systems of world communication, known and used by both government and private interests, lie existing lines of communication little known to the public although not strictly "secret." Only recently, when the "Terrible Turks" threatened the Dardanelles and Southeastern Europe, the State Department asked the Navy if aid could be given in the transmission of dispatches to the Near East in the event that communication service to that quarter of the globe was broken. To this question, which caused the State Department some concern, the Naval Communications Service made reply as follows: "Our lines of communication to the embassy at Constantinople and all our naval craft in Turkish waters are established and in official use to-day. We can communicate with Admiral Bristol within a few minutes."

It has been stated justly that naval communication circles the world. So it does, with the exception of very few corners, and three-fourths of the communication is handled by radio.

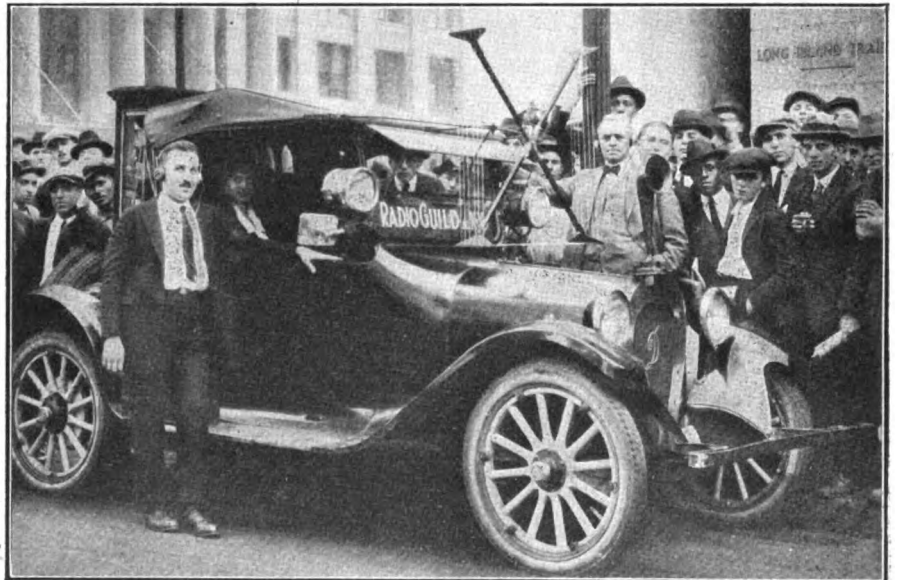
To-day, when a dispatch for Admiral Bristol is filed in the Navy Department, it goes out at once through the Annapolis radio station to a French radio station, thence by land line to the office of the American Communication Service operated by naval personnel in Paris, where it is checked and forwarded by wire to Coblenz. The message is relayed electrically at Coblenz from the office of the Chief Signal Officer of the American forces in Germany, where Army operators handle the wires to Vienna. The Vienna station is in the Austrian Telegraph Building, but the station is operated by the United States Navy. From Vienna the message goes forward by naval radio service from the station at Laareburg direct to the receiving station at the American Embassy at Constantinople, where naval personnel again handle the dispatch and forward it to the naval ship on station there, which relays it to its destination. Admiral Bristol is in charge of all American naval vessels in Turkish waters, and the presence of his destroyers makes a sort of fan to all points of which messages can be relayed by radio and delivered from the vessels to other points. In the event of a break in the wires from Paris to Vienna, messages for Constantinople would be radioed by French stations to Vienna and to United States naval vessels in the Mediterranean.

The route of messages from points in the Black Sea to the United States is similar, except that the outlying ship transmits by radio to Constantinople, either to the station ship or the Embassy, but only the ship can send messages. From the station ship the message goes by radio to Vienna, thence to Coblenz by wire and through to Paris, where dispatches are turned over to French Radio Service for

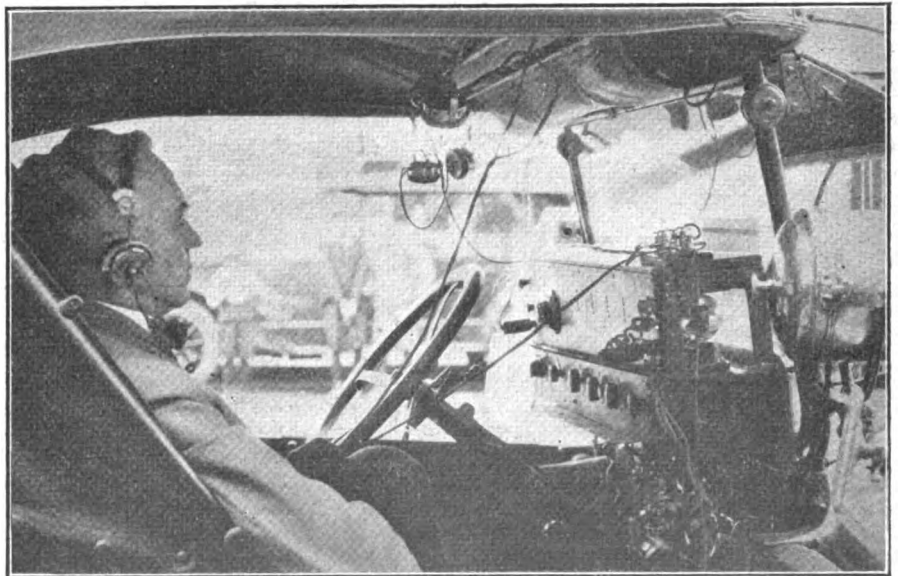
transmission, either from Lyons or Lafayette, to Bar Harbor and delivered by land wire to the Navy Building in Washington.

This system, though seemingly somewhat roundabout, is nearly direct and is good except that it is subject to delay on account of schedules, as the Allies all use the same route in and out of Constantinople and keep it busy twenty-four hours a day.

The "Dashboard Special" Makes 40,000 Mile Tour, Equipped with Radio



(Both photographs by General Photographic Service, N. Y. C.)



An automobile with a loop aerial in front of the wind screen and a receiving set on the dashboard recently made its appearance in the streets of New York. Crowds gathered wherever it stopped and listened to the music of broadcasting stations. Mr. and Mrs. J. C. Davenport, owners of the car, were testing out their new radio set, known as the "Dashboard Special." They had just completed a forty-thousand mile tour and were about to leave on a second tour of indefinite duration. The upper picture shows the "Dashboard Special" in front of the Pennsylvania Station, New York City. The lower picture shows Mr. Davenport and the arrangement of his car's fine radio equipment.

"Kamoi" Claims Prize Radio

*Japanese Naval Craft, Experts Say, May Now Boast
Finest Installation*

"KAMOI," fuel ship of the Imperial Japanese Navy, which steamed out of New York recently, en route to Japan, on her maiden voyage, has the most elaborate radio-equipment of any other ship afloat, according to radio engineers. The most recent inventions in the field of radio art have been included in the outfit, the greater part of which was furnished by the General Electric Company.

Included in the transmitting equipment are a 1-kilowatt radiotelephone and radiotelegraph set which may be used for telegraphy on continuous or interrupted continuous wave; a 20-kilowatt telegraph transmitter and a 2-kilowatt 500-cycle quench spark-transmitter for telegraph only.

The reception equipment comprises a long-wave receiver with a range of from 1000 to 30,000 meters and a short-wave receiver ranging from 200 to 7000 meters. In addition, there is a superheterodyne receiver for long and short waves, and a standard three-tube commercial-ship receiver with a range of from 200 to 7,000 meters.

An interesting feature of the installation is a radiotelephone exchange, by means of which the ship's operator can transfer control of radiotelephone transmitter and receiver to any one of several stations. These stations are located in the commander's room, the commander's office, the senior officer's ward room, and the bridge. By means of the telephone exchange, the commander, or any other officer, may communicate with any vessel in the fleet from any one of the sta-

tions on the "Kamoi." The exchange board differs very little from the usual telephone exchange. A red light indicates that the receiver has been taken from a phone hook, and the operator, by throwing a switch, puts the officer in immediate control of transmitter and receiver.

There is also a radio compass by means of which it is possible to find the direction of distant transmitting stations.

The "Kamoi" is the show ship of the Japanese Navy. She was recently completed by the New York Ship Building Corporation, and is the first vessel of any navy, other than the United States Navy, to be electrically propelled. The electric-drive equipment was designed and installed by the General Electric Company. The "Kamoi" is a 20,000-ton, 8000-horsepower vessel, and will make fifteen knots. Her main propulsion unit consists of an 8000-horse-power Curtis turbine generator which supplies power to two 4000-horse-power synchronous motors directly driving the twin-screw propellers. There are also two 400-kilowatt direct-current turbine generators which supply the excitation current as well as power to operate the auxiliaries, such as the main circulation pump, main condensate pump, sanitary pump, and blower motors. Another feature of the propulsion equipment is a 625-kilowatt auxiliary alternator which can be connected to either of the auxiliary turbines in case of the failure of the main driving-unit. This small generator will supply sufficient power to drive the ship at a speed of seven knots. The "Kamoi" will be used to carry coal and oil to ships of the fleet.

Experts Plan Big Radio Constructive Campaign

TO aid the government and the American people in peace or war, to eliminate the confusion of rapid development, to work with the Federal departments to devise a rational scheme of broadcasting for the Nation, to promote on a universal scale effective organization of all radio instrumentalities, and in general to undertake at once the solution of the pressing problems of the industry, now leading to conflict," are the declared purposes of the new National Radio Chamber of Commerce.

In a statement yesterday announcing the practical completion of the task of selecting the executive personnel of the chamber, which includes the appointment as general counsellor of Henry T. Hunt, No. 111 Broadway, late member of the Railroad Labor Board and former Mayor of Cincinnati, it was said that a committee had been appointed to investigate the whole question of broadcasting. One of the first steps in the committee's work will be to hold an open meeting of the chamber in Chicago during this week at the Chicago Radio Show.

William H. Davis, the president of the chamber, at its headquarters, No. 165 Broadway, summed up the chamber's general attitude toward broadcasting as follows:

"The only scheme of broadcasting which can prevail in any real sense is one in which the end to be attained

reconciles all conflicting elements, even to the submerging of private interests."

The vice-president of the chamber is Harold J. Power, the secretary, George Lewis, and the treasurer, Lloyd Marshall. The board of governors consists of A. H. Grebe, Richmond Hill, N. Y.; C. B. Cooper, New York; A. P. Morgan, New York; B. L. Moore, Buffalo; J. R. Crawford, Long Island City, N. Y.; E. R. Harding, Boston; Boden Washington, New York, and Gordon Sleeper, New York.

A plan of regional organization has been adopted by the chamber with the following district vice-presidents:

First district (Boston), O. K. Luscomb, Cambridge, Mass.; 2d district (New York and Northern New Jersey), to be elected; 3d district (Philadelphia, Baltimore, Washington), Atwater Kent, Philadelphia; 4th district (Atlanta, Savannah, Jacksonville), to be elected; 5th district (New Orleans, Memphis, San Antonio), to be elected; 6th district (San Francisco, Los Angeles, San Diego), Colin B. Kennedy, San Francisco; 7th district (Seattle, Portland, Tacoma), Robert H. Mariott, Seattle; 8th district (Pittsburgh, Cleveland, Toledo, Detroit, Cincinnati, Columbus), Powell Crosley, Jr., Cincinnati; 9th district (St. Paul, Milwaukee, Chicago, Indianapolis, St. Louis, Kansas City, Minneapolis, Denver), Harry Bradley, Milwaukee, and Dr. C. F.



Type R-3
Magnavox Radio
with 14-inch Horn

Why
MAGNAVOX
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The "Reproducer Supreme"

MMAGNAVOX Radio is not manufactured to help sell one make of receiving set, but to complete the service of every good quality wireless station.

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2. **Simplicity:** The hook up is as simple as that of the ordinary telephone headsets.
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4. **Tone:** Official tests with the oscillograph prove that the Magnavox electrodynamic receiver reproduces incoming wave forms with maximum accuracy.
5. **Quality:** In refinement of workmanship, materials and finish, Magnavox products have no rivals in their field.
6. **Construction:** The electrodynamic principle involved in its construction makes Magnavox Radio the most efficient converter of electrical vibrations into sound waves.

The Magnavox Company have been pioneers in the development of devices for scientific sound amplification. When you purchase a Magnavox Radio or Power Amplifier you possess an instrument of the very highest quality and efficiency.

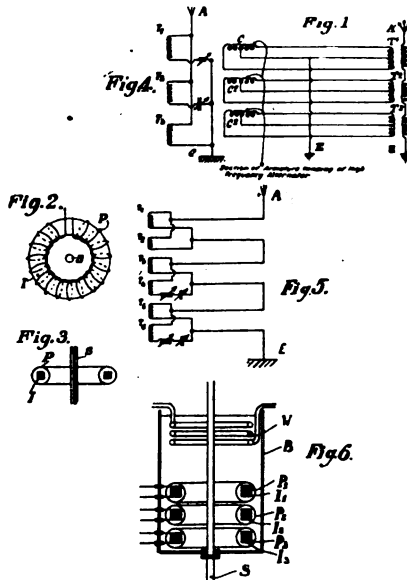
THE MAGNAVOX CO.
Oakland, California
New York Office: 370 Seventh Ave.

Latest Radio Patents

Coupling for Radiotelegraphy

No. 1,427,350. Patented, August 29, 1922. Patentee: Joseph Bethenod, Paris, France.

THIS invention, on which M. Bethenod has been granted letters patent, both in France and the United States, refers to an improved system of coupling between radiotelegraphic antenna and a high-frequency alternating-current generator of the type of those susceptible to furnishing, directly, a current of the frequency necessary for the feeding of the antenna. This system is applicable outside of any combination re-



Mr. Bethenod's invention will be more easily understood by reference to the above diagrams. Figure 1 represents the fractioning of the winding of the alternator and the manner of tying with the antenna by means of independent coupling transformers; the Figures 4 and 5 each represent a modification in the mounting of the secondary windings of the transformers. Figures 2 and 3 represent, respectively, front and side view, the manner of preferred execution for the independent transformers. Figure 6 represent the manner of assembly of the various transformers used.

quired by the difference of phase that may exist between the currents engendered in the different notches of the armature and can be perfectly realized with a monophasic alternator. The inventor's chief purpose is to avoid, in such a machine, having the insulators stand an exaggerated tension; the means used is to fractionate the winding into several sections by taking the precautions indicated in the manner of the tying of these sections to the antenna so that the machine may not be the seat of internal circulation currents.

Mr. Dubilier's Condenser

No. 1,429,227. Patented, September 19, 1922. Patentee: William Dubilier, New York, N. Y.

A CONDENSER adapted to assume any desired capacity value between maximum and minimum limits, and more particularly to a condenser in which the above is accomplished by combining the capacity of a condenser of the fixed type in which the plates bear a permanent

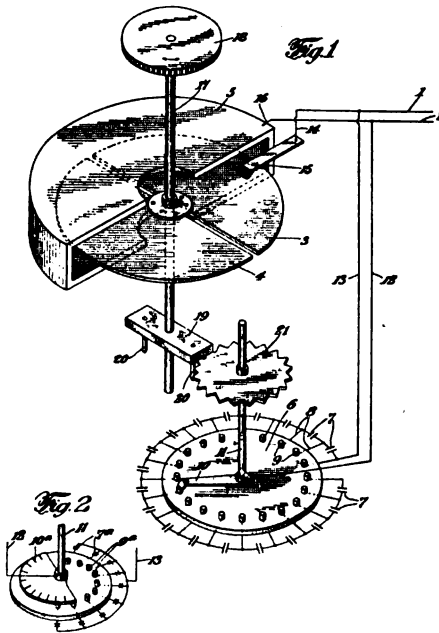


Figure 1 is a perspective view somewhat diagrammatically illustrating a condenser adapted to operate in accordance with Mr. Dubilier's invention. Figure 2 is a detailed view showing a modified form of fixed condenser adapted to be used in place of the fixed condenser illustrated in Figure 1.

and fixed relationship to each other, with the capacity of a condenser of the variable type having a plate or plates shiftable in position as regards plates of opposite polarity to vary its capacity—this is the basic principle of Mr. Dubilier's invention.

The fixed condenser is made up of sections, or units, which may be cut into or out of circuit to obtain what may be termed stepped capacity-values over the desired range of the instrument, and the variable condenser is arranged to supplement the capacity of the fixed condenser in order to obtain the resultant capacity values which are intermediate the values obtainable by adjustment of the fixed condenser alone.

Mr. Dubilier intends to provide a condenser of the above type which may be adjusted to cause the capacity to rise or fall progressively and uniformly, or which may be adjusted to produce a straight-line curve in capacity changes, and, in its preferred form, a single operating member is provided which serves both to adjust the capacity of the fixed condenser to different values and to shift the capacity of the variable condenser in such manner that, substantially throughout its entire range of movement, changes in capacity are effected substantially proportional to the amount or degree of movement imparted to the operating member.

Electron-Discharge Circuits

No. 1,426,526. Patented, August 22, 1922. Patentee: Harry C. Egerton, Passaic, New Jersey.

THIS invention relates to circuits for electron-discharge devices and pertains more especially to audion circuits. Its object is to improve the operation of vacuum tubes, such as the audion. The principal parts of an audion structure are a heated filament, or other source of

electrons, an anode and an electrode, preferably located intermediate the filament and the anode, the electrode being usually called the grid. These are preferably enclosed in an evacuated glass-vessel. The main characteristic feature of the audion is that the amount of the space current flowing between the filament and the anode is dependent on the potential of the grid electrode.

It has been found, however, that, when the grid is made considerably more positive than the filament, the tube operates less efficiently and an excessive positive charge may even cause the tube to "blue-haze," or to be destroyed. This is due to the fact that the grid, on becoming appreciably more positive than the filament, tends to become even more so through secondary electron emission by the grid, this secondary electron emission being caused by the bombardment of the grid by electrons. However, even if the grid does not acquire a charge sufficient to injure the vessel, the charge may hinder the action of the tube in the

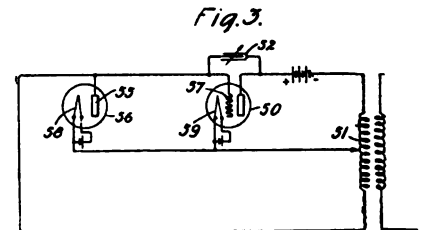
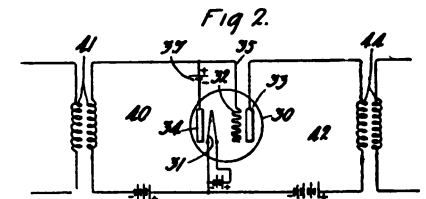
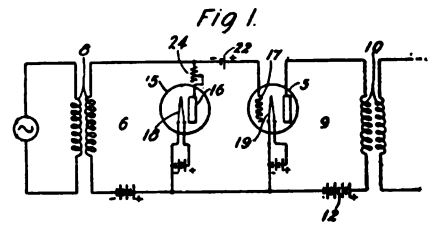


Figure 1 represents a vacuum tube of the audion type having its input circuit connected to the source of oscillations by the transformer, and having its output circuit connected by the transformer to a suitable outgoing line or consumption circuit. 12 is a source of current for the output circuit. With such an arrangement the transformer will impress upon the outgoing line, amplified oscillations of the form impressed on the input circuit. Figure 2 shows how the internal structure of an audion may be modified to conform with the purpose of this invention. 3 illustrates the invention in connection with an oscillation generator. In order to prevent the grid from becoming sufficiently positive to cause the tube to "blue haze," or generate oscillations of an undesirable complexity, the electrode of the unilateral device is connected to the grid and the filament to the filament.

case of a repeater or amplifier by starting free oscillations in the tube circuits. Such free oscillations would be undesirable also where the tube was employed as an oscillation generator.

In order to overcome these difficulties, it is proposed to afford a leakage path to the filament for the positive charge on the grid by connecting a unilateral impedance between these two electrodes in such manner as to allow current to flow from the grid to the filament, but not in the opposite direction.



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"Quality Radio Priced Right"

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Variocouplers, Variometers, Headsets, Transformers, Sockets, Rheostats, Etc.

Guaranteed **Crystal Set \$4**
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Or Money Refunded PRICE,

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531 SO. DEARBORN ST., CHICAGO.

Moving Picture Manager Objects to Radio

UNDER the heading, "Detroit Papers Rebuked by Trendle, Kunsky Manager," "Moving Picture World" publishes the following:

The following letter was sent recently by George A. Trendle, manager of the John H. Kunsky theatres, to the Detroit Free Press and the Detroit News:

"I have recently learned that the Government desires to curtail the operating of the radio broadcasting station of both your paper and the Detroit Free Press, and understand that in the very near future you will be called into conference for that reason, and am taking the liberty of again writing, in the hope that you will seriously consider the advisability of discontinuing the use of the radio outfit after 7 o'clock in the evening.

"We are spending many thousands of dollars with your publication each year to increase the attendance at our motion picture shows. Undoubtedly it is a self-ish motive, but at the same time, an expensive one, while your publication at no profit to itself, makes a strenuous effort to keep as many of our patrons away as possible by giving them lavish entertainments during the evening, without expense. This does not seem to our organization to be a fair and just return for the co-operation we are giving your paper, and if you can eliminate the broadcasting during the evening hours, giving your patrons the benefit of it during the afternoon or morning, I am sure that you will eventually benefit by it.

"I am writing the Free Press and making the same request, not as a favor, but as a strictly fair and square business consideration, to which I feel that the theatres of Detroit are entitled in return for the enormous amount of advertising placed in your publication from week to week. Comments are heard from theatre managers daily with reference to this, and it certainly deserves some consideration on the part of the News.

"I sincerely hope that after careful thought you will agree with me that the News can carry its message to its many radio fans without so seriously interfering with the operation of amusement enterprises in Detroit, which, I am frank to say, have not come back to normal since the inception of the News and Free Press radios. Our residential houses particularly have been seriously affected and we can give no other reason for it."

New Broadcasters Licensed

THREE new broadcasting stations were licensed during the past week:
KFDD—St. Michael's Cathedral, Boise, Idaho.
WNAP—Wittenberg College, Springfield, Ohio.
KFEB—City of Taft, California.

Only One Licensed Broadcaster in Berlin

There is only one licensed broadcasting station in Berlin at present, and this sends out mark and exchange quotations. Service charges range from 1,000 to 7,500 marks a month, to which must be added the cost of the Government license and the installation of a receiving set.

Rocky Mountain Crystals

BETTER THAN GALENA

The most sensitive mineral rectifier known. Can also be used with one or more stages of amplification.

Mounted, 20c.; Unmounted, 10c.; Postpaid
Manufacturers, Jobbers, Dealers, Clubs,
Apply for Special Trade Prices

Rocky Mountain Radio Products, Inc.

8 CHURCH ST., NEW YORK, N. Y.

Recommended by Dealers for Reliability

RADIO STORES CORP.

VARIABLE CONDENSERS—PLUGS—RESISTANCE UNITS, ETC.

If your dealer doesn't carry, address Dept. D, 222 West 24th Street, New York

GOING—and Going Fast

We have only a few left and they are going fast, but while they last we will continue to sell them at the reduced price.

VT 1 Detector and Amplifier.....\$7.50
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The above tubes are the genuine army J's and K's, respectively.

"RADIO BUILDER" PLANS FREE!
By Mail, 5c.

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ANNOUNCES

THEIR "B-F" SET

(Patent Applied For)

NEEDS NO AERIAL

PRICE, \$35.00

Complete Except "A" Battery, \$22.00

Write for Proposition.



CRYSTAL RECTIFIER

MULTIPOINT

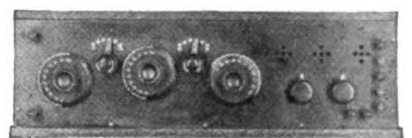
(Patent Pending)

A synthetic product sensitive over its entire surface

Eliminates all detector troubles. 50% increase in clearness and volume. Endorsed by Radio experts and press. Awarded certificates of excellence. Price **50c.** postpaid, mounted.....

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TUNE IN DISTANT STATIONS



F. R. S. Complete Two-Stage Long Range Receiver

Set includes two Federal Transformers, Condenser, two molded variometers, molded variocoupler, three V. T. sockets, filament rheostats, dials. Read "Em binding posts, switch points; in attractive cabinet and drilled panel; complete, ready to hook up. **\$40**
A \$125 Radio for.....

F. R. S. All-Wave Combination Molded Variometers, \$6.00.

Molded Variocouplers, \$5.00.

Molded Bank Winding, \$5.00.

Bank winding is interchangeable for direct mounting on either Variometer or Variocoupler.

This is the only all molded universal combination giving five units in three.

F. R. S. RADIO CORP.

409 East Fort St. Detroit, Mich.

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

To Radio Manufacturers! Send This Firm and Its Branches Your Catalogues

ASSOCIATED ADVERTISING CLUBS OF THE WORLD

EXECUTIVE OFFICES, 110 WEST 40TH STREET
NEW YORK

Radio World, 1493 Broadway, City.

Gentlemen: We have to-day received the following letter from:

Och Freres,
2, Rue du Marche,
Geneva, Switzerland:

"Our Mr. Och is going to publish in the Swiss newspapers the result of your great expansion in radio. Would you be so kind as to let us have the catalog of your radio-equipment manufacturers and, if possible, samples of the special radio papers sold in the United States?"

Will you be good enough to comply with the above request and send samples of your magazine and advertising matter to Och Freres at Geneva?

The house of Och Freres has branches at Lausanne, Montreux, Neuchatel, Chaux-de-Fonds, Zurich, St. Gall and St. Moritz, and appears to be a reputable concern.

Very truly yours,
M. S. THAYER,
Associate Editor.

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Lewis Electric Mfg. Co., Buffalo, \$100,000; J. N. Lewis, E. S. Yates, R. M. Stanley. (Attorneys, Stanley & Gidley, Buffalo, N. Y.)

Radio Installation Co., \$100,000; William T. Hughes, Earle Smyth, Alexander Jamison, Wilmington. (Alexander Jamison, Wilmington, Del.)

Guarantee Electric Co., Atlantic City, deal in goods, \$125,000; George P. Proffatt, Katherine B. Proffatt, Walter Hanstein, Atlantic City, N. J.

National Electric Products Corp., Wilmington, manufacture, \$500,000. (Corporation Trust Co. of America.)

Hutchison Radio Co., Del., 200,000 shares preferred stock, \$5 each; 400,000 common, no par value; reps., E. Fallows and J. Langner, Madison Av. and 44th St., New York, N. Y.

Orator Radio Corp., equipment, \$50,000; L. P. McArthur, Emmett M. Carter, R. B. Dickey, Washington. (Corporation Trust Co. of Delaware.)

Radio Corp., Wilmington, radio devices, \$50,000. (F. L. Mettler, Wilmington, Del.)

Electrical Club Starts Radio Class

THE Electrical Jobbers' Club of New York has organized a class in the practical and technical features of radio, open to any electrical contractor-dealer in the metropolitan district of New York City, or any of his men. No charge is made for tuition. The work covers merchandising, installation, and operation of radio sets.

A Persistent Advertiser

Robinson Crusoe advertised for a ship. His medium was of most limited circulation and had no A B C rating; but he got the ship.

Mr. Crusoe did not get immediate results. His advertisement flapped on the pole till the rains and winds tore it to shreds. But he renewed his "ad." In fact, he gave his last undershirt to his faith in persistent advertising; and through his persistence, Robinson Crusoe's name will be handed down from age to age.

You, too, will get satisfactory results and create a trade name of permanent value by persistent advertising.

Our suggestion is that you give RADIO WORLD a 52-time order obtaining our minimum rate of \$4.25 per inch by using a one-inch rate holder and larger space as desired. Among RADIO WORLD'S 70,000 readers we believe are numbered more radio manufacturers, live dealers, and enthusiastic fans than could be reached for double the money in other radio publications. For full details address RADIO WORLD, 1493 Broadway, New York.

Our Quick-Action Classified Ads., at five cents a word, bring big results in one week after receipt of copy.

Heard at the Radio Counter

A Conversation Between Customer and Radio Clerk

(Part II)

SAY, John, did you hear that 'bird' last night working C. W. with a note like a willow. Oh, boy! If I only had another tube in the circuit, believe me! I would have heard him all over the room."

"Yes, I guess you are right on that; because just when WJZ shut down for a few minutes, I started in tuning for whatever stations I could pick up. The first thing I knew, this 'bird' started up—but it was sure a good note."

"What do you consider a good audio-frequency transformer? I would like to add another step in the circuit."

"Here, this is a good make. I am using them and get wonderful results. Just try one and see what happens."

"All right—and, by the way, give me a tube socket, also."

"Have you any need for an extra B battery, rheostat, or leak condenser? You know, these will be needed when you add the extra tube."

"I guess you better let me have them. Also, better give me about two yards of spaghetti tubing. Now, there is one question I would like to ask before I go. What is the best method to determine the strength of my storage battery? I think I need some acid."

"Just a minute. What you need is this instrument—a hydrometer and holder. It will tell you the exact condition of your battery. See where it is marked 1275? This means that your battery is O. K., and needs but little charging. Now, when the hydrometer shows 1150, or even 1200, just say to yourself, 'I better put this baby on charge before it goes to the dogs entirely.' One good thing to remember: Never let your battery fall below 1225."

"Very well. Wrap up the hydrometer, too."

"See you again, O. M."

(To be Continued)

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31. Colwell & Korbell, Fisk Building, New York City, directors of publicity.

TRI-STATE TOBACCO GROWERS' RADIO SHOW, Covington, Ohio, October 21 to 28, inclusive.

INTERNATIONAL RADIO SHOW, Madison Square Garden, New York City, November 20 to 25, inclusive. E. C. Buchignani, director of publicity.

SOUTHEASTERN RADIO EXPOSITION, Auditorium Armory, Atlanta, Georgia, December 4 to 9, inclusive. Co-operative Radio Sales Assn., 295 Peachtree St.

WANTED: COPIES OF RADIO WORLD, April 22 and May 28, 1922. Mail us copies of these issues, or either one, with an accompany postal and we will send you a copy of the latest issue for each copy so mailed. RADIO WORLD, 1493 Broadway, New York.

Navy Radio Sets Bring \$43,000

THE opening of bids by the United States Navy Surplus Sales Office revealed the fact that 47 firms and individuals were interested in the 390 radiotelephone sets offered for sale re-

cently. The highest bid received was \$251 for one set; the total receipts reaching \$43,000. The awards made were as follows:

Bidder	Address	Amount Each	Total Amount	No. Sets Purch'd
Simon Bitterman,	623 S. Wabash Ave., Chicago	\$150.00	\$450.00	3
Wm. Hansell,	116 E. Main St., Ottawa, Ia.	.....	155.00	1
Henry Kienzle,	501 E. 84th St., N. Y. C.	.....	200.00	1
R. H. Parker,	33 Cony St., Augusta, Maine	.....	175.00	1
Atlantic Marine Ex.,	14 Atlantic Ave., Boston	251.89	.....	.....
		176.89	.....	.....
		126.89	555.67	3
E. L. LeBaron Foundry Co.,	Brockton, Mass.	.....	155.00	1
No. Western Radio Ser. Co.,	Seattle, Wash.	.....	200.00	1
C. C. Tylee,	314 Sumter St., Charleston, S. C.	162.50	325.00	2
Klein's Radio & Elec. Co.,	34 Park Place, New York	200.00	600.00	3
Bion J. Arnold,	105 S. LaSalle St., Chicago	125.00	1,250.00	10
H. A. Braunstein,	248 First Ave., N., Minneapolis, Minn.	.....	1,514.00	10
Alex. Rankin,	Frostberg, Md.	.....	150.00	1
Catholic University,	Washington, D. C.	.....	150.00	1
Frank L. Smith,	7 Newberry St., Worcester, Mass.	.....	105.00	1
Eksaf Trading Co.,	1515 E. Parkway, Brooklyn	206.00	2,060.00	10
Department of Physics,	Cornell University, Ithaca, N. Y.	.....	150.00	1
John W. Lee,	Radio Laboratory, Navy Yard, Phila.	.....	160.00	1
Robt. J. McLain,	6 Chestnut St., Cooperstown, N. Y.	120.00	360.00	3
Greeley Madison Corp.,	26 West 23rd St., N. Y. City.	101.33	34,137.99	336

INSU-LITE

PANELS

1/8" —.01 per sq. in.
 3/16" —.015 per sq. in.
 1/4" —.02 per sq. in.

DEALERS: Write for discounts.

General Merchandise Co.
 142 Market Street, Newark, N. J.

The Hoyt PEEP-HOLE METER

A guaranteed Hoyt miniature voltmeter or ammeter for your board. Used with either A. C. or D. C. current, installed without screws.

Ranges: 0-10 Volts\$2.50
 0-50 Volts\$3.10
 0-5 Amperes\$2.50
 0-1.2 Amperes\$2.50

Other ranges and prices on application.

BURTON - ROGERS CO.
 755 Boylston Street Boston 17, Mass.

GITHENS TRUTONE RADIO HORN-LOUD SPEAKER



First one to sell on ten day trial Money back Guarantee

Retail Price \$21.00
 Includes Loud Speaker

Trutone has been pronounced the best on the market by experts. It has a clear true tone. Every radio fan should try Trutone and compare it with others.

If YOU don't find Trutone the best, your money will be refunded. It is sold on a ten-day trial money-back guarantee. If not carried by your dealer write us.

Distributors and Dealers, write!

AUTO PARTS MFG. CO.
 1515 Trombly Ave., Detroit, Mich.

Limits Radio Talk to Coastal Areas

Norwegian Government Says Ships in Territorial Waters Must Observe Strict Rules of Radio Communication.

THE following regulations regarding the use of wireless stations on vessels belonging to foreign powers not at war, while in Norwegian territorial waters in times of peace, have been approved by government resolution, and came into force on September 1, according to the "Anglo-Norwegian Trade Journal."

1. In Norwegian territorial waters wireless telegraph or telephone stations on foreign vessels may not be used, except by special permission, unless for the following purposes:

- (a) Communications concerning vessels in distress or for the prevention of accidents.
- (b) Communications; (c) communications with the nearest Norwegian coastal station, and other ships' stations when each vessel is at least ten nautical miles distant from the nearest Norwegian coastal station.

In the cases of (a) and (b) communication must at once be stopped on request from the Telegraph Administration, the Naval Department or a station belonging to either of these authorities.

2. In Norwegian ports where there is a state wireless station and within certain prohibited districts laid down by the Norwegian authorities (regarding which information may be obtained from the nearest state coastal station), the ships' station may not be used except for communications as under 1 (a) unless special permission has been obtained.

3. Application for permission to use a station in Norwegian territorial waters for other communications than above mentioned should be sent to the Telegraph Administration (Telegrafstyret), which will give its decision after consultation with the Naval Administration.

4. (This paragraph concerns war.)
 5. When a ship's station is used while in Norwegian waters this must be done with the observation of the provisions

of the International Telegraph Convention and its regulations.

6. The foregoing regulations remain in force only when Norway is not at war.

Textbook on Radio

THIS 350-page volume deserves the most unqualified praise for the thoroughness in which the publishers have endeavored to cover the interests of the radio enthusiast. There are a number of valuable suggestions in its pages which will be of value to both fan and amateur. It is written in a simple style, and, at the same time, it is a standard textbook for the technical radio student. It contains, the up-to-date material regarding circuits and hook-ups including data on superregenerative receiving sets. This book can be secured from your dealer or direct from the Technical Book Co., 130 West 42nd Street, New York City.

YOUR PHOTO IN THIS PAPER

ATTENTION AMATEURS!

Have you built your own receiver?
 Are you experimenting with any particular hook-up?
 Are you improving your set?
 Are you doing any interesting constructive work in radio?

Why not share this knowledge with your thousands of brother fans who read RADIO WORLD every week?

We want pictures of receiving sets with descriptions of how you overcame some difficulty, or of any additional part or unit that you have added to obtain better results. These are the things that, probably, the other fellow is looking for. Send in your information; pictures or whatever you have done to improve the art.

Remember the beginner is looking for them.

We intend to print in this paper, each week, pictured information and description of value to radio amateurs. If you have found a newer or better way of doing anything, don't keep the secret but tell it to your thousands of brother fans.

Send in a photograph of your set with or without accompanying diagrams and measurement. State whether you figure in the picture yourself, or not, and without any expense whatsoever to you we will make an engraving and publish it. Be sure to write your name and address plainly on photograph.

Send in your picture at once, or if you have not made a set or done anything else in making radio material, tell the boy next door all about this offer.

Address Technical Editor
RADIO WORLD, 1495 Broadway, New York City, N. Y.

YOUR NEWSDEALER

will deliver RADIO WORLD to your home. In order to be sure of getting RADIO WORLD regularly, and of not missing a single issue, we suggest that you either subscribe direct or through your newsdealer at \$6.00 a year (52 issues) \$3.00 six months, and \$1.50 three months. Or instruct your newsdealer to deliver RADIO WORLD regularly to your home each week. Dealers will take standing orders and make deliveries of paper whenever requested. Radio World, 1495 Broadway, New York.

FEDERAL PHONES \$5
RADIO DISTRIBUTING & AUTO SUPPLY CO.
 64 West 66th St., New York City
 See our Specials in next issue Radio World

Radio May Rob Volcanoes of Terror

PROBABLY never again will Vesuvius belch its fires of destruction upon an unprepared and unsuspecting populace, or Popocatepetl rain its death-dealing lava upon unprotected Mexican

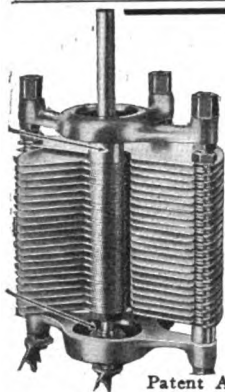
peons, says Raymond Francis Yates in "The Evening Mail," New York.

Scientists and the wonderful vacuum tube of the everyday radio receiving-set are seeing to that.

Work of applying sound amplification to the study of volcanic activities within the earth has already reached the advanced stage. In fact, there has been constructed a device so sensitive that the moving waters of subterranean springs easily can be recorded by it.

This apparatus, which might be called the "sound microscope," is so tremendously sensitive to air vibrations that it permits one to hear things heretofore absolutely inaudible.

It is destined to become as great an aid to hearing and acoustics as the microscope and the telescope have been to vision.



SOMETHING NEW!
Variable Condenser Built Right

Furnished either regular or vernier

Made in the most popular sizes, with aluminum plates, cast end brackets, with a 1" diameter Bakelite bushing therein. (A perfect insulator high in dielectric strength). Dealers write for discounts. Ask to see our Rheostat and Vacuum Tube Socket.

LOMBARDI RADIO MFG. COMPANY

67-71 Minerva Street, Derby, Conn.

P. O. Box 44

Patent Applied For

Does Good Work With Low Power

NIGHT by night, throughout the breadth of the land, there takes place a series of communications under the most efficient organization ever produced by voluntary methods, says "The Tribune," New York. The development and operation of this system are the work of the average American radio amateur, under the executive guidance of his national institution—the American Radio Relay League.

The work of this organization has to a certain extent been obscured in the phenomenal advance of public interest in radio due to the advent of broadcasting, and only occasionally does an inkling of its achievements appear.

Before outlining this, however, it should be pointed out that the amateur owning a transmitting station is restricted to a maximum output of one kilowatt of power by the government. Many of the amateurs are still further restricted by the exigencies of their financial standing, but they make up in enthusiasm what they lack in funds.

To still further understand the contribution of the American amateur to the development of radio as a means of communication, it should be stated that he also is compelled to work on 200-meter wave length as a maximum, where the frequency of the oscillating current is so tremendously high that it offers almost insurmountable difficulties.

Despite these obstacles, he has succeeded in communicating across the Atlantic Ocean with less than one kilowatt of power, where under the same conditions the big transatlantic wireless stations are compelled to use 200 kilowatts. This is unquestionably his crowning triumph.

Day by day he maintains a network of communication across the country which has already proved its worth in cases of emergency and which is becoming more efficient every day. In addition, he also maintains a daily communication between the Pacific Coast and the Hawaiian Islands with the low power allowed him by the government.

For CORRECT RADIO MAILING LISTS Use THE POCKET LIST

of Radio Manufacturers, Jobbers and Dealers in the United States and Canada. Issued Quarterly—January, April, July and October. October, 1922, issue corrected to September 15th, 1922. Classified under three different headings—Manufacturers, Jobbers and Dealers—and alphabetically arranged by states, cities and towns and names of firms. Containing approximately 15,000 names and addresses.

We have been exceptionally careful to see to it that every Manufacturer, Jobber and Dealer is listed and under the PROPER CLASSIFICATION. Most mailing lists concern charge more than \$100 for a list of this kind and, as a rule, those supplied are far from being correct. Compare this list with any other, and you will find it to be the very best obtainable anywhere at any price.

October issue ready for distribution September 25th. Price \$5.00 per copy, or \$10.00 per year (four issues, including monthly supplements which keep the list absolutely correct and up to date at all times). October edition limited. Send your order with remittance today.

F. D. PICKENS, 1621 CARRINGTON STREET JANEVILLE, WISCONSIN

"TUNING IN"

TO THE RIGHT TUNE IS VERY SIMPLE WHEN YOUR CONNECTIONS ARE SOLDERED WITH THE NEW

"POST SOLDERING IRON"

(The Iron with the Platinum Heating Unit). Removable Soldering Tip



1/2 Actual Size
LIST \$6.00

Designed especially to cover every requirement for delicate work. The smallest practical, efficient instrument on the market. Attaches to any socket. Universal current. Fully guaranteed. From your dealer, jobber or write

POST ELECTRIC COMPANY

30 EAST 42ND STREET, Div. 500

NEW YORK

GREWOL DETECTOR

Nothing Like It
 Nothing as Good

\$2.00

The Grewol Detector has taken its place among the standard, nationally advertised parts. In a class by itself because it does what no detector has yet been developed to do and still sells at a popular price.

Asked for by name, sold by reputation.

If your dealer cannot supply you, send \$2 and we will fill your order.

Your Dealer has Grewols

Always Set and Ready

Glass Encased

Super-Sensitive

RANDEL WIRELESS CO.

Sole United State Distributors

9 CENTRAL AVENUE

NEWARK, N. J.



(Actual Size)

REPRESENTATIVES WANTED!

RADIO WORLD wants young hustling subscription representatives in every college, school, factory and big business concern throught the country. Send us your name and address for full particulars. RADIO WORLD, 1493 Broadway, New York City.

Cut Out This Radio World

Do you like clear tone—sharp and distinct—If so try

MARSH'S

Vernier Variable Condenser, Capacity .00056 to .00078 mfd.

Fully Guaranteed

This 23 plate condenser lists at \$3.50. To place before the Radio audience a limited number will be sold at \$4.75. Complete—Dial Knob and Screws.

F. P. Marsh, 145 Nicholl St.

New Haven, Conn.

New Haven, Conn., U.S.A.

Ad and Mail with \$4.75

To F. P. Marsh, 145 Nicholl St.

PATENT
Your Radio Ideas.
Call or Write
FREE ADVICE

ASK MANUFACTURERS
PATENT CO.
FOR 520 FIFTH AVE
NEW YORK

For Building Radio Apparatus at Home

THANKS to the Radio Research Laboratory of thoughtful Uncle Sam, three pamphlets on the construction and operation of radio receiving apparatus have been released for radio enthusiasts through the Bureau of Standards and the Government Printing Office. These supplementary circulars now give data and instructions on how to improve the previously described sets with auxiliary apparatus which can be constructed at home at a small cost. A limited number of the circulars are available at the Bureau.

Circular 46 describes two "fixed" condensers which are used with either of the radio receiving-sets described in the first or second circulars. One of the fixed condensers, which is connected in series with the antenna, is called the "series-antenna" condenser. The other fixed condenser, which is connected across the terminals of the telephone receivers, is called the "telephone-shunt" condenser.

The series-antenna condenser enables the receiving equipment to give signals of somewhat greater intensity when tuned to wave frequencies above 1000 kilocycles per second—that is, wave lengths of 300 meters or less. The effect of this condenser is just the opposite of the effect obtained by a greater number of turns of wire on a tuning coil, which permits the receiving equipment to respond to lower wave-frequencies.

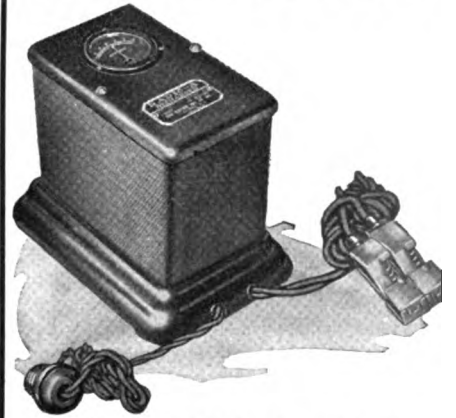
The effect of the telephone-shunt condenser is to increase the intensity of some radio signals to which the receiving set may be tuned. In most cases the use of this condenser has no effect upon the intensity of signals which are received from a radiotelephone transmitting station, but it will increase the intensity of radio signals which are received from most spark transmitting stations. The cost of building both condensers is not over 80 cents.

Circular 47 describes a loading coil which is used in conjunction with the single-circuit radio receiving set described in Bureau of Standards Circular No. 120 or with the two-circuit set described in Circular No. 121.

The purpose of the loading coil is to enable the receiving equipment to respond to wave frequencies between 100 and 500 kilocycles per second—that is, wave lengths between 300 and 600 meters. In other words, the loading coil increases the wave-frequency (wave length) range of the receiving set. The receiving set described in Bureau of Standards Circular No. 120 has a wave-frequency (wave length) range of between 500 and 1500 kilocycles per second (wave lengths between 600 and 200 meters).

The use of this loading coil will increase the receiving distance of the equipment, because many stations using the lower wave-frequencies (longer wave-lengths) use a high-power radio transmitting set. For example, NAA, Arlington, Virginia, uses a wave frequency of about 113 kilocycles per second (2650 meters wave length) and uses sufficient power to be heard a distance of about 200 miles when the loading coil described is used with the receiving equipment previously described. The cost of the parts for the loading coil is approximately \$3.

Reliable and Beautiful
RADIO-A
RE-CHARGER



THE RADIO-A is a highly efficient dependable piece of apparatus, absolutely fool-proof, easily attached by simply plugging into ordinary 110-volt lamp socket. In case of current failure, the unit cuts out automatically until current is resumed, without discharging battery.

It is designed expressly for re-charging radio filament batteries, but may be used for automobile or any other storage battery of reasonable size and capacity.

Price, \$18.50

Dealers and Distributors

Here's a Winner! Write us for full particulars.

Simply screw into any 110 volt lamp socket and connect the terminals to your battery. Impossible to hook-up wrong—RADIO-A charges either way.



A compact portable Re-charging Unit that will fully charge a 100 A. H. Battery overnight, for from 5c to 10c, according to prevailing rates.

LAST A LIFETIME

King Electric Mfg. Co., Inc.
1681 FILLMORE AVENUE
BUFFALO, N. Y.

WELCOME! COME IN AND HEAR THE CORACO RADIO CONCERT
Daily, 8 A. M. to 5 P. M. 15th Floor, 220 W. 42nd St., next to Amsterdam Theatre
The Coraco Super-Radiophone is the latest and greatest improvement in radio, it has no outside connections—no installation expense—is as simple to operate as a phonograph. If you cannot call, write for full information.
THE CORACO COMPANY, INC.
220 West 42nd Street New York

ALADDIN ELECTRIC COMPANY, INC.
COMPLETE RADIO SETS
WRITE FOR PRICES.
71 West Broadway New York City

A B C Standardized Radio
Sectional Receiving Units and Radio Parts, give unqualified satisfaction at low cost.
Write for catalog.
Jewett Manufacturing Corp.
226 Sherman Ave., Dept. G, Newark, N. J.

Universal Phone Connector
Can be used with any type receiver. Makes the use of four sets of phones. Eliminates energy loss. Heavily nickel-plated, and guaranteed to give complete satisfaction.
Price 75c a pair
Dealers, Write for Liberal Discounts
Universal Phone Connector Company
Room 238, 1400 Broadway, New York City


RADIO MAILING LISTS
9276 Retail Radio Dealers, United Statesper M., \$7.50
1184 Radio Manufacturers.....per list, 10.00
1330 Radio Supply Jobbers.....per list, 12.50
257 Radio manufacturers of complete setsper list, 4.00
260 Radio Stationsper list, 4.00
14000 Radio Amateurs and Managers of Radio Stations...per M., 7.50
Neatly typewritten and ready to send you en receipt of remittance covering the amount.
TRADE CIRCULAR ADDRESSING CO.
165 W ADAMS STREET CHICAGO, ILL.

RADIO CITIZENS
WE SAVE YOU MONEY
Send us a list of your radio needs for our prices.
If It's Radio, we have it and we sell it for less.
JOHN R. KOCH COMPANY
CHARLESTON WEST VIRGINIA
Radio dealers since 1918

THE GOODMAN
PATENT PENDING
The Niftiest Short Wave Tuner on the Market
Only \$6.00 & PP on 1 lb.
Send for pamphlet. Order through your dealer.
L. W. GOODMAN
DREXEL HILL, PA.
Dr. Miller, of Chicago, writes: "My perfectly good variometers and vario-coupler now go into the discard."

BUILD YOUR OWN
Complete 50c. instruction book for 20c. only on radio reception and how to make eight classes of crystal and vacuum tube receiving sets. Wonderful instruction makes you understand radio. With every order we send free our price list of parts prepared especially for the several sets described. Buy direct from factory and save many dollars. Both instruction book and price list sent on receipt of 20c. only. Money back if not pleased.
RADIO PARTS MFG. CO.
Dept. 15, Park Pl. W., Detroit, Mich.

35c. each, 3 for \$1.00



NA-ALD

Genuine Condensite Dial
The dial that runs true.
Numerals engraved on
bevel and knob so shaped
that fingers do not hide
them. Thin edge with
clear graduation to make
accurate reading easy.

Concealed set screw in metal insert. Will not warp
or chip. Finish and enamel permanent.

3-inch dial 35c
2-inch dial for rheostat potentiometer use..... 35c
3 1/2-inch dial 75c

Send stamps for literature.

ALDEN - NAPIER COMPANY
52 Willow St., Dept. L. Springfield, Mass.

Come to California

Must sacrifice established
WHOLESALE RADIO busi-
ness. Controls exclusive sales
agencies. Write Mr. Clay, 920
Chapman Bldg., Los Angeles,
Cal.

Answers to Readers

I AM building a set with a crystal detector. May I use enameled wire on my tuner and taps? Has enameled wire insulating qualities?—Eugene Martens, Glen Cove, Long Island, N. Y.

You can use No. 22 enameled wire very nicely for the winding of your tuner and taps.

* * *

Will I hear Newark, Pittsburgh, and Schenectady with the enclosed hook-up and apparatus as listed?—Yearle Travis, Tuckahoe, N. Y.

Your hook-up is almost completely useless. You will not be able to hear anything with it as it is shown. Our best advice is that you read carefully the article by C. White, "Constructing a Radio-Frequency Regenerator," in RADIO WORLD, Vol. II, No. 2, dated October 7. This circuit applies to your ideas.

* * *

How far can I receive with a De Forest receiver, type DL-800, with two-stage amplifier? What length should my antenna be and in what direction should it be run to get best results? Will another stage of amplification enable me to receive further?

Which should I use—2000-ohm or 3000-ohm phones? Would two or more sets of receivers have any bad effects on my machine?—Arthur Walsh, Patchogue, L. I.

Your first question is too broad to answer; but with a good antenna satisfactory results should be obtained. Your antenna for receiving should be one straight wire about 100 feet long. The direction should be from where the lead-in starts. One more step of amplification will increase the volume and distance of your signals, but it is hard to say just how much distance this one stage will increase. You can use either the 2000-ohm or 3,000-ohm phones; but, remember, only one set may be used at one time.

* * *

Can two sets receive from the same aerial? Are all audion bulbs guaranteed to work? Where can I buy an electric soldering-iron? What is the price?—Radio World Reader.

Two sets cannot be used from the same aerial unless they operate at different times; otherwise, the tuning of one set would affect the tuning of the other. I do not believe that all audions are guaranteed to work, but if you buy one of the standard makes it is quite sure to give you satisfactory results. You can buy an electrical soldering iron in any electrical or radio shop for \$7.

* * *

Can a loud-speaker be used with a crystal detector?—John Rogers, Bedford, Mass.

A loud speaker cannot be used with a crystal set. Don't try it. It will not operate. At least two stages of amplification are necessary.

* * *

My receiving set consists of a single-wire antenna about 200 feet long, a loose coupler, two variometers, grid leak, vacuum tube and grid condenser. With this set how far should I receive? If I added a two-stage amplifier, how much further could I increase my range? I also have mounted on my set a shielding made of copper sheet, which has no effect on tube howling.—George Siegel, Coldwater, N. Y.

With a set of this description some operators have heard the broadcasting stations over some distance, using but one tube. In your case no exact distance can be given as this is right up to the operator himself. There is no doubt in our minds that you should at least hear WGY, Schenectady, New York. From other stations near you we have had reports that the following were heard, using one tube: KDKA, Pittsburgh; WJZ, Newark, N. J.; WBZ, Springfield, Mass. The addition of a two-stage audio-frequency amplifier will make these stations louder. We suggest that you connect the copper shield to the ground connection in order to eliminate the tube howling and other noises.

* * *

I added a two-step amplifier to my Westinghouse receiver. Will you please tell me how I can add to the wave-length range so that I may tune, say, up to 1,500 meters? Howard Mitchell, Galveston, Texas.

As the set you have is designed to do certain work, it is doubtful if you will be able to raise the wave length. You might try inserting a large single-slide tuning coil in the aerial lead before it comes to the set. This, possibly, may help you a little; but it is very doubtful. Certain sets cannot be loaded up successfully.

* * *

In some honeycomb coil hook-ups, the bridging condenser is connected from the positive side of the B battery to the filament; in others, it is connected from the filament direct to the plate. Which is correct? (Continued on following page)

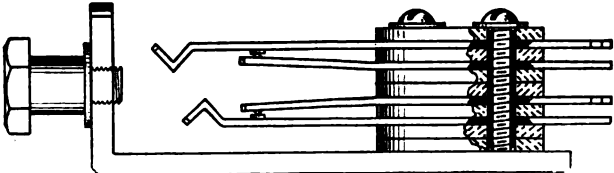
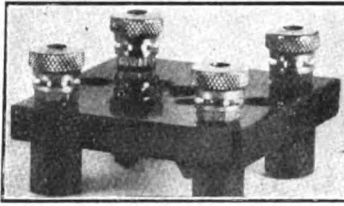
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Answers to Readers
(Continued from preceding page)

rect? Can a .001 condenser be used for the primary condenser instead of a .0015 condenser? Does choke-oil amplification eliminate distortion?—Raymond Finch, St. Louis.

The bridging condenser may be connected in the circuit in either way. Both circuits are correct. The primary condenser should be .001 mfd. capacity for best results. Choke-coil amplification will not eliminate distortion. Improperly adjusted circuits have more to do with it.

* * *

Is it necessary to have an aerial running east and west in order to hear Pittsburgh and Schenectady?—Leslie Meyers, Passaic, New Jersey.

It is not absolutely necessary to have an aerial running east and west in order to hear these stations. If the aerial is extremely long, it may help you a little to aim the free end of the aerial toward the transmitting station; but it will help very little.

* * *

What is the constant for the phone fixed-condenser used in connection with the Armstrong superregenerative circuit? What size vario-coupler should be used with the superregenerative? Can ordinary dry batteries be used for the C battery?—Thomas Meegan, Stapleton, N. Y.

The capacity of the phone condensers should be .0025 mfd. Any standard vario-coupler having a range from 150 to 600 meters. The secondary must be rewound twice the number of turns. Two flashlight batteries connected in series should be used with the first two tubes and a 22-volt battery with the third tube.

* * *

I would like to know what a two-slide tuning coil looks like? I intend buying one of these coils and want to know what I am purchasing.—Arthur Hanson, Phoenix, Ariz.

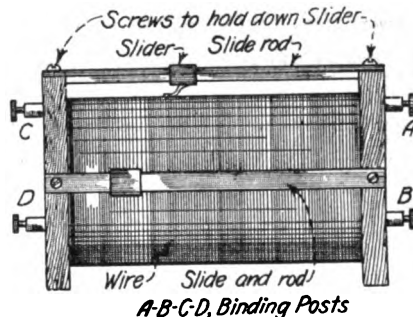


Diagram of tuning coil requested by Arthur Hanson, Phoenix, Arizona.

Above is an illustration of a tuning coil with two slides. This is used in connection with a receiving set as a means of the inductance in order to establish the necessary wave-lengths needed.

* * *

Why must I use 120 volts or more to operate my detector tube?—Peter Gray, Duluth, Minn.

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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified advs., if copy is received at this office ten days before publication, RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796.)

TO THE TRADE—Fixed Phone and Grid Condensers. Write for price list and sample. **SALKEY RADIO CO.**, 2378 Eighth Ave., New York City.

Manufacturers of Rogers Radio Receivers and Rogers Receiving Radiometers. **Rogers Radio Company**, 5133 Woodworth Street, Pittsburgh, Pa.

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ISSUES OF RADIO WORLD from April 1 to Oct. 7 (27 numbers) for 15c a copy, or the whole lot for \$3.15. Or send us \$6.00 for one year and start with the first number. **RADIO WORLD**, 1493 Broadway, New York.

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BROADCASTING STATIONS: Letters and addresses of broadcasting station to-date appeared in Radio World for Oct. 7. Sent on receipt of 15c. Also a broadcasting map appeared in Radio World No. 8. Sent on receipt of 15c. **Radio World**, 1493 Broadway, N. Y. City, N. Y.

FRENCH TUBES, genuine (no bootleg with French name), most sensitive and economic. (Good for detectors, amplifiers, and especially for radio frequency. Will work very good on two dry cells.) Price \$3.90. **ATLANTIC & PACIFIC RADIO CO.**, 131 W. 37th St., near Bway., New Yrk.

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PATENTS
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Are you familiar with all the radio symbols used in the various hook-ups published in Radio World? If not, secure a copy of Radio World No. 26, dated Sept. 23. In this issue was a complete table of all important symbols used in radio construction and testing. Send 15 cents for a copy, or \$5.00 per year, and have subscription start with that issue. **RADIO WORLD**, 1493 Broadway, New York City, N. Y.

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FOR SALE—New \$30.00 regenerative set without detector—\$16.00; Two new variometers and coupler, value \$15.00—\$8.00; \$45.00 Willard Storage battery, \$20.00; Crystal set—\$8.00. **John Keene**, Mont Clare, Pa.

PATENTS—Send for form "Evidence of Conception" to be signed and witnessed. Form, fee Schedule, information, free. **Lancaster and Allwine**, Patent Attorneys, 259 Ouray Bldg., Washington, D. C.

WESTERN ELECTRIC power Amplifier, practically new, complete with tubes and horn. Cost \$161.00. Will sacrifice for \$120.00, \$30.00 down, Balance, C. O. D. **Roscoe E. Magee**, Box 71, London, Kentucky.

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VARIOMETERS AND VARIOCOUPERS, \$3.00 each. Can Handle any number of orders. **Ralph R. Garrick**, 126 North Redfield St., Philadelphia, Pa.

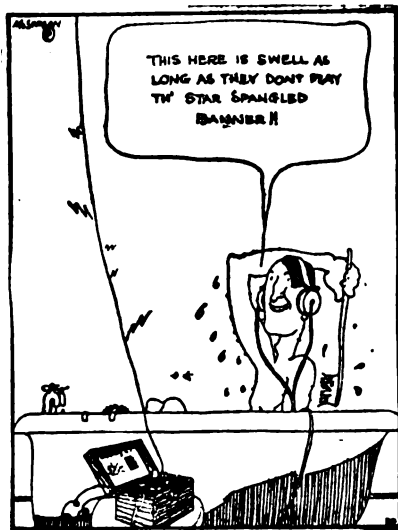
MURDOCK PHONES—type 56, 3000 ohms... \$5.50
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Broadcast Bill's Radiolays

(Copyright, 1922, Westinghouse Electric & Manufacturing Co.)

I'M glad it's gettin' cooler now, fer all these distant stations are comin' in lots better; an' since my wife's relations have packed their trunks an' journeyed home perhaps I'll get a chance to listen undisturbed by noisy chatter of her aunts. Last night I picked up Davenport an' Kansas City too, KDKA came in real loud, but, say, I wish I knew who tried to queer the program with a string of that there code; I'd like to bust his doggone set an' run him down the road. That's not the only QRM I'm gettin' here to-night, cause Willie's in the kitchen puttin' up his weekly fight. It bein' Saturday, you know, Young William's tub comes first an' next to dryin' dishes Willie hates his bath night worst. Then, after he's been put to bed, his mother takes her turn, an' when she's through I reckon, if you'll excuse me, I'll adjourn out yonder to the kitchen 'fore the water gets too cold, an' get the dern thing over with. I hope that Min won't scold if I set there an' lissen to some Military Band while I work with the scrubbin' brush, removin' soil and sand. We may not have a fancy tub with water runnin' hot, like some of our rich friends around the neighborhood have got; but bathin' set to music ought to start a brand new style—I guess I'm goin' to like it if I'm lis'nin' all the while. When I build my



new bungalow I'm goin' to have a set built right in close beside the tub so I can always get the latest news an' gossip an' perhaps a tune er two; 'tain't such a bad idea an' there's one thing sure, it's new.

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A Generous Sample will be sent on request. Address: Ridgways, Inc.,
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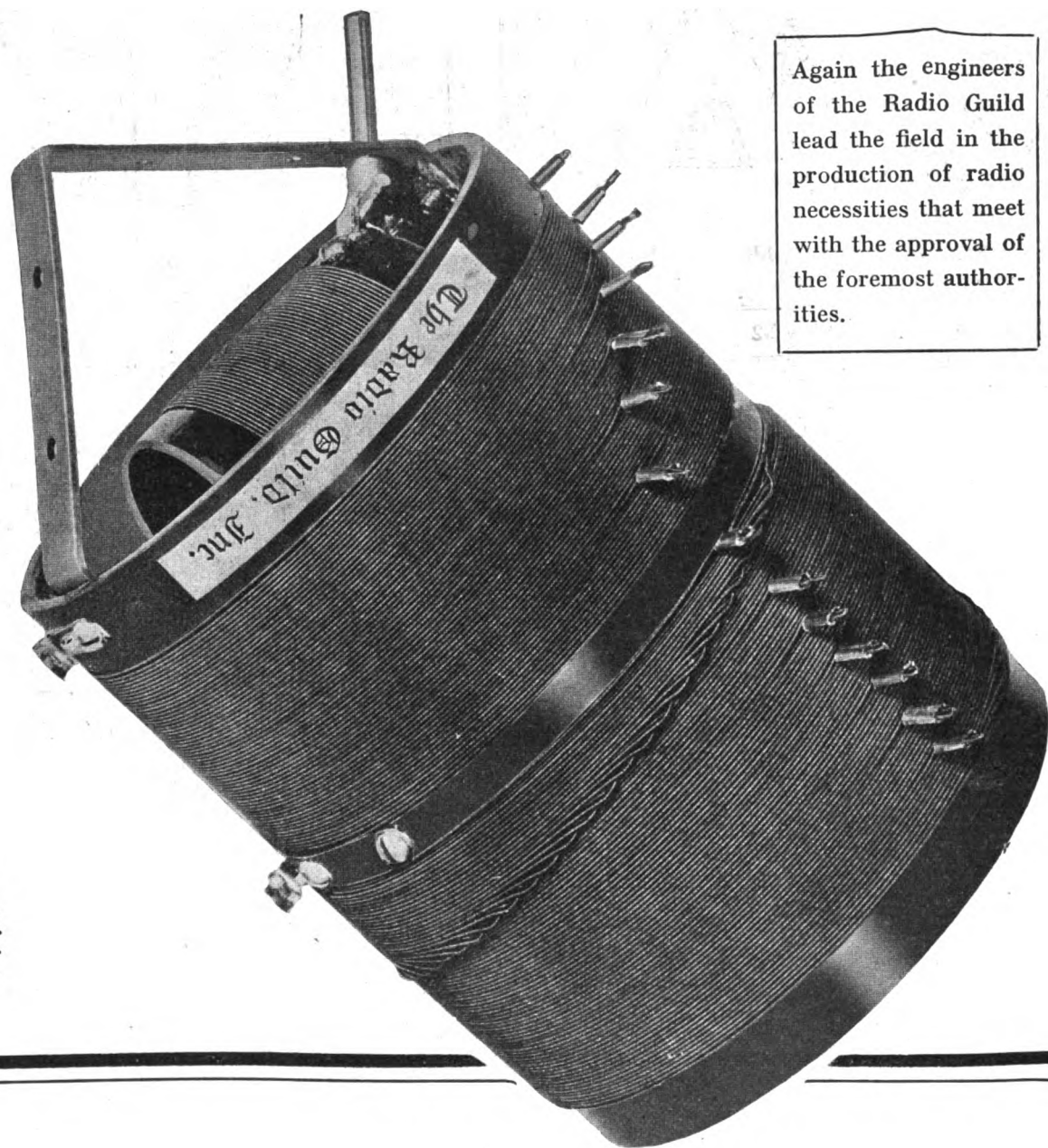
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GOLD MEDAL San Francisco 1915



GRAND PRIZE San Diego 1916



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Passed the strict requirements of the RADIO NEWS LABORATORIES and awarded their Certificate of Merit.

Pronounced by the “N. Y. Evening Mail” Laboratories as “the finest bank wound coupler produced” and awarded their Certificate of Excellence.

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Specifications

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The Radio Guild, Inc.

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RADIO-FREQUENCY SPECIALISTS
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New York, N. Y.

VOLUME TWO

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the act of March 3, 1879.]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. II, No. 6. Whole No. 32

November 4, 1922

15c. per copy, \$6.00 a year

Radio Frequency Set Operates in Interior of Automobile

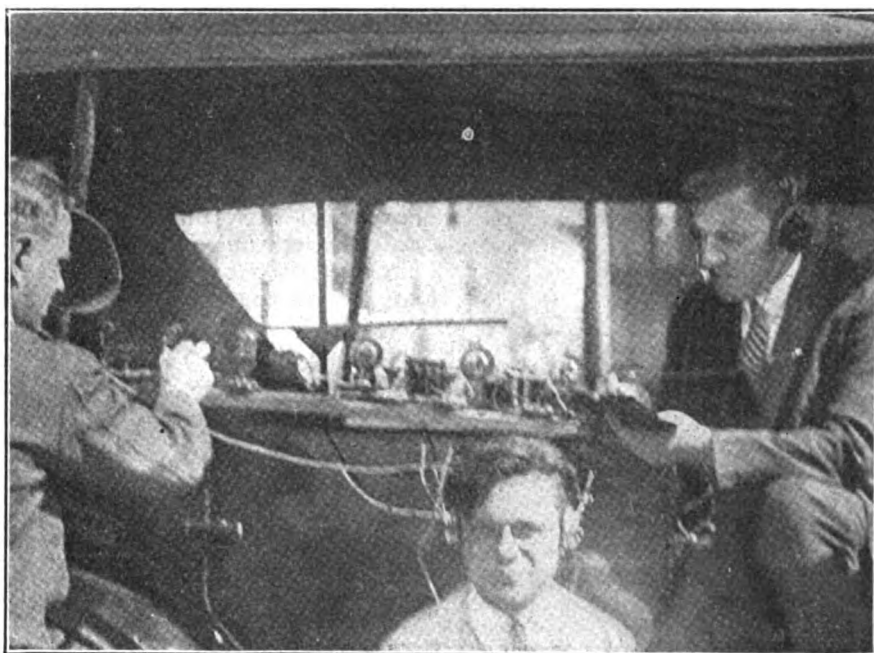
THE day may arrive when the radio sets capable of receiving music clearly from distant points, will be reduced to the simplicity of one knob for tuning; for the present, however, simplicity exists only in the inexpensive receiving sets for the reception of radiotelephone and radiotelegraph signals, at short range. When it comes to receiving sets for long range, satisfactory results may be obtained only from elaborate equipment; and the more elaborate the apparatus the greater the care and skill required for its successful operation. Take the simple receiving sets, for example; there is little or nothing to master in the way of operation. Such sets generally have a multipoint switch to control the wave length and detector. If a crystal detector is used, it must be accurately adjusted for the utmost sensitiveness and this necessitates care. Of course, there are the tubes with audio-frequency and radio-frequency hook-ups. The radio-frequency type of receiver employing vacuum tubes is coming into general use among experienced amateurs for long-range reception. The loop aerial comes in connection with such a set. In the case of audio-frequency amplification, the amplifying is done after the signals have been passed through the detector and rectified so as to produce audio-frequency currents, while the radio-frequency amplification of the waves are amplified before they are passed to the detector.

The advantage of the radio-frequency amplifier lies in the fact that it amplifies only the wave and not the many little irregularities and imperfections which exist in the usual receiver and amplifier equipments.

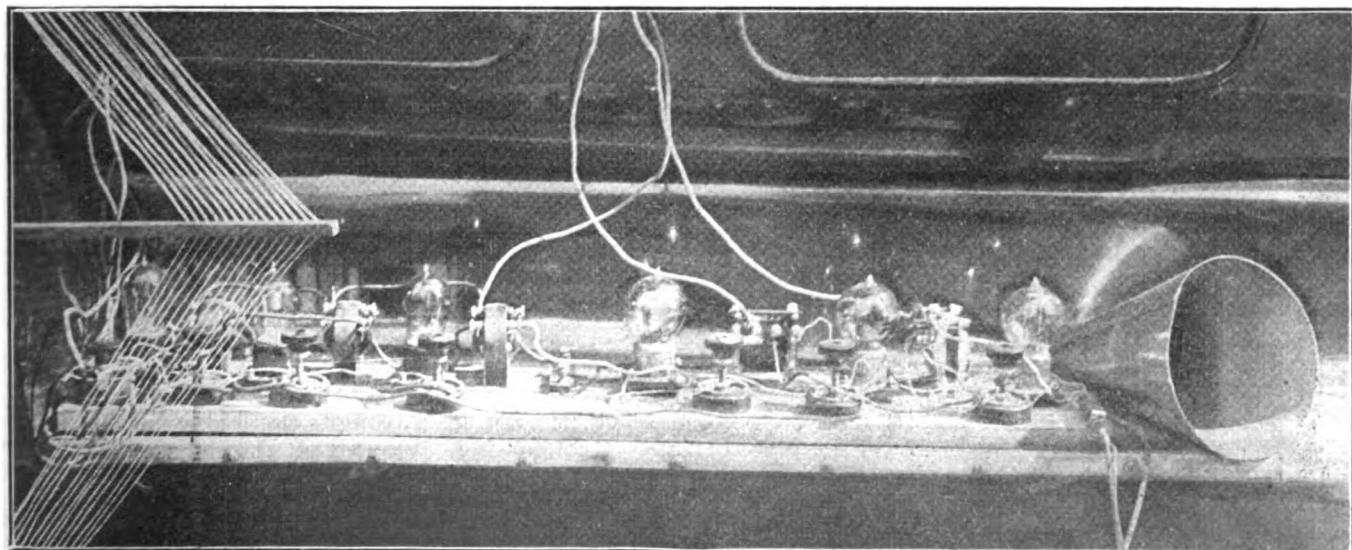
The upper photograph shows a radio-frequency set made by Peter Smancy, a Newark amateur, to operate in an automobile owned in Lavalette, New Jersey, a town claimed by experts as "dead"

to all radio signals. Although expensive sets with big aerials had failed to get a signal, this small portable outfit using an 18-inch loop for an aerial brought in Newark and Pittsburgh so clearly that music could be heard by persons twenty feet from the head sets. The complete set is shown in the lower picture. It utilizes three

stages of radio-frequency with a detector and three steps of audio-frequency for amplification. The loop aerial may be seen with the layout and home-made horn for loud signals. This set has been carried in this car for some time. With it the most satisfactory results have been obtained by using radio-frequency as a means of amplifying.



(Both photographs C. Underwood & Underwood, N. Y.)

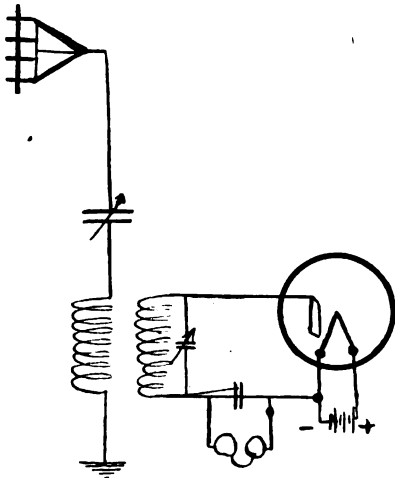


Detectors—and How They Work

By Donald Van Wyck

THE popularity of the receiving-set has caused a great many fans and amateurs to become interested in the broader aspect of radio. Not a few are familiar with electricity and handy with tools, but a large majority of them do not even care to learn the elementary principles of the game. The layman seems to think that all that is necessary is to connect up the set and it will gladly do the work. This is a great thing of which to boast. Many sets will work, but it is a question whether or not a set is working to its fullest efficiency. A little experimenting along well-developed lines may enable the beginner to greatly improve the strength of received signals.

The multiwire aerial, of course, is a waste of time and money; but the single wire cannot be beaten for receiving purposes. However,



This diagram is the simplest way of showing a two-element tube detector. It is the original Fleming invention and acts as a rectifier in much the same way as does the crystal.

the direction in which the aerial points, as well as the location, has a lot to do with the matter. The direction will not make a great difference in the receiving; but, in radio receiving, the currents dealt in are so small that anything that will help in the least to make the signals louder may well be looked into. The direction that the aerial should be pointed is, of course, towards the station to be received.

The ground lead is another important factor in the set. Some amateurs are using several grounds, such as cold-water pipe, gas pipe, radiator, and the outside private ground. All of these grounds may work well together or may not work at all. No definite rule can be

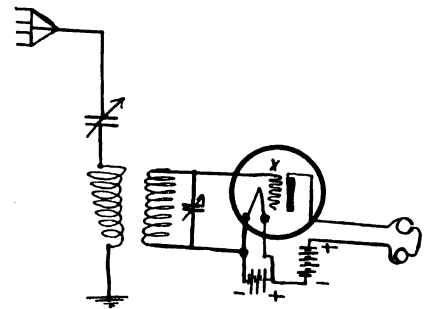
laid down, because conditions will vary greatly with the locality.

The purpose and usefulness of the detector is to convert the received current of high frequency into the direct current necessary to operate telephone receivers. Various forms of detectors which accomplish this end have been used in the past, including the original coherer, the magnetic detector the electrolytic, crystal, the vacuum tube detector. All of these, except the two last mentioned, have become obsolete. We have previously read in RADIO WORLD that the crystal detector makes audible the high frequencies of incoming signals because it rectifies them. In other words, it allows the current to pass only in one direction. This rectified current consists of a series of pulsations which pass through the windings of the telephone receivers and cause the diaphragms to vibrate, at a frequency which, in the case of radiophone signals, would correspond with the tones of the music or voice being sent out. We have also seen that, for long-distance reception, a detector having more sensitive and stable characteristics than the crystal type is very desirable. These desired features are embodied in detectors of the vacuum-tube type.

When using the vacuum tube as a rectifier it must allow passage of the received alternating current in one direction and prevent the passage of current in the opposite direction. To bring about this result, it is obvious that something must be done to lower the resistance of the tube for current flowing in one direction and keep the resistance high when the current tends to reverse. The two metallic parts, or electrodes, are securely sealed into the glass tube and the tube is then pumped out until it is almost entirely free from air. One electrode, the plate, is generally formed of thin sheet-metal, while the other, known as the filament, is made of small wire and has both ends brought out through the glass. By connecting the two ends of a battery to this filament, it can be heated by the battery current to a temperature which will cause it to glow brightly. When the filament is thus heated, the space between it and the plate becomes a conducting path for the flow of current if the voltage on the plate is positive; but the resistance is maintained to pre-

vent the flow of current if the voltage on the plate is negative. In this way, as with the crystal, a pulsation current is produced which vibrates the telephone diaphragm and produces sound. The sensitiveness of the vacuum tube is greatly improved by the use of a third electrode, called the grid, which is essentially a metallic screen of fine mesh. This screen is placed between the plate and filament of the tube and connected into the circuit as shown. Its function is to control the flow of current from the plate to the filament, through the telephone circuit.

It will be seen that, besides the A battery for heating the filament, there is also a plate battery called the B battery. This is connected in series with the telephone receivers so that the positive ter-



The three-element vacuum tube is shown here. The X in the circle represents the grid which makes the vacuum tube the most sensitive rectifier of radio signals. The third element, or electrode, is the work of Dr. Lee de Forest.

minal is next the plate and the negative terminal is next the filament. When the battery is connected in this way, there is a steady flow of current from the B battery through the tube. This current may be controlled by applying a small voltage between the grid and filament. When the voltage on the grid is negative, it has the effect of decreasing the current in the telephone circuit; and when the grid voltage is positive, it allows the plate current to increase. In this way, the feeble alternating currents of an incoming signal may be applied to the grid and filament and used to control the flow of direct current from the B battery through the telephone receivers. Thus the effect of the signal is multiplied through the relay action of the tube and produces considerably greater action of the telephone receivers than could be obtained by simple rectification.

Hermit Radioist of Canadian Wilds

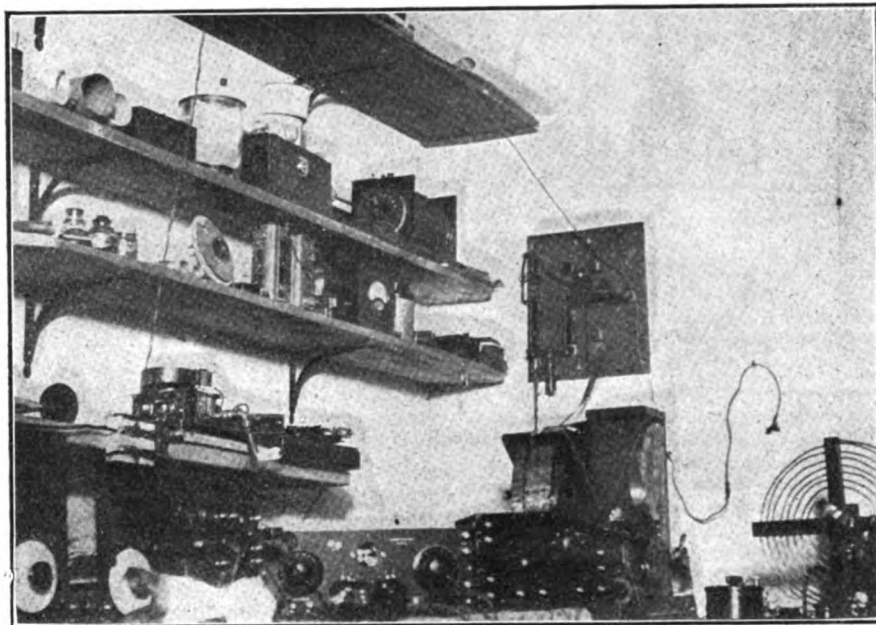
By Peter Gray

THE unique circumstances and exceptional radio accomplishment of M. J. Caveney, a lonely trapper with a penchant for companionship by radio, should stir the admiration of all radio enthusiasts. Mr. Caveney occupies a cabin at Sandy Falls, near Timmins, Northern Ontario, Canada. He has assembled one of the most powerful radio sets. It includes a complete transmitter and a receiving layout. The accompanying photograph shows the interior of Mr. Caveney's radio shack. To the left of the receiving set, to the right is the transmitting gear.

An oscillation transformer makes it possible for Mr. Caveney to insure amateurs that he can give them sharp coupling, which, in turn, will bring sharp tuning at the receiving end. Mr. Caveney claims that with this spark transmitter, he has reached and communicated messages to amateurs within twenty-five States of the United States. This the trapper can prove by the collection of postal cards, shown in another picture. In looking over the list, most amateurs who have heard Mr. Caveney were from the eighth and ninth districts. Yet there may be read the call letters of some from the third, fourth, and fifth districts. Some very fine work of transmission, indeed!

Mr. Caveney no doubt intends to keep plastering his walls with postal cards from radio amateurs who listen in when he is using his transmitter.

Probably his transmitter may be heard at a greater distance when the transatlantic tests are being made in December. If so, this would prove the importance of utilizing radio as a means of long-distance communication between amateurs.



(C. Underwood & Underwood, N. Y.)
Mr. Caveney's set. He calls this corner of his cabin his "radio junk shop."

Italy Demands Radio

THERE is a growing interest on the part of the Italians in American production of radio apparatus. Inquiries are being received both for transmitting apparatus to be used in broadcasting and for radio telephone receiving sets. If American manufacturers interested in the possibilities of the Italian market for their product will send catalogues and other descriptive literature to the office of the American Commercial Attache, care of the American Embassy, Rome, such material will be made available to all persons inquiring.



(C. Underwood & Underwood, N. Y.)
A few of Mr. Caveney's radio post cards. Nearly every American radiolist who has "heard him" has sent him a card—and he has quite a collection.



(C. Underwood & Underwood.)
The cabin where C. J. Caveney, Canadian trapper, spends twelve months of the year—and it looks like this the long winter round. But Mr. Caveney is not lonesome. His radio set keeps him in touch with so much of the rest of the world that he has a goodly quota of conversation and entertainment when not engaged in his interesting occupation.

Working Right!

Jimmy—You take this wireless receiver I just finished making, and go down stairs in the cellar; hold it close to your ear and listen.

Freddy—(after waiting in suspense for several moments in the cellar)—Aw—it's a fake; I didn't hear a thing.

Jimmy—Good! That shows it's workin' right. I didn't say anything yet.

One of the Most Delicate Parts of a Receiver

By George W. May, R. E.

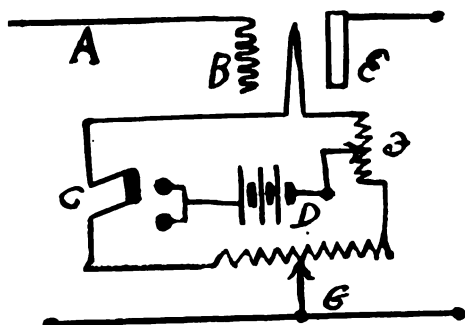


Figure 1—Schematic hook-up of the vernier rheostat. A is the grid circuit. B the grid of the tube. E the plate of the tube, C the switch. D the A battery. F the rheostat. G the potentiometer and arm.

THE detector tubes now on the market require careful attention and correct adjustment of the plate battery for satisfactory results. As a matter of fact, here are no two tubes possessing the same characteristics either in filament current or plate voltage. It is very easy to make adjustments on the filament, since the rheostat gives very fine control of the current. Vernier rheostats may be purchased. These vernier rheostats have an extra arm built on the same shaft as the regular arm, and it travels over a single fine wire tightened around the body of the instrument. This is very practical as it enables the operator to regulate the filament temperature *very* closely which, sometimes, is very desirable.

The high-voltage batteries may be purchased tapped; the battery should, in fact, be tapped. Changing the number of cells in a B battery would change

the positive potential on the plate. If the positive potential on the plate became greater, it would have a greater attraction for the flying electrons in the tube; hence, in a given time, more electrons would arrive at the plate and be pumped around the circuit by the battery. Such B batteries as are used for this change of high potential are of the high-voltage type, as previously explained. They have five or more brass strips on binding posts secured into the sealing compound. Each one of these cells is connected to a cell in the battery. So by connecting with the different posts, different values of voltages may be obtained.

Jumping from one post to another on the battery may be done by employing a clip; but it is much more convenient and easier to put five contact points and a switch arm on the panel of the receiver and so be able to vary voltage by simply turning the switch arm. Of course, this necessitates a little hard work, but it is compensated for by the ease and rapidity with which tubes may be tested to determine the relative efficiency of different makes.

The connections are shown herewith. Each strip on the battery is connected to a contact point on the panel, while the switch goes in the rest of the hook-up, as indicated. There is one interesting point here which must be noticed. If the switch arm is so wide, or the contact points so close together that the end of the blade touches two posts at the same time, the cell between these two posts will be short circuited. In other words, if the switch is kept in

this position for more than a few minutes, the cell will be ruined and it may be necessary to purchase a new battery. To overcome this it would be a wise stunt to insert an extra switch point in between the five regular ones; the extra ones will not be connected with anything. These will simply act as spacers and be dead.

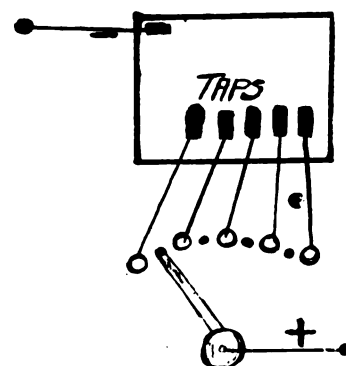


Figure 2—The tapped B-battery with control of voltage utilizing a switch arm.

As an added instrument, an A battery potentiometer may be used. This gives extra-fine adjustment of the tube; but it really is not necessary except in radio-frequency amplifiers. The correct method is shown in the accompanying sketches. The ends of the winding go directly across the 6-volt battery, while the arm is the common terminal for the input and output circuits of the tube. It will be noticed that the potentiometer, notwithstanding its high resistance, acts as a drain on the battery in order to do away with this loss and to have the instrument connected only when the set is used. It is suggested that a double-throw switch be used. This cuts off the filament as well the potentiometer at the same time.

The use of this device is simple. Before making any other adjustments, set the arm at the middle of the winding. Now proceed to experiment with the values of the other elements of the tube control, get what you think are the correct amounts, and then listen in. While doing so, move the potentiometer arm slowly either way until signal strength is secured. Remember that the action of the B battery may be compared to a pump. When it forms part of a circuit, it pumps electrons out of its negative terminal and into its positive terminal. The flow of electrons is around the circuit. This flow is a current of electricity. It may be measured by an ammeter placed at any convenient point in the circuit.

Yes, Radio Is Quite au fait!



(C. Underwood & Underwood, N. Y.)

The leading hotels of America now have their radio rooms, and guests hear the finest concerts. This photograph was taken in the "Radio Room" of the Greenbrier Hotel, White Sulphur Springs, West Virginia. Harry Sadenwater, radio engineer of the General Electric Company, New York, is announcing the next number on the program; Mrs. Charles F. Thompson of Washington, D. C., and Mrs. A. N. Fay of Pittsburgh listening in.

National Radio Week Has Been Set for December 23 to 30 (inclusive)

Major J. Andrew White Appointed Chairman of Executive Committee. Preparations and Programs to Be Planned At Once

NATIONAL RADIO WEEK has been definitely set to take place from December 23 to December 30 (inclusive). This was decided unanimously at the meeting of radio magazine editors, publishers, and representatives of the radio trade, the National Radio Board of Trade, and the American Radio Exposition, held at the Bankers Club, New York, on October 24.

So the idea suggested by Radio World, in its issue of October 21, becomes an assured fact. Radio World is pleased—happy beyond expression—that National Radio Week is not to be confined to its efforts alone, but is to be—as it should be—a big, broad, national affair in which every radioist—man, woman and child—may not only take active part but feel that he is an integral factor in its success.

The meeting at the Bankers Club—preceded by a luncheon at which the greatest optimism in the future of radio was expressed—was presided over by L. S. Byers. Among those present were: Frank Hitchcock, Postmaster General under President Roosevelt; H. Gernsback, Editor of "Radio News"; Lawrence A. Nixon, managing editor, "Radio Dealer"; Amedee J. Casey, "American Radio Journal"; John Gillette, "Electrical Merchandising"; Austin C. Lescarbours, "Scientific American"; Mr. Crosby, "Modulator"; Mr. MacAttamany, "Radio Retailer and Jobber"; Mr. Wardrop, "Radio Merchandising"; Arthur H. Lynch, "Radio Broadcast"; Kenneth B. Warner, "Q. S. T."; Mr. Henderson, "Talking Machine Journal"; Mr. Robertsen, "Talking Machine World"; Mr. Miller, "Radio Digest"; Mr. Callahan, "Radio Topics"; Kenneth Payne, "Popular Science Monthly"; Roland Burke Hennessey, editor, "Radio World"; Walter Gordon Clark, Harold Bolster, George Brokaw Compton, Chester D. Humphrey, and Messrs. Davis and Hunter, of the National Radio Chamber of Commerce.

Major White was appointed chairman of an executive committee to take charge of the details of preparations for National Radio Week.

A supplementary committee of one hundred will be appointed. The members of this committee will be published in the next issue of Radio World.

So National Radio Week takes definite shape and form! The week (December 23 to 30 inclusive) was chosen not only because this is to be actually "A Radio Christmas," but because it will give wider scope for broadcasting and for amateur transmitting. It is a week when the younger element—whose interest in radio is as keen as that of the grown-ups—

will have ample time to join in the many festivities that will be planned and carried out.

National Radio Week, remember, is not a local affair. It extends to every hamlet in the country. Every fan and amateur is expected to take part—and particularly, for the future of radio, to interest his friends in the new science; to bring strangers into the evergrowing radio field.

Watch Radio World for National Radio Week news. And let us hear from you if you have any practical suggestions that will help to make the week a history-making one.

"What would you do to make National Radio Week a success?"

Let us have your answer to this question.

Letters commending National Radio Week continue to pour into the office of RADIO WORLD. Here are just a few of the many received. They show the trend of opinion:

O. H. Caldwell, editor of "Electrical Merchandising," will give his publication's aid:

Congratulations on your plan for a National Radio Week! "Electrical Merchandising" will publish an announcement in its next issue regarding this idea. It opens up interesting opportunities. Please keep us in touch with any developments that take place in your program.

Major General George O. Squier, Chief Signal Officer, U. S. A., will cooperate:

I believe it is a very good idea. Anything that will help to stimulate an interest in the radio art and bring about a wider diffusion of the knowledge of the art is worthy of every effort. I have no specific suggestion to offer; but I shall be glad, in a general way, to cooperate in any way I can to help towards the success of this enterprise.

Major J. D. Felsenheld, Radio editor, "The Jerseyman," Morristown, N. J., is in line:

This department will be glad to cooperate with you to the fullest extent in putting over a big National Radio Week. If you can go through with it, the stadium stunt will suffer a total eclipse. Let us know if we can be of any assistance.

Glenn Howell, Lieutenant-Commander United States Navy, says N. R. W. should accomplish results:

Your suggestion for National Radio Week is believed to be very appropriate and, no doubt, should accomplish results which would be beneficial to the radio business and science as a whole. Should it be desirable for the Navy to take an active part in such a celebration, it would be necessary to consult the Secretary of the Navy. You have my best wishes for the success of this venture.

Be a National Radio Week Booster

Last-Minute Radio News

WIRED RADIO is the latest corporation to file its charter in Wilmington, Delaware. Its purpose is to develop systems. The capital stock is \$10,000,000. The holding company is the Corporation Trust Company of America.

Recent modification of the rigid laws governing the installation of radio telephone and telegraph stations have made possible the installation of radio broadcasting, according to Vice-Consul Edwin B. Montgomery of Montevideo. Applications are now pending which, if granted, should mean the opening of a splendid market for radiotelephone receiving apparatus in Uruguay.

Application for Government sanction to establish a radiotelephone system has been made by the Daido Electric Power Company, of Nagoya, Japan, according to advices received by the Department of Commerce. The company proposes to operate this system primarily for its own convenience in connecting the various stations with its electric light and power system, but its

use may be extended to the general public. As at present planned the wireless system will start from Okuwa in Nagano Prefecture on the Central Japan Railway Line, from which point communication will be established through Nagoya and as far as Osaka, a distance of about 150 miles. American firms interested in the possibilities of supplying equipment may obtain the name of the purchasing agents for the Daido Company in the United States from the Electrical Equipment Division, Bureau of Foreign and Domestic Commerce.

More About the Telephone Mystery

Editor, RADIO WORLD:

In your issue No. 28, dated October 7, I read the letter from Albert Lundberg, Fairdale, North Dakota, in regard to re-

ceiving telephone messages from a nearby telephone line.

I had a similar experience. Sometime back, a friend and myself, while experimenting with standard regenerative receiver-circuits, put in a short ground line house-telephone system so that we could compare notes on our work. By accident we discovered that we could talk to each other through the transmitter of the house phones and receive through the radiophones. Further experiments convinced us that a standard ground-telephone system would radiate sufficient induction to be received by a radio receiver (regenerative) as far as 50 feet from the receiving instrument. This experience may afford some one a chance to do some work along this line.—R. O. Nemeier, 497 Winona Avenue, Pasadena, Calif.

Radio-Equipped Polar Weather-Stations Sought

By Washington R. Service

WITH the perfection of radio communication, great progress has been made in another science which is, perhaps, of equal value to the world at large, particularly the seafaring and agricultural nations. Meteorology has advanced with leaps and bounds during the past few years. Due chiefly to radio, the outposts of meteorological knowledge have been pushed far afield into distant and unpopulated wilds where, previously, lack of communication has withheld local weather conditions from the world.

Last winter, an American engineer, Hagbard D. I. Ekerold, spent months on a barren rock 400 miles north of Iceland, in the Arctic Ocean, as the leader of a meteorological expedition backed by the Bergen Geophysical Institute. His observations were believed so important to the rest of the world that an observatory was established by the Norwegian Government at Jan Mayn, this lonely spot of rock in the Arctic sea.

This new northern observatory has a wireless station, so that weather observations may be broadcast as fast as noted. Scientists hold that this, the station farthest north, is the beginning of a new epoch in the history of science, admitting that credit is due to radio.

Meteorology is fast becoming an international study, for the storms and weather of one country soon affects the situation in another, and, to-day, the immense area covering the whole of Europe, Northern Africa, and the Near East, as well as the United States and Canada, is combed with great care by weather observers and their reports received at central points, abstracted and broadcast by radio daily from Washington, Paris, and a few substations. Thus it has become possible for meteorologists to obtain within twelve hours of the taking of the observations, a representative meteorological situation over the greater part of the Northern Hemisphere, extending from the Pacific Coast of America to Russia and Egypt.

Professor Bjerknes, of Norway, who has done much to advance our knowledge of cyclones forming in the temperate zones, holds that weather conditions there depend chiefly on the conflict between two streams of air—a cold current flowing southward from the north Polar regions and a warm current drifting northward from equatorial sources already well known. These air streams, he believes, meet along a wavering front in the temperate zone, and in their intermingling create those mysterious swirls in the

atmosphere which are called cyclones. To study these possibilities, he desires to establish a chain of radio-equipped observation stations near the Pole, from the records of which the tracks followed by the Polar current southward and the centers of conflict with the warm currents may be definitely determined. Such a series of circumpolar meteorological posts will have more than theoretical importance when regular forecasts for the North Atlantic are required in connection with daily air flights between Europe and America, he says.

This Observatory at Jan Mayn, which transmits by radio observations six times daily, constitutes the first link in the chain with Spitzbergen. Mr. Ekerold has made a proposition to England, the United States, and Canada, to establish a third link in the Arctic chain at Baffin Island, on Davis Strait near Western Greenland, over a thousand miles from Jan Mayn, Iceland, and Newfoundland. This third radio station would aid materially in studying the weather in the Far North which is practically unknown. From these stations observations aiding in establishing forecasts for the Northern hemisphere and the North Atlantic trade and air routes would emanate.



(Cartoon by Lawrence B. Hinckley)

TOO DEEP FOR DAD

Young Amateur: "Say, father, if I hook up a five ten-thousandth-microfarad condenser on the antenna circuit, and a variometer in the plate circuit of the electron-relay, do you think my set will oscillate?"

19 More Broadcasters Are Licensed

TWELVE licenses were issued by the Department of Commerce to 360-meter broadcasters and seven to Class B Stations operating on 400 meters, as follows:

Limited Commercial or Broadcasting Stations for 360 Meters, Licensed Between October 14 and 21, 1922.

WMAY—Kingshighway, Presbyterian Church, St. Louis.

WNAT—Lennig Bros. Co., Philadelphia.

WNAH—Manhattan Radio Supply Co., Manhattan, Kansas.

WOAV—Pennsylvania National Guard, Erie, Pa.

WMAW—Wahpeton Electric Co., Wahpeton, N. D.

WTAW—Agricultural & Mechanical College of Texas, College Station, Texas.

WPAA—Anderson & Webster Electric Co., Waco, Nebraska.

WNAJ—Benson Co., Chicago.

WMAN—Broad Street Baptist Church, Columbus, O.

KFBV—Clarence O. Ford, Colorado Springs, Colo.

WMAX—K. & K. Radio Supply Co., Ann Arbor, Mich.

WSAV—Clifford W. Vick, Radio Construction Co., Houston, Texas.

Class B Station to Operate on Wave Lengths of 400 Meters, Licensed Between October 14 and 21, 1922.

WDAF—Kansas City Star, Kansas City, Mo.

WOC—Palmer School of Chiropractic, Davenport, Iowa.

WHB—Sweeney School Co., Kansas City, Mo.

KDKA—Westinghouse Electric & Manufacturing Co., East Pittsburgh.

WSB—Atlanta Journal Co., Atlanta, Ga.

WFI—Strawbridge & Clothier, Philadelphia, Pa.

WBAP—Wortham-Carter Publishing Co., The Star Telegram, Fort Worth, Texas.

"My short experience with radio convinces me that future generations have something to live for."

—Sir Thomas Lipton.

Keep Your Clocks Right by Radio

By Carl H. Butman

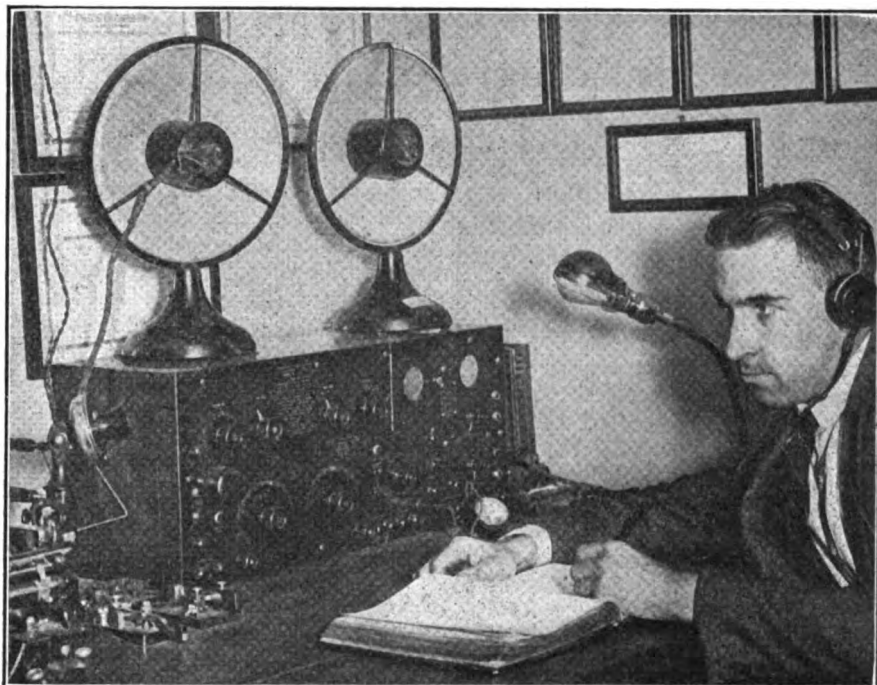
WASHINGTON, D. C. — Through Naval Radio broadcasts, it is now possible to set clocks and watches to standard time twice daily. At noon, and at 10 o'clock every night, the Naval radio stations at Arlington, Annapolis and Key West transmit radio signals, indicating the exact time for the 75th meridian or standard eastern time.

The actual time is kept at and sent from the Naval Observatory in Washington, the source of standard time for the territory east of the Rocky Mountains, the chronometer and time office at the Naval Station at Mare Island, California, serving the western territory and ships off the Pacific Coast.

In a deep, even-temperature vault at the Naval Observatory three Riefler clocks keep sidereal, or star time, and although they are not quite correct, it doesn't matter. They are checked by the observation of certain stars as they cross the meridian, and their exact error and rates of error calculated. Having obtained the exact Washington sidereal time, a correction for the difference in longitude of Washington and the 75th meridian—which is 8 minutes and about 15 seconds—is made to secure Eastern Standard time. This is kept on two transmitting clocks, one of which sends out the time signal to the three radio transmitting-stations by means of a relay.

Previously to sending the time signals, the sending clock is checked with one of the standard Riefler clocks by comparing their ticks which are recorded on a chronograph, wavy pen lines indicating the separate ticks. These are measured by a finely divided scale and compared. Determining the error, the sending clock is speeded up or slowed electrically until its ticks correspond exactly with the standard clock.

The ticks of the transmitting clock are sent to the three transmitting stations by closing a switch at the observatory, but they are broadcast by radio from the three stations. Five minutes is required to send a complete time-signal, starting at 11:55 and running to noon, and from 9:55 to 10 p. m. The time signals consist of telegraphic dashes every second except the 29 of each minute, the 55th to 59th seconds of the first four minutes, and the 50th to 59th seconds inclusive of the last



(C. Kael & Herbert)

Radio fans wonder how WJZ, Newark, New Jersey, retransmits the Arlington, Virginia, time signals every day. The time signals are received from Arlington on this heterodyne receiver, after which they go through the amplifiers to the aerials. This heterodyne receiver operates on from 250 to 2500 meters. The photograph shows Raymond F. Guy, well known to radio audiences as "O.G.N.," retransmitting the Arlington time signals.

minute before the hour. Each of these blanks is caused by a missing tooth on an otherwise complete gear-wheel. Following the 59th second of the last minute, there is a long dash commencing at the beginning of the new hour. Listen in for NAA on 2650 meters and set your clocks then.

By means of a radio receiving set at the observatory the message of ticks may be caught and recorded

on a chronograph for comparison with the sending clock's record to determine the loss in transmission. It averages about .09 of a second. The time signals sent from Annapolis on a wave length of 16,900 meters have been heard in Australia, while in the Antipodes time signals have been heard coming around the world both ways. With a receiving set it is now no excuse to say "my clock was wrong."

Better Radio for Infantry Units

SIGNAL Corps radio engineers are perfecting a better field-radio set for army infantry units. The present spark set, SCR 105, developed during the World War, has become practically obsolete and continuous-wave sets are desired.

A board of Signal Corps officers, which met at Camp Vail, New Jersey, recently, has recommended that surplus sets such as SCR 79-A, 127 or 130 be issued to infantry regiments for training purposes until continuous-wave sets can be developed and distributed to replace the old 105s. Recently the continuous-wave sets were adopted for all Army radio communication.

The old 150 sets are quenched-spark sets used for transmitting and receiving between headquarters, usually not more than five miles apart, but if an amplifier was employed by receiving stations it was useful up to about thirteen miles.

The SCR 79-A, one of the sets recommended by the board as a temporary

substitute, is a vacuum-tube set designed for transmitting undamped waves and for receiving either damped or undamped signals. The transmitter delivers about ten watts to the antenna, and the messages will carry about twenty miles on waves between 500 to 1100 meters. This set was designed for use at command posts, or at headquarters, where transportation is available.

Details of the new sets are not completed, but it is understood that they have a range of about ten miles, and will be used between regiments and brigade headquarters.

Radio Don'ts

Don't attach ends of antenna to power or telephone poles.

Don't connect a radio set direct to the electric light circuit.

Don't forget that tickler coils are not used with crystal detector sets.

The Radio Primer

*For Thousands of Beginners Who
Are Coming into Radio Circles*

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

What is a variable condenser?

A VARIABLE condenser consists of a number of semicircular metal plates arranged in two sets. One set is stationary; the other may be moved on a pivot so that both enter between the stationary plates but without touching them. All the stationary plates are connected and, likewise, the rotating plates. The plates may be of aluminum, brass, or any other metal that retains its shape.

* * *

What is the function of the variable condenser?

The variable condenser supplies an electrical quantity known as capacity. Radio circuits are made up of inductance and capacity. Tuning coils supply much of the inductance while condensers are depended on to supply the capacity. Perhaps a clearer idea of capacity would be gathered if a condenser were to be considered as a miniature storage-battery which catches and holds the minute electrical impulses until there are sufficient to make an impression on the head phones.

* * *

How does a variable condenser store up these impulses?

Strange as it may seem, it is not the metal plates in a condenser that hold the impulses, but rather the air between the plates. The impulses come in from the aerial and are transferred to the detector circuit by simple tuner, loose coupler, variometer, or vario-coupler. The sounds are made up of little trains

of waves. These trains come into the metal plates of the condenser and cannot jump from one set of plates to the other. Thwarted, they are still able to strain or twist the air between the plates. This action is the same as when a piece of soft rubber is twisted in one's hands. So long as the pressure is maintained, the twist will remain; but if one hand is removed, the rubber returns to its former shape and size. In the condenser, the waves strain the air and the air holds the strain until it has stood all it possibly can. Then it "back fires," to use a common term.

* * *

Are other than variable condensers used in radiophone sets?

Yes. There are grid condensers, fixed condensers and the by-pass condenser. These are used in receiving sets.

* * *

What is the grid condenser?

When a train of waves enters from the aerial through the secondary of the loose coupler or vario-coupler, the grid is affected with an alternation of positive and negative waves. As previously described, the flow of electrons from the filament is helped when the grid is positive, and hindered when the grid is negative.

* * *

What is a grid condenser made of?

A few square inches of tin foil separated by a good grade of waxed paper, both materials being folded several times to conserve space.

Radio Terms That Puzzle Beginners

NEW radio fans seem to have difficulty in understanding many of the technical terms connected with the art. In many cases, incorrect definitions are published. These frequently cause confusion, and poor results when applied to the operation of radio instruments. A few of the more important terms are herewith defined:

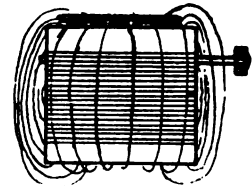
Crystal Set.—This type of receiver derives its name from the form of detector used with it. A detector of this sort depends for its rectifying qualities on a little crystal

of one of the number of crystals, such as galena, silicon, carborundum and others. The disadvantage of the crystal is the range which it offers. It is satisfactory in a range from 15 to 20 miles. Its advantage is due to the fact that its upkeep is low—comparatively inexpensive. For short-distance work, it gives satisfaction.

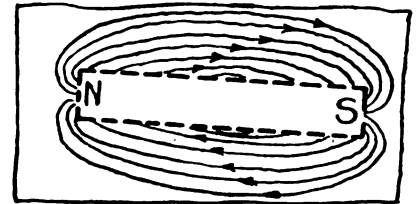
Regenerative Set.—This is the vacuum-tube set; for crystals cannot regenerate. The regenerative action depends on feeding part of the current flowing through the plate circuit back into the grid cir-

cuit, thus increasing the grid current and, likewise, the current in the phones. This feed-back is accomplished by either tuning the plate circuit, or by using a tickler coil or a coupler condenser.

Lines of Force.—Those invisible streams of magnetism that surround a coil of wire, such as tuning coil, loose coupler, or vario-coupler. It is these lines of force that transfer the electrical energy from the primary coil of a tuning device to the secondary coil. That these lines actually exist can be proved easily by laying a piece of paper on which fine iron filings have been strewn. The filings will assume positions along curved lines which lead



How lines of force act in a radio loose-coupler



How the lines of force would affect iron filings if the metal particles were spread on a sheet of paper over a bar magnet.

from one end of the magnetized strip to the other. Although there is no metal around tuning coils except the copper wire—which is nonmagnetic—these lines of force exist. They pass out of the individual turns of the coil down through the center and around to the other side.

Non-magnetic.—The term applied to some common metals which are not attracted, or repulsed, by a magnet. Copper, brass, carbon, and gold are nonmagnetic metals.

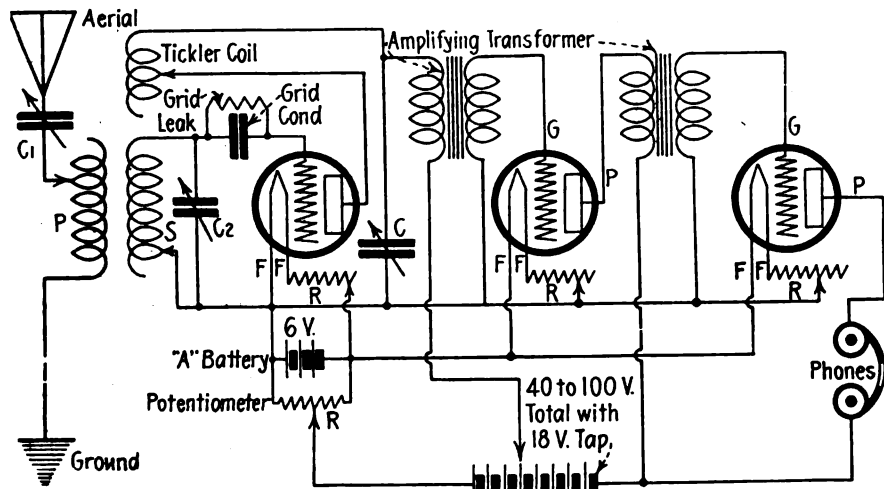
Radio Notes

SOMETIMES it is difficult to find a sensitive spot on your crystal. Try the following plan: Take a discarded crystal, and pulverize it, but not very finely. Put some of this inside a metal casing and screw it into the cup of your detector. You will be surprised to note how quickly you can find a good spot.

The receiver is capable of all sorts of refinement. The best way to perfect one is not to hurry the job. Some amateurs take months to build their sets; but when the sets are finished, they are real ones. *The secret of radio construction is patience.* Even after the set is completed it is well to try making a few changes in the wiring provided this seems necessary.

Receiver for Amplifying Weak Signals

By Horace Beers



Complete schematic diagram of a detector and two-stage amplifier as described in the accompanying article.

THE regenerative type of receiver has come into very common use in the reception of both radiophone and radiotelegraph communication, and the added increase in strength of signals makes it possible for this type of receiver to catch the very weak signals from exceedingly long distances whereas with other types of receivers amplifying transformers are employed for loud signals.

It is my idea that we employ the amplifying transformers in connection with a receiver of the regenerative type. This would in turn give very satis-

factory results, especially to those interested in listening to the broadcasting stations. The accompanying illustrates a detector and a two-stage amplifier of the regenerative type. This form of receiver is unusually selective in its tuning, and requires critical adjustment in order to get the best results. The amplifier acts as a magnifier of the signals received by the detector. With each stage of amplification, the incoming signals are magnified many times.

With this regenerative receiver, distant stations may be brought in and the fan will experience for the first time

the complete satisfying thrill of hearing a faint voice announce, "This is broadcasting station WOC, Davenport, Iowa," or "this is 'Atlanta Journal' station WSB." True enough, the signals will be weak and they'll fade in and out as is customary with all distant transmitters, but they are *there!*

Most every listener is gifted with patience beyond the ordinary; for it requires considerable practice before the operator is sufficiently skilled to tune in these faraway stations. It is usually necessary to become somewhat of a "night" owl as these long-distance stations cannot be picked up with just a turn of the knob. However, until WJZ and WOR "sine off" for the night, the local interference is apt to make such an attempt hopeless.

In using a regeneration set, especially those who are not familiar with oscillation, a rushing sound like that of falling water is heard just at the point where the secondary and primary are tuned to the same wave-length. The broadcasting wave will make known its presence by a squeal, or whistle, the pitch of which may be varied at will. When this is tuned in, the primary circuit should be varied until it is as loud as it possibly can be made, then the plate and secondary circuit-condensers should be readjusted sufficiently to eliminate the whistle and bring in the broadcasting clearly.

Radiomen at WJZ We Hear But Never See



(C. Kadel & Herbert)

THOMAS H. COWAN, "A.C.N."

Mr. Cowan is concert manager at WJZ and one of the pioneer announcers. He has the distinction of having announced the first radio concert ever given and the first World's Series baseball games. He is 25 years old, single, and formerly was connected with the Metropolitan Opera Company.

RAYMOND F. GUY, "O.G.N."

Mr. Guy, who is 24 years old, and married, has been with WJZ since December 1, 1921. He is one of the best known operators in the country—for WJZ, Newark, N. J., is widely heard. The initials are arranged to read, if one wants to know: (O) operator, (G) Guy, (N) Newark. In the instances of Messrs. Cowan and Watt, (A) is for announcer.

JOSEPH L. WATT, "A.W.N."

Mr. Watt is in his 30th year, and married. His particular work is to announce the many literary features sent out by WJZ. When you hear the familiar voice saying, "A. W. N. announces this or that," then you know that Mr. Watt is speaking. His cheery voice has been heard, it is estimated, in almost every State in the Union. He is a pioneer among radio announcers.

How to Learn the Code This Winter

By Ortherus Gordon

RADIO WORLD has suggested since its beginning, that the newcomers in radio learn the Continental Code. That this was appreciated was made evident when it was necessary to republish the code for the benefit of those who were lacking a copy of it and were requesting the editor to supply it. In this article, I suggest the use of a practice outfit for learning code and offer an outfit that may be constructed by the ambitious amateur at very little cost.

If you are the only amateur in your community, owning such a set, you can command the interest of the other radio enthusiasts by inviting them over for code practice. They should bring their headsets, plug in on the buzzer, and take down the messages as you send them from your own home-made key and buzzer. Hide or muffle the buzzer so that its sound is not audible, or put it in the next room, and you will treat your friends to actual receiving conditions combined with a speed they can read and understand.

The outfit I describe is, also, ideal for radio clubs wishing to organize code classes for work during the winter. Only two instruments are needed—a key and buzzer, with a dry cell for operating them. If you own a crystal set, then you already have the buzzer; but since it is desirable to have this practice set mounted on a single board, you may want to build another. Amateurs who own regenerative outfits do not use buzzers as detector tests and, therefore, should follow the plans as they appear in this article.

While definite instructions are given, it is understood that the dimensions and other features of the drawings are not rigid by any means.

The key shown is a serviceable and yet simple affair. For its lever use a 5-inch piece of 1/4-inch solid-brass rod. This rod is drilled as

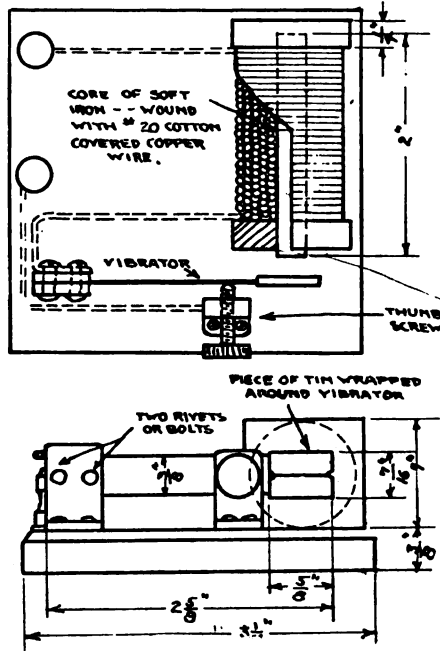


Figure 2. The buzzer. Made according to these dimensions, it will have a high, pleasant pitch.

shown in the drawing—all taps being the useful 8/32. The knob is made of wood or hard rubber.

If the amateur wants a good-looking knob, consider the tops of ink-bottle corks. I mean the two or four-ounce bottles and not the office size.

The spring is made of spring brass and may be cut to suitable dimensions. The uprights are made of brass plate or of wood, the only requirement being that they afford a rigid fulcrum for the lever. The fulcrum pin is a brass rod passed through the lever at right angles and fitted snugly into holes in the uprights.

A convenient feature of this key is the use of battery binding posts for contacts. Take the nut of any dry-cell binding post and saw it in half. This will give you the upper and lower parts of the contact. Fasten the lower part to the base of the

key and the upper to the lever, as shown, and then file them flat so that a perfect contact is made when the key is pressed. Only the principal dimensions are given.

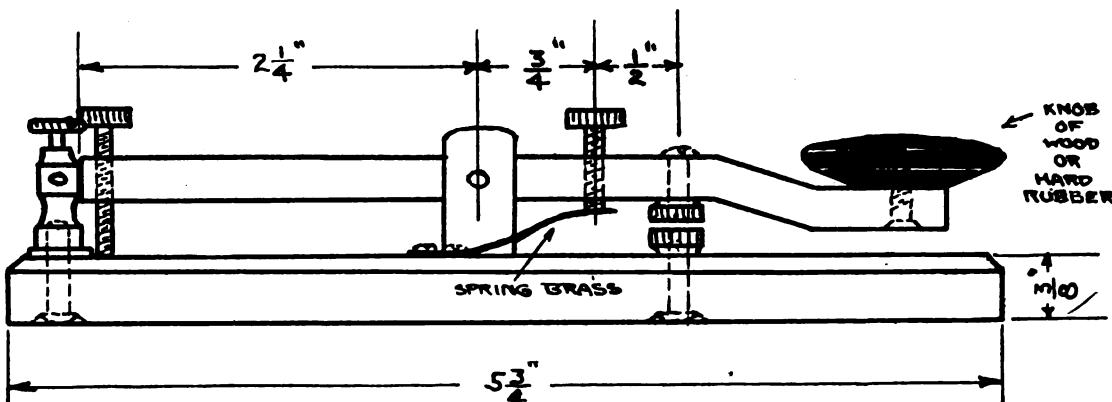
The buzzer—full plans of which are shown in Figure 2—may be explained as consisting of three parts, each part to be made separately and put together last. They are the coil, the vibrator, and the thumbscrew.

The coil has a soft-iron core. In this buzzer it is 2 inches long and 1/4-inch in diameter. This core may be either a solid piece of iron or a bundle of thin iron wires; but they must be soft iron. If steel is used, it becomes permanently magnetized and defeats the principle on which the buzzer works. The core is held firm by two wooden ends, 1 inch square and 1/4 inch thick. It is embedded in the after end, as shown, but protrudes through the forward end 1/16 of an inch. When it is rigidly set up in these supports, wind it with six or seven layers of No. 18 or 20 cotton-covered copper wire. Bring both ends out free. If you wish, give the coil a coat of shellac or cover with tape for appearance sake.

The vibrator is a strip of copper or brass 2 5/8 inches long by 3/8-inch wide. You may use spring brass if you wish, but it is not necessary. One end of the vibrator is made fast to the standard while the other end is wrapped with a piece of tin. This tin is placed directly in line with the center line of the core, as shown in the sketch. This is necessary because an electromagnet does not attract copper or brass.

The thumbscrew hardly needs explanation. It is merely an 8/32 screw fitted into a brass standard, or support, and placed so that it is just to the side of the tin plate on the vibrator and touching it.

The connections are as follows: One end of the coil goes directly to



Complete schematic diagram, giving the necessary dimensions for the construction of a transmitting key. For the lever use a 5-inch piece of 1/4-inch solid-brass rod. The knob may be of wood or hard rubber. The spring is of spring brass, and the uprights of brass plate or wood. The fulcrum rod is a large brass pin. Battery binding-posts are used for contact. Read the accompanying article carefully for further detailed instructions which the amateur builder should follow closely.

Conductive Amplifying Receiver Picks Up Long Distances

DR. FRANCIS LEROY SATTERLEE, noted X-ray specialist who is now devoting himself to radio research at his laboratories, Flushing, New York, is shown in the accompanying photograph with his "inductive amplifier," a non-regenerative radio-receiver working on an entirely new principle. With it he has reached unusual distances, having heard from Ontario, as far south as Louisville, Kentucky, and over a sweep from Memphis to Denver. The apparatus has the effect of radio-frequency amplification without employing radio-frequency bulbs and transformers, the receiver using only one bulb for radio-frequency detection. The signals are then amplified by two or more steps of audio frequency in the usual manner. This is the same set

By Herbert K. Dale

that interested Major-General George O. Squier, Chief Signal Officer, U. S. A., who said he would give fifteen minutes to see a test of this receiver, but actually gave three hours.

The novelty in Dr. Satterlee's set is the arrangement of the inductances. He uses three flat spiral-wound coils which look a great deal like a small talking-machine record. Two operate with a "butterfly" motion. The third moves through an arc between the

other two, similar to a bookmark slipped between pages of a book. Rough tuning is accomplished by a variable condenser, and thence finer tuning by the variation of the positions of the three coils.

Extreme ease of manipulation and freedom from distortion are features of this set. With a 125-foot aerial, Dr. Satterlee hears distant points.

The large set on left of the lower illustration shows the original set made by him, while the small set on the extreme right is the present-day model embodying the same principles.

(Continued from preceding page)
the binding post. The other end goes to the vibrator, while the second binding post is connected with the thumbscrew. Figure 3 shows the hook-up for the key, buzzer, and dry cell—together with the head-pieces as they should be connected in order to hear the buzz of the instrument loud and clear. There is no limit to the number of headphones that may be connected to the buzzer outfit in this manner. In fact, in radio schools where the

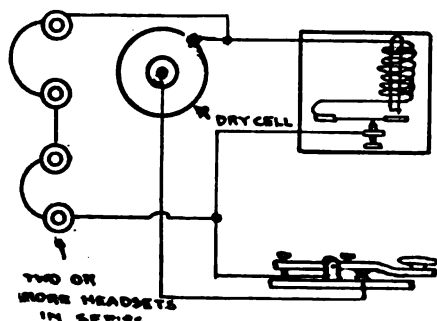
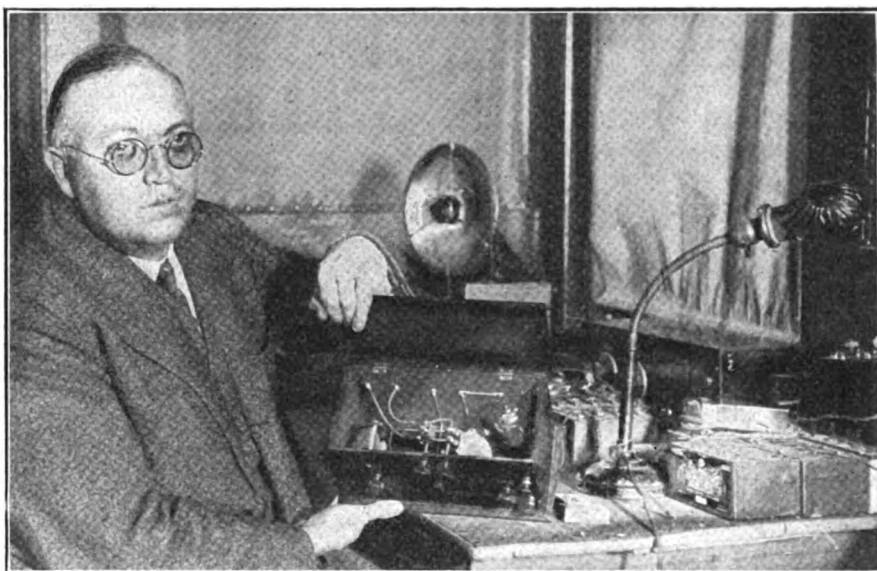


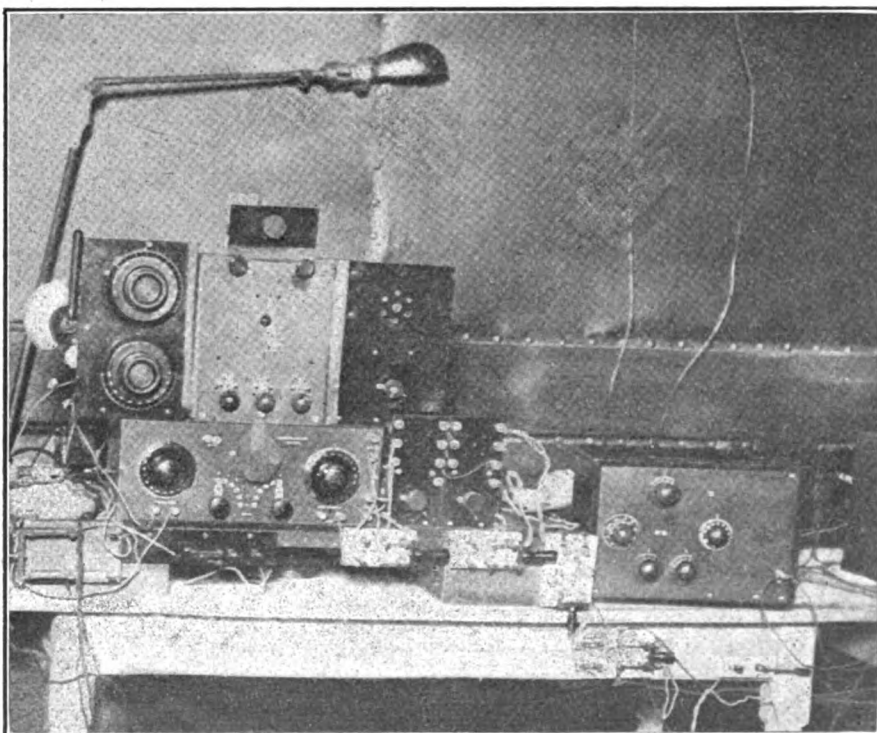
Figure 3. Hook-up for buzzer set with two or more headphones attached for code practice.

teaching of code is an important part of radio work, the headphone extension is run down the center of a long table, with jacks at every chair, so that at times as many as one hundred students are listening in on what the instructor is sending.

These instruments have been designed separately; but you can put them both on the same base and save binding posts. Such a set is invaluable to the amateur who is eager to learn code.



Both photographs (c) Kadel & Herbert.



(Above)—Dr. Satterlee and his small one-bulb set. (Below)—Original large set, and (at extreme right) his new invention.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

THE possibilities of the radiotelephone as a newsgathering agency were demonstrated in a dramatic manner, recently, when "The Inquirer" was the first newspaper in Philadelphia to receive word of the disastrous fire which swept the business district of Atlanta, Georgia. Through Edwin A. Hoban, a member of "The Inquirer's" local staff, a radio enthusiast, the news came into "The Inquirer" office even before the first flash from the Associated Press reached Philadelphia. The information came from station WSB, operated by the Atlanta "Journal," and located in that newspaper's building. The news, announced by the speaking voice instead of by the more conventional medium of the telegraph instrument, came floating through the air, a distance of approximately 760 miles.

The Bureau of Mines of the Department of the Interior is seriously considering the problem of equipping mines with radio apparatus for use in the event of accident. The stringing of telephone wires is impracticable, but officials state that it would be fairly simple to equip certain distant rooms, or chambers, with crystal receiving sets so that rescue parties could communicate with imprisoned miners. The real problem is to find a simple and portable transmitting set by which the miners could communi-

cate with the mouth of the mine of the outside world in the event of being injured in or imprisoned after an accident.

* * *

Several types of speaking movies, based on the principles of radio will be tried out on the New York public in the next few months. The most serious competition will be probably between the General Electric Company, which is reported to be perfecting its talking film in a studio on Long Island, and Dr. Lee de Forest, who is working with motion-picture actors and directors at a studio near this city. The General Electric talking film and the de Forest invention both consist of films in which the voice and other sounds are photographed at the edge of the motion-picture film itself. The photographed sound waves are reproduced in each case with the aid of the photographic cell. Those who have heard the Lee de Forest phono film and the General Electric talking film say they have both reached a high degree of perfection and reproduce the human voice.

* * *

Rear Admiral W. H. Bullard, U. S. N., who was in charge of the navy radio service during the world war, says that five powerful radio stations would soon be in operation in China with sufficient energy to communicate direct with San Francisco. Admiral Bullard says that radio will not supplant, but would supplement, cable lines, telegraph and telephone.

* * *

Corkscrew Radio May Serve to Pick Up Rum Runners



(C. Fotograms, N. Y.)

Don't throw away that corkscrew—even if the Volstead Act is in force. There still is a good reason for keeping it around the house. It can be improvised into a real radio outfit, that may do everything a radio outfit should do. This photograph shows Jack Riley with his corkscrew radio. It is not a complete outfit, but it will serve to pick up warnings for the rum fleets. Two receivers are attached to the device, which is guaranteed to pick up all radio messages within a fifteen-mile circle. It is only necessary to attach it to a light plug or charged wire in order to hear music or bed-time stories as you drink.

Great Britain is just beginning to regulate radio broadcasting. The British scheme is to have all broadcasting done by a single organization which will be sanctioned by the government, operated by manufacturers of receiving sets, and financed by both. Present plans call for the establishment of eight stations in the British Isles, at London, Manchester, Birmingham, Glasgow, Cardiff, Plymouth, Newcastle and Aberdeen.

* * *

The Mercantile Trust Company of San Francisco has established a broadcast station on Telegraph Hill, and will broadcast financial, industrial and general business information throughout the territory west of the Rocky Mountains.

* * *

"Ariograms" is the name given to United States Department of Agriculture radio reports.

* * *

The Los Angeles "Evening Herald" is broadcasting lessons in code fifteen minutes every week day. This is the first step in the way of definite instruction by radio. The University of California extension division, Berkeley, is supplying a correspondence course in elementary radio. California is keeping to the fore in radio enterprise.

* * *

Dr. Nicholas Murray Butler, President of Columbia University, believes that the motion picture and the radio-telephone are going to become invaluable in the educational work of the future. He lays stress, however, on the necessity for the right material being filmed or broadcast.

* * *

Here are three extraordinary transmission records. Two western correspondents. E. J. Conkelman, Enterprise, Oregon; and E. M. Bacigalupi, Hillyard, Washington, reported successful reception of the WGY concert of September 26 and, in both cases, their reports checked up accurately with the WGY station log. Hillyard is seven and one-half miles northeast of Spokane and 2,200 miles from Schenectady. The distance has been bettered by WGY but never during the early fall. Mr. Bacigalupi reported that his reception was made on detector alone with a Grebe Cr-9 and no amplification. His time of reception was 6:15 to 6:30 p. m., Pacific time.

On September 29, Private G. G. Westfall, operator at Fort Randolph, Canal Zone, Panama, 2,250 miles from Schenectady, reported that he had on that date heard WGY in spite of a powerful arc set which operates twenty miles away at the Balboa station. Mr. Westfall is operator at the United States Army station. His call is WNCI. This reception is the more remarkable because of the heavy static which prevails in the warmer climate of the Isthmus of Panama.

Still another unusual reception is reported by J. C. Grindell, manager of the Rectifier Department of the Valley Electric Company, St. Louis. Mr. Grindell reports that he heard WGY's program Friday evening, September 29, on a home-made crystal set without amplification. His aerial, he explained, is one wire 65 feet long and 30 feet high. St. Louis is approximately 875 miles from Schenectady.

Radio and the Woman By Crystal D. Tector

I CALLED at the office of RADIO WORLD, the other day, to have a little chat with the editors about National Radio Week. Friend Husband advised me not to do so. He told me that the editors are usually so busy they become ferocious and devour people on sight—that they imagine that every woman who enters a sanctum wants to sell a poem on spring—that women talk editors to death, and all that sort of chatter. Well, I didn't heed F. H.'s warning.

* * *

I must admit that editors are just like any other type of human beings and will stand perfectly still without being hitched. They don't bite, or even bark; in fact, they seem to have all the necessary elements of kindness that one expects to find in ordinary men. When I reached home and told this to Friend Husband, he simply laughed and snickeringly asked if I hadn't got in the wrong pew! Fancy! I found the editors of RADIO WORLD not only willing to talk but very (*We modestly delete the rest of Miss Detector's flattering comment. She is entitled to her opinions; but the power of the blue pencil must be preserved—The editors.*)

* * *

Well, I left their offices convinced that National Radio Week will be about the biggest thing in the United States this winter. The date—December 23 up to and including the 30th—could not be more satisfactory, for we will have two Saturdays during the time of the year when everyone will be on the alert for fun of some sort. And as so many of us are looking to radio to provide something new in the way of pleasure, it does seem that the prevailing slogan: "This is a radio Christmas," is most appropriate.

* * *

Mother was telling me that she remembers when the automobile first came into popularity. There was such a week celebrated in her home town. It wasn't a big national affair such as our National Radio Week will be; but a purely local occasion. Although there had only been about two automobiles in the town up to the time "Automobile Week" was announced, everybody got so het up over the event, ma says, there were nearly a hundred cars in the parade—and some of them were the worst looking home-made affairs imaginable. It seems that everybody who was able produced a car for that occasion, and some folks even made their own. Ma says that she will always remember "Automobile Week" at home because an old-maid sister whom the folks thought would never marry found a willing beau.

* * *

From the stories she tells, the spirit of the people in making that week a success must have been something wonderful. And if such a spirit existed in one little town a quarter of a century ago, what must it amount to in this huge nation to-day? Personally, I am full to the brim with energy to make National Radio Week a success. I'm going to be the best little booster of them all. And I'm asking every one of my big family of readers to get right in and help me enthuse women all over the land.

* * *

I want you to send me suggestions. For instance: we should have an emblem, or a pin, or a hat band, or something else that can be worn that week. Who will be the first to suggest some attractive design or monogram? Who will be the first to send in an appropriate slogan? Who can think of something absolutely original for that week? Who will organize a committee to get the shopkeepers busy with window displays?

* * *

My first suggestion is that radio parties be made a bright particular feature of the occasion. They will blend most attractively with the Christmas festivities—particularly as so

many churches are interested in broadcasting and so many ministers are broadcasting their sermons. Why, I am told that thousands of poor people and cripples who never have a chance to attend church now thank God that radio can bring words of sacred cheer to them in their loneliness. Can't someone suggest something unusual for these unfortunates during National Radio Week?

* * *

And for the radio parties we will want all sorts of new radio dishes—dishes that are tasty and easy to make. Girls, haven't some of you a recipe for a radio pie? Can't some one think of a radio cake?—or a radio salad? If you will send in something along the line of edibles, I will have Friend Husband make up a radio drink. I'll promise that it will be quite in keeping with all the prevailing laws and that the recipe will be published in plenty of time for all who wish to use it.

* * *

Here in New York the spirit of National Radio Week is already apparent among radio fans. You hear it talked about already, and many plans are being made. But we want it to move westward with the sun. We want it to get so deep under the skin of every fan that he will not be content to enjoy it by himself or in the company of other fans, but will bring strangers into the vortex of things. One of its principal objects is to bring new fans into the fold. And if every radioist is responsible for at least one genuine beginner, radio will receive an impetus that will help all of us.

* * *

Friend Husband told me at dinner, the other day, that there is a fan in the office—remember, not an amateur but a fan. F. H. says that he asked the man, in a casual sort of way, if he really cared for radio. "Care for it!" the man flared up. "Why, I wouldn't be without it." Then he went on to tell of all the wonderful pleasures that his set had brought him. This man is just one of many—but there are millions more like him who do not know what a truly satisfying pleasure maker radio really is. We want these unknowns in the ranks of radio and we are going to get as many of them as possible in the ranks during the big week.

* * *

Now, don't think I am preaching or asking you to do missionary work. Far from it. We who know radio—we pioneers—want to share it with those who do not know. Why, for months I heard F. H. bawl out the man next door because he would not go to the ball games—and F. H. knows batting averages better than I know how to tune in KDKA. Finally the neighbor reluctantly consented to go with F. H. Last season you couldn't keep Mr. Neighbor away from the Polo Grounds with chains. That is the way it will be with thousands who don't know, to-day, whether radio is a science or a door mat.

* * *

I have given up largely of my space, this week, to National Radio Week. But I feel its great importance and I realize that it is going to be one big occasion. I know, too, that much depends on the women of radio to make it a success; because they are nearer to the little ones than the men are. And we all know that it was our boys who really made radio possible—who ignited its first impulse. Think what a combination of radio and Christmas mean to them!

* * *

Let me hear from you all. Start something in your town. Get the spirit. As our editors say: "Be a National Radio Week booster!" I will keep in touch with you regarding all my plans—but you must help to swing this great radio event into one of the most national joy festivals this big bustling country of ours ever knew.

How One of Our Hook-ups Worked

Editor, RADIO WORLD: In regard to the circuit on page 19 of RADIO WORLD (No. 30, dated October 21) issue, I tried it with one small change and brought in San Antonio, Texas, very clearly and fairly loud, using a one-step amplifier. The change made was the use of a variometer in place of the DL-50.

I was greatly surprised by the amount of regeneration obtainable and the ease with which regeneration was controlled by the condenser which would not appear to be in the plate circuit at all.

In the near future, I expect to try several long-wave hookups (1,500 to 30,000 meters) using a single coil, in the hope of finding one which will tune fairly close and give good regeneration with the use of DL coils. I shall certainly try this one with larger coils,

although I am afraid that the size of the condenser will limit the wave-length range to some extent.—L. J. Coleman, Sioux City, Iowa.

(The hook-up referred to by Mr. Coleman was sent to RADIO WORLD by Mr. W. Miller, Southern Methodist University, Dallas, Texas.—The editor.)

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Latest Radio Events Keep



(C. Kadel & Herbert)

(Above) This is the mysterious "Black Box" of Thomas A. Edison, photographed for the first time. Through this mysterious device he discovered what he termed "etheric force," and which is, in reality, the wireless spark of today as perfected by Marconi. Ether is an hypothetical medium supposed to fill all known space, even those portions occupied by fluids and solids. The functions assigned to ether, such as the transmission of transverse waves with the velocity of light and the production, when under certain strains or subjected to certain motions—of all the phenomena due to electric and magnetic fields of force—indicate properties unlike those of any known form of matter.



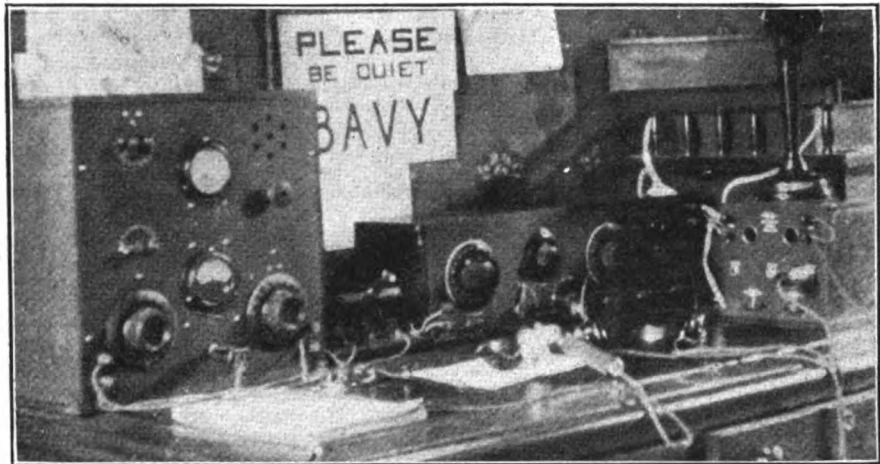
(C. Kadel & Herbert)

Eight-year-old Robert Scott holding his tiny receiving set and a 50-watt transmitting tube to make a comparison.



(C. International News Reel)

(Above) Dr. ...
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Georgia T...
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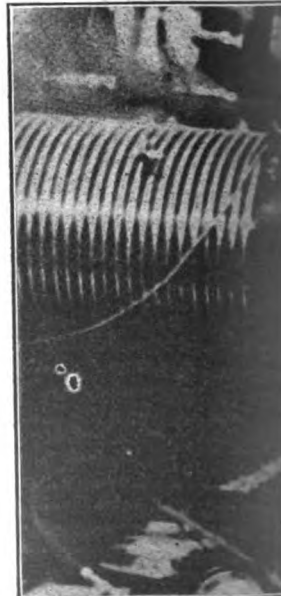
(Left) "Clo...
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(C. Underwood & Underwood, N. Y.)

(Left) Listening to a concert by radio inside a steel passenger car traveling over sixty miles an hour. This is a photograph of the interior of the car. The experiment took place on the Broadway Limited of the Pennsylvania lines, running from New York to Chicago. An 18-inch loop, installed in seventeen minutes in an all-steel car was used. The reception was successful, broadcasting being heard during the entire trip.

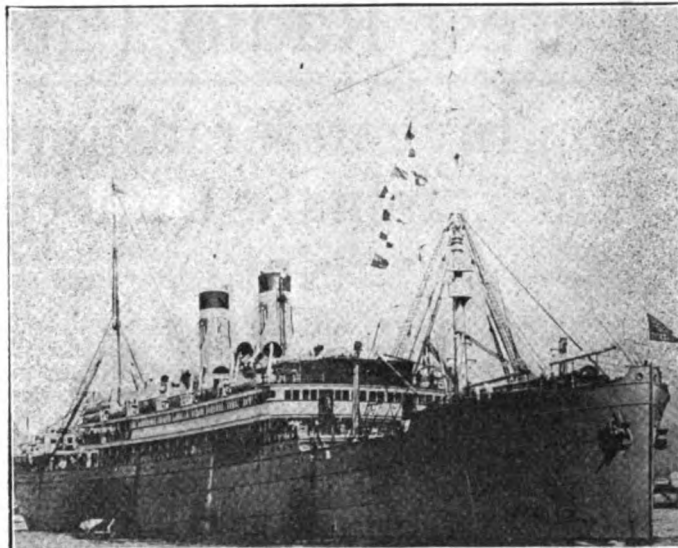
(Right) The ever-smiling Mr. Fairbanks has become a radio "bug." He is talking so that many who have never heard him speak may know what the voice of this star of the silent drama sounds like.



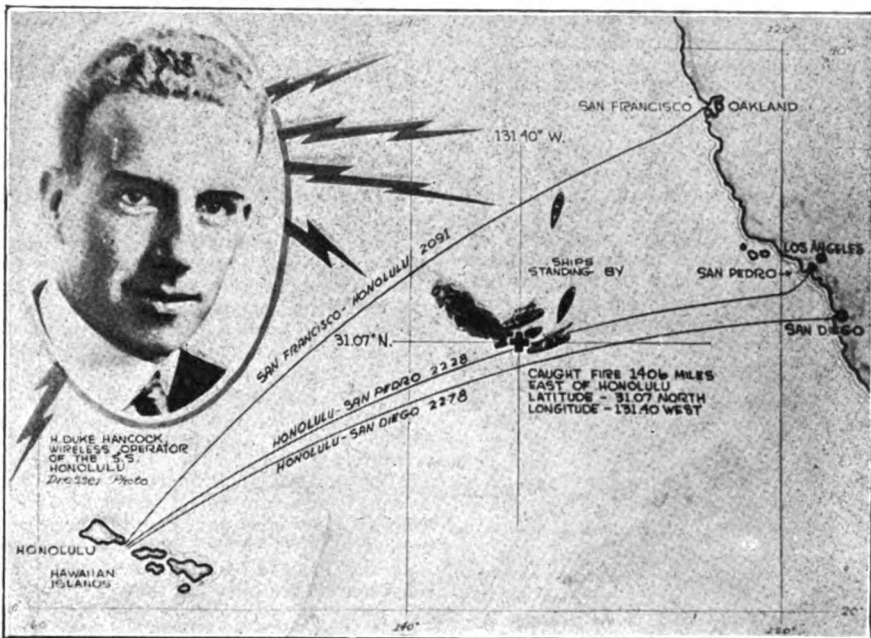
(C. Photonews, N. Y.)

Photographers Busy

Captions
by
John
Kent



(C. Wide World Photos)



(C. International News Reel)

(Above) The upper photograph shows the "City of Honolulu," which burned to the waterline, 670 miles off San Pedro, California, on October 12. Her 217 passengers owe their safety to the prompt reply for help sent broadcast by her radio. The photograph directly underneath is an excellent chart of the scene with a good likeness of Chief Operator Hancock. This sea catastrophe made radio history. It proves that radio must be a part of the equipment of every vessel that carries human beings from one port to another. It is as necessary as steam.

(Below) The radio apparatus in this photograph is a loop aerial or direction finder—one of the most useful things now in use aboard all vessels that ply the high seas. This photograph was made in port—that is why Miss Claire Tarrwell is in the picture.



(C. International News Reel)



...to music played by a band nearly two miles away was the ... of members of the Club de Vingt of Atlanta, Ga., shown in ... to a special number. The music, played by the ... and, was transmitted to the roof of the Capital City Club ... Radlman who witnessed the demonstration said the dance ... and that the few slight difficulties encountered in transmi ... sily be overcome. A loud-speaker was used at the receiv ... ing end.

... of the radio station owned and operated by Miss Catherine ... gata Street, Carbondale, Pennsylvania. Her call is SAVY. ... is of the pioneer radio amateurs of America. SAVY is known ... Lackawanna Valley and there are fans beyond the borders ... it up. The receiver shown at the right is that of a Grebe ... v-stage audio-frequency amplifier. A loud-speaker is also ... on the amplifier. The transmitter is at the extreme left.



Latest Radio Patents

Edison Invents Transmitter That Will Eliminate Unnecessary Noises

No. 1,425,183. Patented, August 8, 1922. Patentee: Thomas A. Edison, East Orange, N. J.

My invention," declares Mr. Edison in a description published by the United States Patent Office, "relates to transmitters, and more particularly to microphone transmitters wherein the desired variations in current are produced by variations in electrical resistance caused by varying the pressure upon a quantity of granular conductive material, such as carbon, which is disposed between electrodes in the circuit carrying the current, preferably in a somewhat loose state, the requisite changes in pressure being effected between the electrodes and the granular material by a diaphragm, or other means, to be set into vibration by sound waves such as the human voice."

Practically all microphone transmitters of this type such as are now used are seriously and adversely affected by phenomena extraneous to the sounds they are designed to transmit, such, for example, as shocks, jars, vibrations, concussions, etc. These phenomena often

it impossible to understand or even detect the sounds which the microphone is intended to transmit.

The principal object of Mr. Edison's invention is to produce a microphone transmitter which will be extremely sensitive to very weak as well as to loud sounds and at the same time to substantially eliminate or prevent the production of extraneous sounds, making it possible to employ powerful amplifying devices, such as the audion, with the transmitter.

Operating Vacuum - Tube Circuits

No. 1,426,755. Patented, August 22, 1922. Patentees Robert C. Mathes, New York City, and Harry S. Read, East Orange, N. J.

THE invention on which Messrs. Mathes and Read have received letters patent, relates to vacuum-tube circuits, more particularly to multistage amplifier-circuits in which vacuum tubes are employed in the various stages.

It is well known that a vacuum tube of the three-electrode type will reproduce in amplified form in its output circuit impulses impressed upon its input terminals, and that the amplified impulses may be impressed on the input terminals of other tubes to give any desired degree of amplification. When such a multistage amplifier is employed to amplify low frequency impulses, it is generally preferable to have a direct coupling instead of an inductive coupling between stages in order that the low fre-

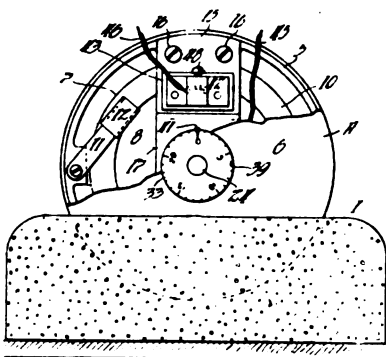
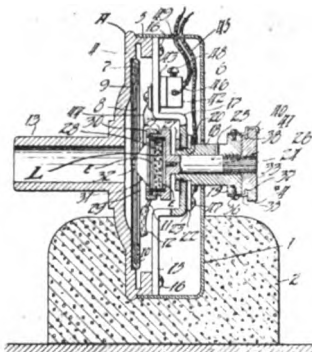


Figure 1 (above) is a vertical sectional view, partly in elevation, of a microphone transmitter constructed and mounted.

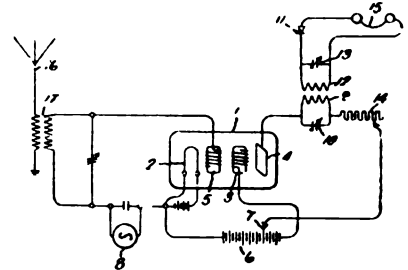
Figure 2 is a view in front elevation, partly broken away, of the structure shown in Figure 1.

create such relative movement of the conductive granules disposed between the electrodes of the microphone transmitter as to produce extraneous or foreign sounds, loud enough when amplified to practically obliterate and render

New Signal Receiving System

No. 1,430,533. Patented, October 3, 1922. Patentee: Burke Bradbury, Schenectady, N. Y.

MR. BRADBURY'S invention is to provide a simple and efficient means for providing an audible indication of signals transmitted by means of radio-frequency continuous currents. The receiving station is provided with a source of audio frequency current which is associated with an electron discharge device and a detector in such a way that when no signaling currents are impressed upon the system there will be no ap-



Schematic diagram of Mr. Bradbury's system.

preciable flow of audio frequency current in the detector circuit. When, however, a radio frequency signaling current is impressed upon the system this signaling current is modulated by means of the audio frequency source and the modulated radio frequency signaling current is transmitted to the detector circuit where it is rectified and the rectified current is used to produce the desired audible indication.

Will Help Voltage

No. 1,430,067. Patented, October 3, 1922. Patentee: William C. White, Schenectady, N. Y.

IT has been discovered that the current which will flow through an electron-discharge device comprising an incandescent cathode and an anode enclosed in a highly evacuated envelope will, between certain limits, vary approximately as the 3/2 power of the applied voltage. In other words, the apparent resistance of such a device varies with the voltage applied to it. In some cases, this characteristic is objectionable; for example, when such a device is included in a measuring circuit which comprises other resistance. In such a case the relation between current and voltage in the circuit will be a complex one and a calibration will be necessary to determine this relation.

The object of Mr. White's invention is to overcome this disadvantage by constructing and arranging an electron-

Fig. 1.

Fig. 2

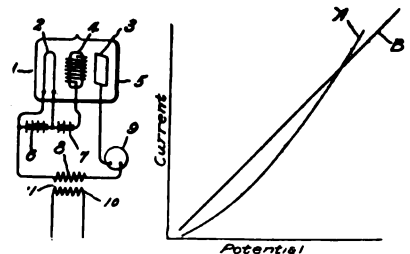


Figure 1 shows diagrammatically a circuit connection.

Figure 2 shows the current-voltage characteristics of an ordinary high-vacuum electron discharge device.

discharge device in such a way that the current will vary directly as the applied voltage between certain well defined limits.

Answers to Readers

1. How far could you hear with the hook-up you have on page 7, RADIO WORLD, No. 27, dated September 30, using an aerial of four wires, each eighty feet long?

2. What size fixed-condenser do you recommend on the stopping condenser and condenser before the grid of the third tube?

3. What kind and size tubes are recommended for all three shown?

4. The lead from B battery to 2-circuit jack is about 22 volts. Am I correct?

5. To make a 45-volt B battery may I connect two 22-volt batteries in series?

6. Would the addition of my honeycomb coils help any?

7. Are the two transformers the same size?

8. Will a potentiometer help?

9. What size is the grid condenser and leak?

10. What rheostats are best—the wire type or the carbon type?—F. Bruhns, Oakland, Cal.

1. Everything depends on the way a set is constructed, also the locality, erection of antenna, etc. No exact figures can be given, but there is no reason why considerable distance cannot be received.

2. Usually about .00025 mfd., but this may be omitted from this particular place in the circuit.

3. The first tube is that of a UV-200 detector tube; the next two are the UV-201 amplifying tubes. Be sure to see that the detector tube is used in the first socket.

4. The B-battery voltage on the first tube is about 22 volts.

5. Yes. By connecting two 22½-volt B batteries in series with each other you are able to secure the necessary 45 volts.

6. No. They will not help the circuit in any manner.

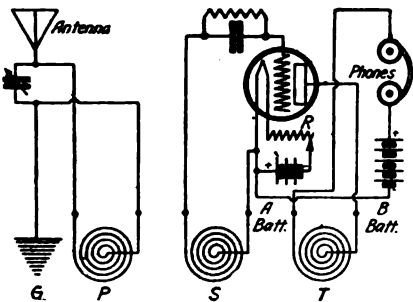
7. The two transformers used are the same in size.

8. A potentiometer is of no use with this particular circuit.

9. The grid leak is of 2 megohms and the grid condenser of about .00025 mfd. capacity.

10. This all depends on the radioman who is building the set. Some prefer the wire rheostats, while others like the carbon. A vernier on the detector tube will be of great value.

I have a receiver using duo-lateral coils, and believe I have the wrong hook-up. Note my diagram and let me know what error I have made.—Gustav Altrack, Manchester, Pa.



Hook-up requested by Mr. Gustav Altrack, Manchester, Pa.

The accompanying diagram is the correct method by which you should wire your set. Follow each and every connection carefully and you will get the desired result.

I am building a regenerative receiver with two variometers and a vario-coupler. Can

a dry-cell tube be used with as good results?—Vincent Delapotteries, Wichita, Wis.

Certainly. Use the same circuit, merely connecting a single dry-cell to the A battery terminals.

Will you publish a diagram of a single-tube regenerative set employing three honeycomb coils?—Fred Loveland, Niagara Falls, N. Y.

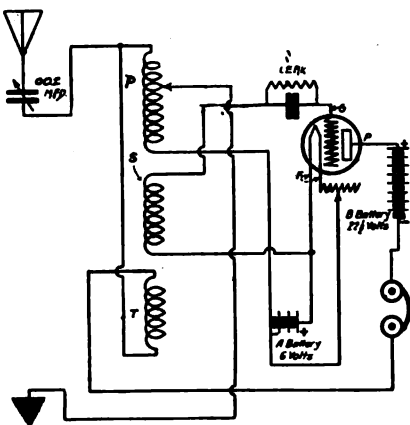


Diagram requested by Mr. Fred Loveland, Niagara Falls, N. Y.

Herewith is a schematic diagram of a three-coil regenerative circuit employing one of the coils as tickler: P is for primary, S for secondary, and T for tickler coil.

May I run my aerial from a pole to and through the gable of my house, a total distance of 100 feet, and then bring my lead from center of aerial?—Harry Alexander, Staten Island, N. Y.

Leave your aerial an inverted L. Don't run it through the house. We advise you to experiment with it for results, but the outside aerial still holds the record for long-distance reception.

Please publish a hook-up of a regenerative circuit using three tubes, used with variometers and vario-coupler.—Kenneth H. Jones, London Mills, Ill.

A hook-up of this circuit was published in RADIO WORLD, No. 27, dated September 30.

What is wrong with my set? The diagram is enclosed. The aerial is 100 feet long with a 70-foot lead-in. I am using a crystal detector.—Matthew Rasmussen, Syracuse, New York.

Your diagram is wrong. Connect aerial to the switch arm and the ground to the other. Then connect one side of the detector to one switch arm and one side of the phones to the other. Now join together the remaining posts and detector. The phones should then be shunted by the phone condenser.

I have an aerial plug, tuning coil, ground clamp, crystal detector, variometer, phones, and variable condenser. What broadcasting station should I receive with this set?—William Bruns, Boston.

Unless you have an unusual location or live within a mile or two of some broadcasting station, you are doomed to disappointment with the antenna plug. The lighting system makes a fairly good aerial for vacuum-tube sets, though for crystal sets it is practically ruined out.

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Wave Meter for Amateur Operators

How to Construct the Device Which Enables You to Adjust Your Set and Comply with the Law

Prepared by the United States Bureau of Standards Experts

THE construction of a portable short-wave radio wave-meter for use of amateur transmitting stations is fully explained in the following article which was carefully prepared by the Bureau of Standards of the United States Department of Commerce. The device is for measuring the frequency or length of radio waves.

According to the Bureau of Standards, amateur radio stations in the United States at present are required by law, when transmitting, to use wave lengths not exceeding 200 meters, and, therefore, it is important that amateur operators should have a wave meter available so that they may adjust their sets to comply with the law. The device should be adapted to measure short wave lengths, such as 200 meters as well as other short lengths such as 300 and 485 meters now used for radiotelephone broadcasting.

The Radiotelephony Conference which met in Washington in February, 1922, recommended narrow bands of waves for particular services, some bands being only 10 meters wide. Stations which must work within such narrow wave bands must be provided with well-designed wave meters if they are to comply with the requirements of the law, and the design of a portable short-wave meter is a matter of importance, according to Bureau of Standards experts.—The Editor.

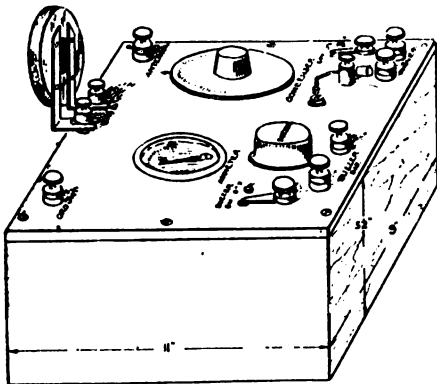


Figure 1. Arrangement of the wave-meter box and assembled units.

A WAVE METER is a device for measuring the frequency, or length, of radio waves. Radio waves always travel with the same velocity. If the frequency is known, the wave length is also known. Amateur radio stations in the United States at present are required by law, when transmitting to use wave lengths not exceeding 200 meters. It is important, therefore, that amateur operators should have a wave meter available so that they may adjust their transmitting sets to comply with the law, and it is necessary that this wave meter should be adapted to measure short wave-lengths such as 200 meters. Other comparatively short wave-lengths, such as 360 and 485 meters, are now used for radiotelephone broadcasting, and it is important to have a wave meter which can measure these wave lengths. The Radiotelephony Conference which met in Washington, in February, recommended narrow bands of waves for particular services, some bands being only 10 meters wide. Stations which must work within such narrow bands must be provided with well-designed wave meters if they are to comply with the requirements of the law. The design of a portable short-wave meter is, therefore, a matter of importance. It is the purpose of this article to point out the most important considerations in the design of such a wave-meter, and to describe the construction of a wave-meter suitable for the measurement of frequencies from about 3,000 kilocycles per second to 530 kilocycles per second (wave lengths from 100 to 570 meters).

The parts of a wave meter are, usually, a variable condenser, a fixed inductance-coil, and a device to indicate current flow. The condenser will first be considered.

It will be well at the start to eliminate certain large classes of Condensers unfit for use in wave meter circuits. Variable condensers employing other dielectrics than air, and condensers whose capacities are varied by a screw to change the distance between plates, however serviceable they may be for furnishing a variable capacity, will not in general retain their calibration and are untrustworthy for use in a wave meter. This elimination leaves only air condensers whose capacity is varied by changing the overlapping area of parallel plates—the usual type of variable condenser.

All condensers of this type can by no means be used in wave meters. A condenser to be used in a wave meter should have fairly heavy plates rigidly held together with ample tie-rods and nuts, spacing washers of large diameter and sufficient thickness, adequate conical bearings, and, preferably, unimpeded rotation through 360 degrees of arc. Particu-

lars in which variable condensers commonly fail to meet these and other requirements are: too thin plates, spring-supported bearings, extremely close spacing of plates, vertical or lateral play of the shaft in its bearings, contacts made by brushes wiping on movable parts, stops which in arresting the rotating plates shift them out of line, shifting scales or indices, and faulty workmanship which allows short-circuiting of the condenser at some settings. In general, anything that allows a capacity change without a change in scale reading or a change in reading without a capacity change destroys the usefulness of a condenser for wave meter purposes. Some method of shielding is desirable to eliminate any change of condenser capacity owing to movements of surrounding bodies. The shield usually is a grounded metal case placed around the condenser.

Regarding the inductance coils: The requirements of a wave meter coil are: (1) that its inductance be such that with the condenser used the desired range of wave frequency can be covered. (2) that its effective resistance and effective capacity be low; (3) that its inductance, resistance, and capacity all be constant.

The first requirement, which has to do with the range of wave frequencies, will first be considered. It is well to restrict the part of the condenser scale used for frequency measurements to the sector between 15 degrees and 170 degrees on a scale graduated in degrees, or between the eighth division and ninety-fifth division on a scale graduated in hundredths. Since capacity at 170 degrees or 95 hundredths will almost always be more than six times the capacity at 15 degrees or 8 hundredths, the frequency obtained with any one coil at the lower end of this region will be not less than about 2 1/4 times the frequency obtained with the same coil at the upper end. This will make it possible, with one coil, to cover the range from 3000 to 1200 kilocycles per second (100 to 250 meters) and with a second coil to cover the range from 1330 to 530 kilocycles per second (from 225 to 570 meters).

Range of Wave Frequencies

The following table gives the number of turns required for two single-layer inductance coils which will cover, approximately, the stated ranges with each of the maximum capacities indicated in the table. It will be noted that the size of the wire and the spacing between turns are not specified. The inductance is nearly independent of the size of wire used, and the spacing is controlled by the number of turns and the length of the inductance coil, both of which are given. The length of the coil, as indicated, is the length of the actual winding, not the length of the supporting core.

Single-Layer Inductance Coils for Short-Wave Portable Wave Meter.

Coil 1.—Range 3000-1200 kilocycles per second (100-250 meters). Diameter, 10 cm. (4 inches); length of winding, 2.5 cm. (1 inch).

Maximum capacity of condenser	No. of turns
0.0005 microfarad	16
0.0007 microfarad	13
0.0010 microfarad	11

Coil 2.—Range 1330-530 kilocycles per second (225-570 meters). Diameter, 10 cm. (4 inches); length of winding, 5 cm. (2 inches).

Maximum capacity of condenser	No. of turns
0.0005 microfarad	42
0.0007 microfarad	35
0.0010 microfarad	30

The second requirement stated for the coil is that the effective resistance and the effective capacity be low. Low resistance is desirable in order to secure sharper indication of resonance. The practice of surrounding an inductance coil with quantities of miscellaneous insulating material is undesirable in any

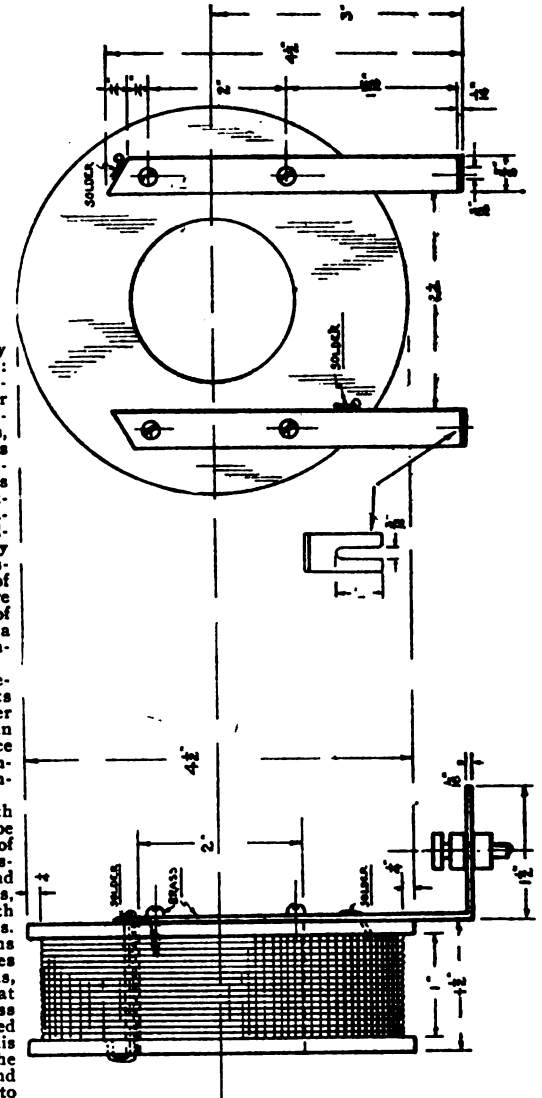


Figure 3. Schematic details of wave-meter coil. Turn page sideways when reading.

radio circuit and is especially to be avoided in the case of wave meter coils. Imperfect insulating materials so used increase not only the effective capacity but also the effective resistance of the coil. This does not mean that all types of manufactured insulating materials are unsuitable for use in frames for wave meter coils. Probably, however, the best form on which to wind the coil of a wave meter like that here described is a hollow spool of thoroughly dry wood lightly varnished with an extra grade of insulating varnish. The use of shellac is not considered advisable under any circumstances. The use of wood having even a comparatively small moisture-content may seriously affect the accuracy of the wave meter. Properly selected wood is chosen in preference to manufactured insulating materials, glass, or pasteboard. Many available manufactured insulating materials largely increase both the resistance and the capacity of the coil. While the electrical properties of glass make it well suited for a form, it presents too great mechanical difficulties. Pasteboard is not rigid enough and should not be used under any circumstances. The wire used may be solid copper double cotton covered, No. 24 B & S, or larger. The wire should be lightly varnished with a single coat of an extra grade of insulating varnish. Further insulation merely increases the effective resistance and capacity of the coil without compensating advantages. The resistance frequently can be considerably reduced by the use of the braided high-frequency cable.

(Continued on following page)

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That Armstrong Circuit

So much interest has been displayed in the special article, "TESTED INVENTION OF MAJOR ARMSTRONG AMPLIFIERS SET 100,000 TIMES" by John Kent, that appeared in RADIO WORLD No. 13, dated June 24, 1922, the publisher decided to put aside a number of copies for those who were not able to get this issue when published. Copies will be sent, postpaid, on receipt of 15c. or send in your subscription, \$3.00, for one year (12 issues), \$3.00 six months or \$1.50 three months, and subscription will be started with the issue containing the article about Major Armstrong's Amplifier.—RADIO WORLD, 1498 Broadway, New York.

Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

(Continued from preceding page)

Care must be taken, however, in using the high-frequency conductor to see that all the strands are continuous and well insulated from one another, and that every strand is joined at the terminals of the coil. If imperfect insulation exists between adjacent strands, these high-resistance contacts may cause a considerable increase in the power losses. Broken strands seriously increase both the effective capacity and the resistance of the coil. The strands may be tested for continuity by dipping one end of the cable in mercury and joining the separate strands at the other end successively to a buzzer or voltmeter joined to a battery, the circuit being closed through the mercury contact. The enamel may be removed from the ends of the separate strands by carefully heating the end of the wire cable to a red heat and dipping it in alcohol. This procedure makes the strands more fragile and consequently particular care must be exercised to avoid breaking them.

A single-layer coil has generally a lower effective capacity than a multilayer coil of the same inductance and radius. This, together with the greater precision with which specifications can be furnished for winding single-layer coils, was the reason for choosing this type of coil in the table already given. Since appreciable effective capacities exist when there are parts of the circuit near each other which have comparatively large areas and which are at different potentials, it follows that the leads from the coil to the condenser should not be long or close together. An additional reason for having the leads short is found in the third requirement previously stated for a wave meter coil, namely, that the inductance, capacity, and resistance of the coil, including its leads, be kept constant. Long

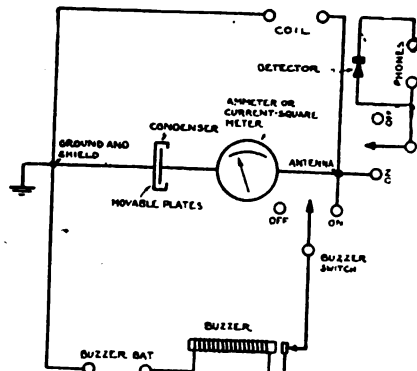


Figure 2. The wave-meter circuit.

leads are apt to be flexible; and flexible leads, long or short, introduce possibilities of change in inductance, capacity and resistance which can not be compensated for by any slight advantage they may give in convenience of handling.

The best leads are rigid metal terminals soldered to the ends of the wire and screwed to the wooden core. The position of the coil should be such that the plane of the turns of the coil is perpendicular to the condenser plates if the condenser is unshielded. This is to prevent the induced current in the coil from itself inducing eddy currents in the condenser plates. Since it is almost always desired for convenience in coupling to have the plane of the coil vertical and the condenser plates horizontal, this matter will usually take care of itself. A very important precaution in giving the coil permanent characteristics is to draw all the turns tight and so fasten them that, with ordinary care in handling, they will not shift.

The coils may be attached to binding posts on the wave meter, so that they may be conveniently connected or removed. Various other methods of attaching may also be used.

The third part of the wave meter is the device which shows current flow, and thus indicates resonance. If a crystal detector and telephone receivers are used, only the one-point (unilateral) connection should be employed; that is, the detector and telephone receivers are joined in a closed circuit, and one point of this circuit is joined to one terminal of the coil. This arrangement is sufficiently sensitive and makes the calibration of the wave meter fairly independent of the position of the telephone leads, at least so long as they are not closely drawn across some part of the wave meter or wrapped around it. A more precise indicating device is a thermogalvanometer or a radio-frequency milliammeter.

Available types of thermocouple instruments are usually found more satisfactory than the ordinary expansion type of hot-wire instrument, because they respond more quickly to changes of current. The instrument should give full scale deflection with a current of about .1 ampere. It should be able to stand a considerable overload. It is generally inserted directly in the wave meter circuit, sometimes with a shunt to keep low the resistance of the circuit. It is important to note that the presence of the instrument will probably modify the capacity, inductance and resistance of the circuit, so that the wave meter should be calibrated with the same instrument in the cir-

(Continued on page 24)

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Repairing all detectors and amplifiers using a single tungsten filament such as the following listed tubes: Marconi, Moonland, DeForest, A. P. Shrover, Radio, Radiotone UV-200, UV-201, Conestogham C-200, C-201.
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Manufacturers, send a sample of your goods to our Technical Editor, Fred. Charles Ehlert, 8008 Pleasant Street, Queens, Long Island, N. Y. It will be carefully tested and returned. If your goods satisfy our experts, RADIO WORLD'S endorsement will be published in our merchandise department without charge or obligation of any kind on your part. This is a free service on the part of RADIO WORLD, calling for no expense whatsoever on the part of the manufacturer, except the sending of a sample of his goods.

A Well-Constructed Variable Condenser

Manufactured by Caldbeck Tool & Manufacturing Co., Des Moines, Iowa.

A WELL-DESIGNED and well-constructed 23-plate variable condenser, the capacity of which was found to be, approximately, .0005 mfd. The construction of this condenser is as follows: All plates are of the best-grade even-gauge hard aluminum, and are laid out mathematically correct so that the area increases with the square of the angle.

The edges are so cut as to prevent burrs. This keeps down the leakage when using it with C-W transmitters. All of the insulating bushings used in this condenser are treated in boiling beeswax to prevent the absorption of moisture. This treatment also makes the bushings self-lubricating.

The condenser is nicely finished and when used with a set comprises a satisfactory receiver ready for panel mounting. It was tested out in all sets and found to stand up under all conditions.

"Make Your Own Variometer"

Racine Radio Parts Co., Racine, Wis.

A "Make Your Own Variometer" has been tested out after being assembled. By the instructions and illustrations that accompany it, it will be found easy and interesting to assemble. The parts come complete. In one hook-up, it was placed in the aerial circuit of an oscillating receiver and found to have a wave-length range from 150 to 450 meters. It behaved well, without showing signs of being noisy. The rotor and stator are wound with cotton-covered magnet wire. In construction and appearance it is very attractive, and neatly finished for panel use.

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Victo-Rad Radio Co., Wilmington, Del., manufacture radio equipment, \$500,000. (Colonial Charter Co.)

Guarantee Electric Co., Atlantic City, N. J., \$125,000; George P. Proffatt, Katherine B. Proffatt, Walter Hanstein, Atlantic City.

Precision Instrument Co., Wilmington, Del.; \$500,000. (Corporation Service Co.)

Lewis Electric Mfg. Co., Buffalo, \$100,000; J. N. Lewis, E. S. Yates, R. M. Stanley. (Attorneys, Stanley & Gidley, Buffalo.)

Capital Increases

Halsey Electric Service & Contracting Co., New York City, \$10,000 to \$25,000.

Continental Radio & Electric Corp., New York City, \$30,000 to \$60,000.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31, Colwell & Korbell, Fisk Building, New York City, directors of publicity.

INTERNATIONAL RADIO SHOW, Madison Square Garden, New York City, November 20 to 25, inclusive. E. C. Buchignani, director of publicity.

SOUTHEASTERN RADIO EXPOSITION, Auditorium Armory, Atlanta, Georgia, December 4 to 9, inclusive. Co-operative Radio Sales Assn., 295 Peachtree St.

Heard at the Radio Counter

A Conversation Between Customer and Radio Clerk
(Part III)

"FINISHING up my set the other night, I noticed that the signals came in weak at times and, at other times, the set went absolutely dead. With a move or adjustment of the condenser, or plate variometer, everything was 'jake.' Must need a rheostat—don't you think?"

"I believe your trouble lies right there."

"Do you think a vernier rheostat would help the set?"

"Absolutely."

"How do vernier rheostats come, and how do they operate?"

"Well, there are the different makes and types; and anyone will supply the need of vernier control."

"All right, then; I'll take one and try it out to-night. And, by the way, will I also need a vernier on my amplifiers?"

"No—not at all. Just use one on the tube in your detector circuit."

"Very well, then. I hope this will keep the signals in at all times—especially when giving a concert to my friends who are on the verge of buying sets."

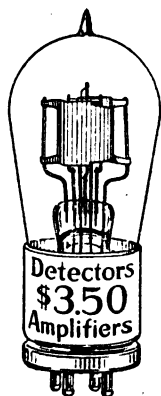
"If you are in any more trouble, Mr. Customer, with that set of yours, come in and fire away. That's what we're here for. We are here to give you advice as well as sell you merchandise."

"Thank you. Will see you shortly."

(To be continued)

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Lynn W. Meekins, New England district manager of the United States Bureau of Foreign and Domestic Commerce, broadcasting foreign inquiries from the Amrad Station of the American Radio and Research Corporation at Medford Hillside, Massachusetts. This is the first office of the Department of Commerce to use the Radio and the first station to send out foreign trade information. "A firm in Switzerland wants to buy thousands of electric light sockets," says radio. The next morning the bureau's office in Boston receives scores of applications from firms throughout New England for the name and address of the Swiss importer. This is the highest speed that foreign trade promotion has yet attained.

Million - Watt Vacuum Tube May Send Human Voice Across Atlantic

A MILLION-WATT vacuum tube has been developed in the General Electric research laboratory, Schenectady, New York, by J. H. Payne, Jr., says "The World," New York. The huge capacity tube is a magnetron, involving the principle of magnetic control as developed by Dr. Albert W. Hull of the laboratory.

The tube is expected to be of much importance both in radio work and long-distance power transmission. Its output is about forty amperes at 25,000 volts, and serves as a rectifier to change alternating to direct current, and also to change direct to alternating current of any frequency or to convert low frequency alternating current to high frequency.

It is thought that one tube will be sufficient to carry radiotelephone signals across the Atlantic. This tube consists essentially of a water-cooled cylindrical anode 30 inches long and 1 3/4 inches in diameter. In the axis of the anode is a tungsten filament four-tenths of an inch in diameter and 22 inches long. This filament is excited by a current of 1,800 amperes at 10,000 cycles, the filament excitation requiring about 20 kilowatts.

The magneto field produced by this large heating current is sufficient to "cut off" the electrical current from the cathode of the anode during a portion of each half cycle of the current passing through the cathode; this action taking the place of that of the grid in the three-electrode tube. The electron current to the cathode is thus interrupted 20,-000 times per second.

By the use of properly tuned circuits this can be used for the production of high-frequency power radio or any other purpose.

Don't expect to get loud signals with a crystal detector set while using an indoor antenna.

Non-liquid Storage A- and B-Batteries

THERE are now on the market A- and B-storage radiobats which incorporate a number of revolutionary new features of considerable interest to every radio fan. Both A and B types of these new principle-batteries contain a solid electrolyte which makes them absolutely nonspill. This feature will be appreciated by every radioist who has ever spilled acid from his battery on his carpet or clothes.

Another interesting feature is the total absence of separators which reduces internal resistance to a minimum. The radiobat grid (the metal mesh into which is pressed the "active material," forming the "plate") has a double reinforced construction. This construction adds from 25 to 30 per cent. more actual metal per square inch. The plate is, consequently, just that much more rugged and does not buckle. This reinforced strength plus the solid electrolyte makes the use of separators unnecessary. Due to the fact however, that the secondary reinforcing mesh in the grid does not come to the surface of the plate, there is actually more active surface per square inch of plate area. In the case of the radiobat A, this results in a battery from 25 to 30 per cent. smaller and, consequently, easier to handle than any other A battery of equal rating.

The radiobat storage B is even more unusual and interesting. It is compact—only four inches square by seven inches long—scarcely larger than a large-size dry-cell B. It has no glass jars to break, no liquid to leak. The most notable feature is its utter noiselessness of operation.

It substitutes the steady, sustained voltage characteristic of a storage battery in place of the irregular constantly dropping voltage of a dry cell, thus eliminating all hissing and crackling noises with which all radio operators are familiar. Changing voltage in the plate circuit is the direct cause of most tube noises and most of what is blamed on static. Sustained voltage does away with this and results in a marvelously clear true-tone reproduction of each word and note.

The Radiobat Storage B is economical as well. It is easily rechargeable at home from either AC or DC and outlasts its value in dry cell Bs on each home charge.

Honeycomb Coils Suggested for Usual Wave Length Ranges

By Harold Day

Type of Service	WaveLength Range (Meters)	Primary Coil Cat. No.	Secondary Coil Cat. No.	Tickler Coil Cat. No.	Condenser
Amateur	145-350	DL-35	DL-25	DL-35	Series
Special Amateur	305-710	DL-75	DL-50	DL-35	Series
Commercial	635-1660	DL-150	DL-100	DL-75	Series
Navy Calling	845-1970	DL-200	DL-150	DL-100	Series
Arlington Time	1420-2850	DL-300	DL-250	DL-150	Series
Navy Ship Arcs	2550-4250	DL-200	DL-300	DL-150	Parallel
Navy Station Arcs ...	4200-6300	DL-500	DL-400	DL-200	Parallel
Foreign and Press ...	6250-14500	DL-1250	DL-750	DL-400	Series
Foreign and Press ...	13600-21000	DL-750	DL-1250	DL-400	Parallel



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TANGLEY CO., 187 Main, Muscatine, Iowa

No Experience Necessary

Full or Spare Time at Home

PATENT
Your Radio Ideas.
Call or Write
FREE ADVICE



Wave Meter for Amateur Operators

(Continued from page 21)

ALADDIN ELECTRIC COMPANY, INC.
COMPLETE RADIO SETS
WRITE FOR PRICES.
71 West Broadway New York City

cuit as will be used in measuring frequencies. An inexpensive indicating device and one which is satisfactory when the power output of the generating circuit is large enough, is a miniature lamp, such as a flashlight lamp, inserted directly in the wave meter circuit. To avoid any possibility of changing the calibration of the wave meter, the lamp should not be changed if it can be avoided. If it must be changed, it should be replaced by one of identically the same kind. The sensitiveness of this device can be greatly increased by having a dry cell and a rheostat in parallel with the lamp in the wave meter circuit. By ad-

justing the rheostat until the temperature of the lamp filament is raised almost to the point of illumination, it is possible to have the lamp lighted by induced currents much smaller than would otherwise be required. However, changes in the battery and rheostat will be likely to change the characteristics of the circuit and hence the calibration of the wave meter. This device, therefore, should be used with caution.

The wave meter may be excited by impact, that is by a source of highly damped waves having only a very few waves in a train. The wave meter can then be used as a source of damped waves to determine the frequency to which a receiving set is tuned. The buzzer, in series with the battery, is connected across the condenser terminals, completing its circuit—when the contact is closed—through the inductance coil of the wave meter. Not more than four volts should be used to operate the buzzer. The buzzer will add to the capacity of the circuit, thereby decreasing its frequency. This decrease will be especially noticeable at the lower part of the condenser scale, where it may amount to several per cent. of the frequency. It can be reduced by having short, widely spaced leads to battery and buzzer. If the wave meter is equipped with both a buzzer and an ammeter, or current-square meter, the ammeter must be so connected in the circuit that the current from the buzzer battery cannot pass through the ammeter. If this is not done the ammeter or current-square meter may be burned out by the current caused to pass through it by the buzzer battery.

The assembling of the parts of the wave meter must be such that each part is rigidly joined to the rest of the circuit. Mounting in a box is as good a means to this end as any from the standpoint of rigidity and is superior to any in portability and in the protection afforded to the parts. A convenient box mounting is shown in Figure 1.

The over all dimensions are left to the constructor since the size of the component parts will vary. The box should be substantially constructed so that it will stand considerable handling. The component parts are all mounted on a panel of rigid electrical insulating material which will not absorb moisture. This panel is, in turn, secured to the supporting box. It is possible to use a panel of thoroughly dried and seasoned hard wood thoroughly varnished with an extra grade of insulating varnish.

Figure 1 shows one possible distribution of the component parts. Attention should be given to the convenience of operation and advantageous wiring of the circuit to keep distributed capacities at a low value. The most advantageous arrangement of the instruments on the panel will depend in part on the particular instruments used, and the constructor should work out the best arrangement in each case.

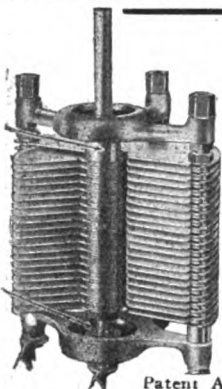
Figure 2 gives a circuit diagram showing the connections as they should appear underneath the panel. These connections should be made of No. 12 solid copper wire soldered into lugs. Where bending is necessary, sharp right angle bends are used. If it is desired to make a short-wave portable receiving set, terminals for antenna and ground connections can be supplied without decreasing the value as a wave meter in any way, provided suitable care is used in handling the instrument. A wave meter should be handled more carefully than an ordinary receiving set. If it is desired to shield the wave meter, a copper, or brass, sheet may be permanently fixed on the under side of the panel and spaces cut in it to allow for the terminals and supports of the various units. There should be at least 1/8 of an inch clearance for the terminals.

Figure 3 gives the dimensions and construction of the inductance coils.

The forms are turned in a lathe from thoroughly seasoned wood. Several coats of extra grade insulating varnish applied to this form will be desirable in keeping low the absorption of moisture. The proper number of turns of the correct size of wire is wound in a single layer in the recess provided for this purpose. A light coat of extra grade insulating varnish is applied to the wire to keep it in place and to prevent moisture from changing the distributed capacity of the coil. The terminals of the inductance coil are brought out through the wood form and soldered to the supporting brass terminals. The wood supports holding the coil form to the brass supports should be of brass rather than a magnetic material.

It is desirable that the box be provided with a protecting cover and a carrying handle.

After the wave meter has been constructed it must be calibrated. Consideration has been given to the transmission of standard wave length signals from laboratories equipped with precision measuring apparatus. This would make it possible to determine accurately several points on the calibration curve of a wave meter without sending it to a standardizing laboratory. The carrier waves of some radio-telephone broadcasting stations may be adjusted to some particular wave, such as 360 meters, and one point on a wave length calibration can thus be determined. A wave meter transported for standardization should be packed in a wooden box large enough to give room for three inches of excelsior.



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Radio Services Are Deeply Appreciated

RELIGIOUS services at 10:30 a. m. and 4:30 p. m. every Sunday have become a regular feature of the broadcasting program of WGY, the General Electric Company's radio broadcasting station at Schenectady, N. Y. The morning service, in every case, will consist of the entire service of one of Schenectady's churches, which will be connected with the transmitting equipment of the big radio station by telephone wire. The afternoon or vesper service will be conducted in the station studio.

The expansion of WGY's program to include Sunday has come as a result of thousands of letters from radio listeners within the station's transmitting radius. A great many of the letters were from aged people, too feeble longer to go to their churches but earnest in their desire for spiritual uplift. Among the letters were also a great many pathetic appeals from invalids, some of whom must spend their life in a single room. To such as these the deep swelling tones of the organ, the singing of hymns, the responsive readings, and the sermon are a real inspiration—a boon that lifts them out of the monotony of their existence and gives them a share in the activities which have failed to touch them.

Another class, and probably the most numerous, that has requested radio church-services are residents of country districts too remote from churches, or of localities where churches are closed because of the scarcity or expense of a regular pastor. In one case, it is known that a little group of neighboring farmers has gathered at the home of one of their number who had a powerful receiving set with loud speaker, and listened in, following the scripture reading in their own Bibles, making the responses in the psalter reading and joining in the congregational singing.

The first service sent out by WGY was from the First Methodist Episcopal Church, the Reverend Philip Frick, pastor. Three microphones were placed in the church, one located near the singers and the organ, the second at the pastor's reading desk, and the third in an anteroom for the announcer. Controlling switches brought any of these three microphones into the circuit.

While wandering from one radiophone to another we often wonder what it is all about—whether anything really matters after all, and, if it does matter, what are we going to do about it. Perhaps we are getting to be a radiofanatic.—"The Sun," New York.

Radio

Inland so deep all roaring waves are still;
So far at sea that dock lights long have died
And there's no sound of any train or mill;
Across the mountains high and deserts wild;
Where arc lights flare, or candles softly glow;
Past harbors where ships lie with canvas furled;
From sunrise to the twilight's afterglow
Man's puny voice is heard around the world.

—Walter Trumbull, in "The Herald," New York.

Although the domestic demand is light, numerous firms in and about Berlin manufacture radio apparatus. Curiously, vacuum tubes are "almost unavailable," says Vice-Consul Davis.

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Broadcast Bill's Radiolays

By William E. Douglass

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I'VE been to lots of parties, but the best I've ever seen wuz one we had at our place, in the barn, on Hallowe'en. I had the haymow all fixed up with punkins an' with corn an' them there fancy lanterns; when I's through you would a sworn the place wuz built fer parties. I had apples hung on strings an' some others to be bobbed fer, an' a lot of crazy things. When the folks begun arrivin', I got dressed up in a sheet—one that covered me all over, couldn't even see my feet. Then I met 'em at the doorway 'fore they climbed up in the mow, pointed out how they could get their, givin'



"It don't seem to faze her—boys; I'll tell you, she's a bear."

each a little bow. Abe an' Milly were the last ones, they drove up in their new flivver, an' I guess I musta scared it; when Abe stopped I saw it shivver. Well, us three went up together fer the party had begun. They were workin' on those apples an' in general havin' fun; we had cider an' some doughnuts, an' a lot of things to eat; an' those punkin pies that Min makes, let me tell you, can't be beat. We played a lot of games an' then I walked right out in front an' sez, "Each person present has to do a little stunt. If you can't sing a song, you'll have to hand us out a joke. Abe Jenkins, you kin start it off, then we kin watch your smoke." Well, everything wuz goin' smooth until Rebecca Vance sed if she had some music, she'd put on a ballet dance. Now Becky's eddicated—been away to school a heap, an' she kin do them dances, almost does 'em in her sleep. The stunt that I had planned to pull wuz with my Radio an' I wuz waitin' so I'd be the headline of the show. But, when Rebecca wouldn't do her dance without a tune, I 'lowed as how my act would slip fer I would just as soon pick up some real jazz music so that she could do her bit. I thought that she wuz stallin' an' that she would throw a fit when she found out that I could get the "music in the air." It didn't seem to faze her—boys, I'll tell you she's a bear. The first piece I tuned in wuz "Stumbling," which you've heard before an' so she stumbled in her dance—you ought to heard 'em roar. She'd taken several encores, an' an' we'd all quit clappin' when the chap announced the band would play that tune, "Do it Again."

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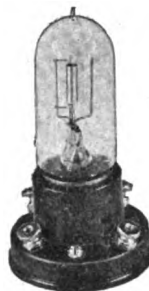
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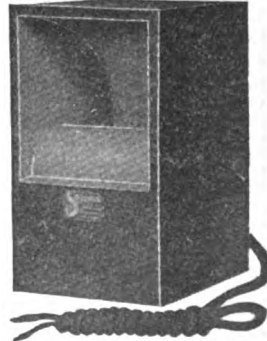
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A Broadcasting Record

WHAT is believed a record-distance for daylight broadcasting was made by WGY, the General Electric Company, broadcasting station, in reporting the recent World Series. Baseball fans in Havana, Cuba, 1500 miles from Schenectady, reported distinct reception of the game of Thursday, October 4.

The series was reported, play by play, by W. O. McGeehan, sporting editor of the New York "Herald." A leased wire carried the story of the game from the press box in the Polo Grounds, New York, to the transmitting apparatus of WGY, 150 miles away. From WGY, the story traveled on Hertzian waves to listeners within hundreds of miles. Many letters and telegrams were received expressing appreciation for the prompt baseball service. Fans were able to follow every play and actually visualize the game.

The following cablegram was received from Havana:

"Havana Life" published a front-page story which in part, states: "The broadcasting of the World Series games by the New York Herald and WGY has made a great hit in Cuba. In was heard distinctly throughout the republic, according to reports received by 'Havana Life.' Our managing editor, Fred M. de Stefano, heard the report from the receiving station of Cecil J. Dale at Marianao, near the Oriental Park Race Track. F. W. Borton, president of the Electrical Equipment Co., of Cuba, leading radio fan, pays a great compliment on the clearness with which the report was received here."

A Radio Newspaper

A PARIS newspaper has ceased to be printed and is published orally. The subscribers meet in a hall and listen to the editors and reporters. The editorial staff has specialists who address the subscribers on topics of the day. So far the experiment has proved profitable. It saves the mechanical cost of publication and the white paper, says "The Globe," New York.

Here is an idea that might be adopted by one of the radio stations. The main cost of a daily newspaper is not the pay of the reporters, copyreaders and editors; but the cost of the mechanical departments and the white paper. By substituting radio broadcasting all the typesetting, stereotyping, and printing-press machinery would be dispensed with. There would be no expensive system of distribution, such as wagons and trucks. The hundreds of tons of white paper could be left to grow into spruce trees in the forest.

This may come some day; but the difficulty at present would be in collecting from the subscribers and in preventing anybody with a receiving apparatus from getting his daily news and editorials without paying for them. The subscribers would also have to go without cartoons and illustrations, unless they installed the more expensive and complicated apparatus recently invented, by means of which pictures can be electrically transmitted.

May—What did Noah do for laughs on his voyage in the ark with no radio to tune in on jokes from ABC and XYZ?

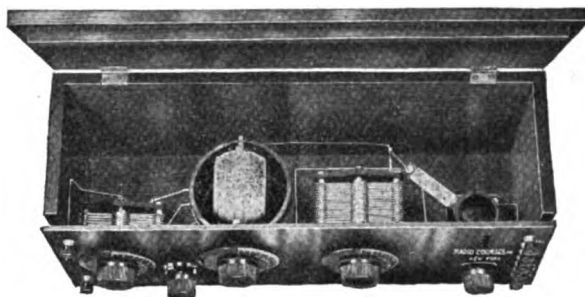
Ray—You recall that he took two of every animal known?

May—Yes.

Ray—Well, the hyenas were the laughing stock of the ark.

—"Topics of the Day" Films.

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radio development since the Vacuum Tube. After years of experiment and proof, this genuine fixed Radio detector is now available to amateur and professional operators. Its introduction marks the third GREAT step in the progress of Radio—first the crystal then the vacuum tube and now the wonderful Phonophone. Price, \$9.50, sent postpaid.

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3-Plate	\$0.95
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WESTERN ELECTRIC HEAD SETS, THE SUPERSENSITIVE PHONE USED BY THE SIGNAL CORPS AND NAVY. BOUGHT FROM THE U. S. GOVERNMENT. TYPE 194W (THE BEST MADE).....\$8.00

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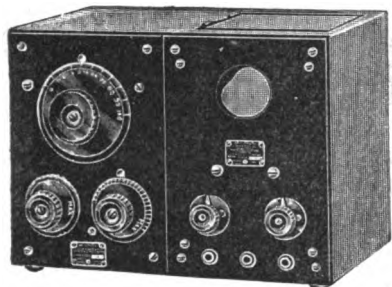
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Reference: Bradstreet's and Bank of The Manhattan Co., Rockaway Park, N. Y.

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Error in our last advertisement for Kallog Phones. Should have been \$8.00 instead of \$5.00.	
VACUUM TUBES	
Guaranteed U. V. 200.....	\$3.35
Guaranteed U. V. 201.....	4.35
B BATTERIES	
7 1/2 Volt.....	\$0.65
15 Volt.....	2.25
15 1/2 Volt, Large Size.....	1.85
STORAGE BATTERIES	
6 Volt, 80 Amp., Exide, Guaranteed.....	\$14.95
6 Volt, 60 Amp., Exide, Guaranteed.....	11.10
BATTERY CHARGERS	
E. F. Battery Booster.....	\$11.40
G. M. Tungar Rectifier.....	14.00
LOUD SPEAKER HORNS	
Just attach one phone.....	\$3.00
Just attach your head set.....	6.00
PHONOGRAPH ATTACHMENTS	
Fits any Phonograph and Phone.....	\$0.75
SPECIAL VARIOMETER	
Guaranteed perfect.....	\$2.00
DUO LATERAL COILS	
DL 25, 35 and 50.....ca.	\$0.35
DL 75, 100 and 200.....ca.	.50
DL 250.....	.65
DL 1250.....	1.35
DL 1500.....	1.48
DL COIL PLUGS	
Complete with strap.....	\$0.50
TRIPLE COIL MOUNTINGS	
Complete with Leads.....	\$2.50
SIGNAL CORPS VT. I VACUUM TUBES	
Guaranteed originals.....	\$5.45
NEW 1 1/2 VOLT DRY CELL TUBE	
TYPE WD-11.....	\$8.00
MAGNET WIRE —Write your inquiries.	
AERIAL WIRE	
Bare Copper—100 ft.....	\$0.35
1-STRAND PHOSPHOR BRONZE—100 ft.....	.50
AIRPLANE NAVY WIRE—100 ft.....	.75

STANDARD MAKE DETECTOR AND TWO-STAGE Samples which are out of their boxes, but have not been used, values that were as high in price as \$75—a few at..... \$39.00

Add postage, deliveries made daily.

RADIO DISTRIBUTING and AUTO SUPPLY COMPANY

64 West 66th Street, New York City
Phone Columbus 8584
Broadway-7th Avenue Subway
6th or 8th Avenue L

John Bull's Radio Exchange

WHAT is said to be the first radio-
phone exchange in the world was
recently opened at Croydon, England, the
point from which the air lines to the
European Continent take their departure,
according to Consul Linnell.

The chief use made of this exchange is to connect the serial-traffic controller, who has his headquarters in a control tower at Charing Cross, London, with the pilots of the air express flying between Croydon and the Continent.

This wireless exchange can also connect the phones of the airships and airplanes while in flight with any office at the aerodrome at Croydon, making direct telephone conversation possible.

The pilot of each aerial transport is now required to report his position to the traffic controller every fifteen minutes, so that the progress and position of each plane is known throughout its journey. The controller is of particular value in directing the course of the aircraft in cases of fog, and in giving them special directions for landing.

The Radio Bug

I WAS sitting one day at my office desk,

Writing of boys and men,
When a radio bug crawled out of a crack
And perched on the tip of my pen.

He scratched his neck with a wiry paw
And gazed at my half-writ poem,
Then settled back with a sleepy air
And ohmed an indolent ohm.

"Your room is chilly," said he to me,
As he shivered his aerial wire;
"If I were you I know what I'd do—
I'd build me an ampli-fire."

Then, tipping back 'till the pen point
cracked,
He ohmed again and said,
"I swallowed a couple of codes to-day
Any they gave me a pain in the head."

I asked him about his sister Ann,
And Galena so crystal fair.
"Oh, Gale is tickling the cat," said he,
"And Antenna is up in the air."

"I think that Ann's getting sour because
Of the unripe currents she ate,
For when I come with 'the weather' she
scolds,
'Now, wi-re you in-su-late?'"

He kicked his foot in a drop of ink,
Then slid from my pen with a snap—
Gave a switch to his tail and disappeared
Where the spark had begun to gap.
—Le Roy W. Snell in "The American
Boy."

"If I buy a radio apparatus, is there
any danger of getting a shock?"
"Only when the dealer tells you the
price."

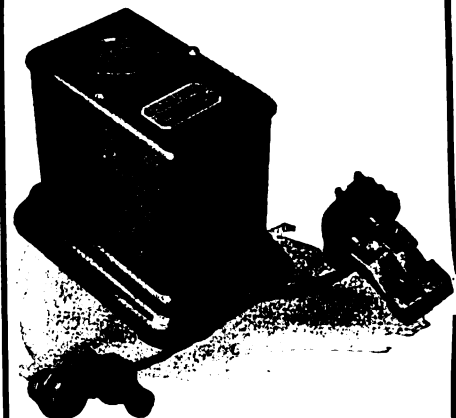
—James Madison's Comedy Service.



NA-ALD DE LUKE V. T. SOCKET

Contact strip of laminated phosphor bronze press firmly against contact pins, regardless of variation in length. No open current Condensite. Practically unbreakable. Special protected slot, with exterior reinforcement. Unaffected by heat of bulbs or soldering iron. All excess metal eliminated, aiding reception. May be used for 5 Watt power tube. Highest quality throughout. Price, 15c. Special proposition for Dealers and Jobbers
ALDEN-NAPIER CO.
Dept. L.
32 Willow St. Springfield, Mass.

Reliable and Beautiful RADIO-A RE-CHARGER



THE RADIO-A is a highly efficient dependable piece of apparatus, absolutely fool-proof, easily attached by simply plugging into ordinary 110 volt lamp socket. In case of current failure, the unit cuts out automatically until current is resumed, without discharging battery.

It is designed expressly for re-charging radio filament batteries, but may be used for automobile or any other storage battery of reasonable size and capacity.

Price, \$18.50

Dealers and Distributors

Here's a Winner! Write us for full particulars.

Simply screw into any 110 volt lamp socket and connect the terminals to your battery. Impossible to hook-up wrong—RADIO-A charges either way.



A compact portable Re-charging Unit that will fully charge a 100 A. H. Battery overnight, for from 5c to 10c, according to prevailing rates.

LAST A LIFETIME

King Electric Mfg. Co., Inc.
1681 FILLMORE AVENUE
BUFFALO, N. Y.

Cavite to Washington, by Radio, in Four Minutes

THE transmission of a routine radio-message from the Naval Station at Cavite, Philippine Islands to Washington, D. C., was accomplished recently by the Naval Communications Service within four minutes. The total distance is 11,500 miles, establishing a new record for long-distance land and transpacific communication.

Ordinarily, with the delay on account of schedules, a message from Cavite to the Navy Department would not be delivered in less than several hours, and sometimes a whole day is required in the transmission, due to relaying and other causes.

Of course, the message was relayed at San Francisco, where it was received from Cavite, but as the radio circuit to Washington was "set up" the message was relayed immediately. Within four minutes after the sixteen-word dispatch left Cavite, it was received on the aerials on top of the Navy Building in Washington and read in the receiving room below. Radio communication is said to be instantaneous, and a signal is instantaneous; but a message is slower due to

the fact that time is required to transmit it, record it, retransmit and again record.

Westward, transpacific radio messages are relayed to Guam and Cavite through Honolulu. Recently through the operation of the Fanning electrical relay at Honolulu, 184 words were automatically relayed to Guam from San Francisco without being transcribed or retransmitted, thus saving considerable time in their dispatch.

Radio Jokes

Jay—How is your new Radio set?
Ray—Great, but my wife is kind of jealous of it!

Jay—Howzzat?
Ray—I have a loud speaker.

—"Topics of the Day" Films.

"The Radiophone has wonderful possibilities."

"Yeah. When they get it perfected we can visit with relatives without having to feed 'em."

Spinkus—Old Henpeck doesn't look as downhearted as he used to.

Spunkus—No, he doesn't have to listen to his wife talk any more. He has a

radio set and wears receivers around the house all the time.

—New York Globe

INSU-LITE

P 1/8" —.01 per sq. in.
A 3/16" —.015 per sq. in.
N 1/4" —.02 per sq. in.

DEALERS: Write for discounts.

General Merchandise Co.
142 Market Street, Newark, N. J.



NA-ALD SMALL SPACE V. T. SOCKET

85c each, 3 for \$1.00. Molded genuine Condensite. Requires but small space for mounting. Readily accessible binding posts. No excess metal to interfere with efficiency. Unaffected by heat of bath or soldering iron. Phosphor bronze contacts. Nickel plated brass binding screws. Blank out slot. Price possible because of large production.

Special proposition for dealers and jobbers.
ALDEN-NAPIER CO.

Dept. L. Springfield, Mass.
52 Willow St.

Hearing Atlanta in Des Moines

EDITOR, RADIO WORLD: I noticed in RADIO WORLD (No. 29, dated October 14) that a Des Moines, Iowa, man heard Atlanta, Georgia. We pick up Atlanta every time they are on—and they come in perfectly. We also pick up the Norton Laboratories, Lockport, New York; also Schenectady, New York, and both come in loud and clear—just as natural as if in the same room. Our outfit is only a single detector-bulb regenerative set, but it works fine! —Newby Auto Electric, Milford, Iowa.

Clever Lawyer—Now, if you will let me have some of his love letters—Breach-of-promise Gertie—I haven't any. We both had radio sets.

—"Topics of the Day" Films.

FRS

ALL MOLDED
UNIVERSAL COMBINATIONS
5 Units in 3

F. R. S. Molded Variometers..... \$6.00
F. R. S. Molded Variocouplers..... \$5.00
F. R. S. Molded Bank Windings... \$5.00

Bank Windings are interchangeable for direct mounting on either Variometer or Variocoupler.

Universal—Accurate—Interchangeable

Dealers Send for Quotations
A Complete

Two-Stage Long Range Receiver



Set includes two Federal Transformers, Condenser, two-molded variometers, molded variocoupler, three V. T. sockets, filament rheostats, dials. Read 'Em binding posts, switch points: in attractive cabinet and drilled panel: complete, ready to hook up. **\$40**
A \$125 Radio for.....

F. R. S. Radio Corporation

409 East Fort St. Detroit, Mich.

DIALS



2"—20c. 2 3/4"—25c. 3"—27c.

with brass insert and set screw. Specify 3/16th or 1/4" insert.

\$1.75



Sesco Variocoupler, 600 meters.

One-half with order. Balance C. O. D.

\$2.50



Sesco Variometer.

Standard Model 8 Phones 2500 ohms, \$5.75

Standard Electric Sales Company

843 BROAD STREET

NEWARK, N. J.

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD

1493 Broadway, New York City.

Please send me RADIO WORLD for months, for which

please find enclosed \$

SUBSCRIPTION RATES:

Single Copy\$.15

Three Months1.50

Six Months3.00

One Year (52 Issues)..... 6.00

Add \$1.00 a Year for Foreign and Canadian Postage.

DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS
DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office ten days before publication, RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4794.)

FOR QUICK SALE—Westinghouse R C at best offer. Daryl McClung, 1221 9th Avenue, Huntington, W. Va.

FREE APPARATUS FOR SECURING SUBSCRIPTIONS FOR "RADIO." Write today for complete list of premiums and our special subscription offer. "RADIO," Pacific Bldg., San Francisco, Cal.

RADIO HOSPITAL. Radio sets repaired by practical radiotician, and experimentations under customer's supervision. Mail orders filled MELCO RADIO, 37-A Bedford Street, New York City.

RADIO ENTHUSIASTS: For Sale—A Complete Colin B. Kennedy Universal Receiving Set, almost new and in excellent condition. Remarkable long distance set, giving range of wave lengths from 175 to 25,000 meters. Have continually heard European stations. Owner is in a position where he can not use set. All communications may be addressed to Frederic W. Proctor, The Ambassador Hotel, Park Ave. and 51st St., New York City.

ADAPT your socket for Westinghouse dry cell tubes—no changing of connections needed. The Suneco adapter costs only \$1.50. Sent postpaid on receipt of price. Clark & Tilson, 1 E. 42nd St., New York City.

UNWIRED REGENERATIVE SETS

Details, Cabinet, 2 Condensers, 2 Honeycomb Coils, Coil Mountings, Socket, 1 Tusko Dial Bevel, Formica Panel, Grid Condenser and leak, Bradley Stat. Price \$16.00. Frost Phones, \$4.25. Also, Phones rewound.

LOUIS WERTS, 400 St. Julian St., Pekin, Ill.

BRILLIANTONE RADIO PRODUCTS

Dept. E, 374 Columbus Ave., New York City
\$3.50 23-Plate Var. Condensers, .0005..... \$1.75
4.50 43-Plate Var. Condensers, .001..... 2.25
4.50 Thordarson Audio Amp. Trans. 3.00
5.00 B. R. P. Audio Freq. Trans. (11 tol).... 4.00
7.00 U. V. 712 and Freq. Trans. (Radio Corp.) 6.00
6.50 U. V. 1714 Radio Freq. Tr. (Radio Corp.) 5.50
.70 Jacks single open or closed (Firth)..... .35
.90 Jacks double closed (Firth)..... .50
.002 and .005 Mica Bakelite Condensers..... .25
.0005 and .00025 M. B. Cond. with Var. Leak... .25
.0005 and .001 Fixed Mica Bakelite Cond..... .20
Tub. Grind Leaks, ½, 1, 1½, 2, 2½, 3 Megohms .45
Arrow Variometer 2.25
B. R. P. Variometer (to 800 Meters)..... 3.00
180 Degree Vario Coupler (wound Green Wire) 1.65
B. R. P. Vario Coupler (Panel & Lab. Type) 3.50
Send Money Order, but do not add postage for mailing. Pkg. will come Parcel Post Collect.

MURDOCK PHONES—type 56, 3000 ohms... \$5.50
MURDOCK PHONES—type 56, 2000 ohms... \$4.50
U. V. 200 (Detector tube)..... \$4.30
U. V. 201 (Amplifying tube)..... \$5.85
Postpaid in U. S.

Send 25c for 208-page radio manual and catalogue. A. V. Gregory, 42 Broad St., Red Bank, N. J.

ISSUES OF RADIO WORLD from April 1 to Oct. 7 (27 numbers) for 15c a copy, or the whole lot for \$3.15. Or send us \$6.00 for one year and start with the first number. RADIO WORLD, 1493 Broadway, New York.

BROADCASTING STATIONS: Letters and addresses of broadcasting station to-date appeared in Radio World for Oct. 7. Sent on receipt of 15c. Also a broadcasting map appeared in Radio World No. 8. Sent on receipt of 15c. Radio World, 1493 Broadway, N. Y. City, N. Y.

Manufacturers of Rogers Radio Receivers and Regenerative Radiometers. Rogers Radio Company, 5133 Woodworth Street, Pittsburgh, Pa.

PATENTS—Electrical cases a specialty. Patent charges. B. F. Fishburne, Registered Patent Lawyer, 26 McGill Bldg., Washington, D. C.

PATENTS—Send for form "Evidence of Conception" to be signed and witnessed. Form, fee Schedule, information, free. Lancaster and Allwine, Patent Attorneys, 259 Ouray Bldg., Washington, D. C.

FRENCH TUBES, genuine (no bootleg with French name), most sensitive and economic. (Good for detectors, amplifiers, and especially for radio frequency. Will work very good on two dry cells.) Price \$3.25. ATLANTIC & PACIFIC RADIO CO., 131 W. 37th St., near Bway., New York.

Exchange jolly interesting letters through our Club! Stamp appreciated. Betty Lee, Inc., 4254 Broadway, New York City.

Are you familiar with all the radio symbols used in the various book-ups published in Radio World? If not, secure a copy of Radio World No. 26, dated Sept. 23. In this issue was a complete table of all important symbols used in radio construction and testing. Send 15 cents for a copy, or \$6.00 per year, and have subscription start with that issue. RADIO WORLD, 1493 Broadway, New York City, N. Y.

RADIO MAN, eleven years' experience in all sides of the game, capable of constructing, installing, operating broadcasting station of any power, desires permanent connection. Go anywhere. What can you offer? Evans, Momus Pier 48, N. R., N. Y. C.

NEWS AND GOSSIP OF THE STAGE—Send 10c. for specimen copy of NEW YORK STAR, the great illustrated theatrical weekly. \$4.00 year, \$2.00 six months, \$1.00 three months. New York Star Co., 1493 Broadway, N. Y.

ASTONISHING results Rokay Regenerative Hook-up without use of Variometers—variocouplers, switches, taps, etc. ONE SINGLE CONDENSER CONTROL ONLY. The coming receiver. Simpler than a non-regenerative—better than any regenerative we have tested. Hook-up, \$1.00. Money Orders only. Saves you \$10.00 in building your own. With properly wound coils, \$3.50 post paid. Complete receiver parts on wood base with Vacuum Tube, \$8.00. Head set and "B" Battery, \$21.35, Express paid. Rokay Electric Co., Ingomar, Ohio.

HELP WANTED—MALE

EARN \$110 to \$250 Monthly, expenses paid, as Railway Traffic Inspector. Position guaranteed after 3 months' spare time study or money refunded. Excellent opportunities. Write for Free Booklet G-151. Stand. Business Training Inst., Buffalo, N. Y.

DO YOU USE A CRYSTAL DETECTOR? ARE YOU MAKING A CRYSTAL RECEIVER? Increase the efficiency of your crystal detector 1,000 per cent by using a "PT" Ultra-Sensitive Contact. Of special gauge and alloy; makes and holds a quick, ultra-sensitive, stable, adjustment. Endorsed by RADIO WORLD. Using galena, you may pound panel or table without disturbing sensitivity in slightest. Proved practical on ship-board by an oldtime Marconi operator. Using a "PT" Contact on galena, Arlington (NAA) was brought in clear at 3,300 miles (below the Equator); and Arlington came in loud at 2,200 miles (off Dutch Guiana). In both instances, nearby ships using vacuum tubes were unable even to hear NAA. As to stability, Cape May (WCY) was worked over 1,000 miles, sending right through crystal with 2 KW spark, without affecting detector's adjustment. Replace your insensitive unstable spring or catwhisker with a Contact which will hold its adjustment in addition to giving louder signals and music. Indispensable for use in your crystal set, regardless of make. A novice can install. "PT" ULTRA-SENSITIVE DETECTOR CONTACT, with instructions, twenty-five cents, coin or M. O. "PT" CRYSTAL CONTACT CO., Box 1641, Boston 8, Massachusetts.

CASH FOR OLD GOLD, Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magneto Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 337 Hippodrome Bldg., Cleveland, Ohio.

A Vacuum Tube Dry-Cell Set

But has a wave-length of 150 to 1000 meters.
Dealers and Jobbers Write to

LINCOLN RADIO CORP.

Manufacturers
116 West 69th Street New York, N. Y.

What Is It?

THE State Music Dealers' Association, of Iowa, met a few days ago and discussed the radio situation, says "The Mail," New York. Whether a radio set is a musical instrument or a scientific commercial device was one of the "big" questions that occupied the attention of the members. The delegates decided that should they class the radio receiver as a musical instrument the various members would lend support in exploiting radio.

This was an odd discussion. That it should occupy the attention of a business-getting organization is one of those things that cannot be understood. In the first place, whether the radio instrument is a musical device or another class of utility, is of no importance. Is the phonograph a musical device? Not essentially, although 95 per cent of the records we have are of a musical nature.

Attention! Fans and Amateurs!

Have you built your own receiver?

Are you experimenting with any particular hook-up?

Are you improving your set?

Are you doing any interesting constructive work in radio?

Why not share this knowledge with your thousands of brother fans who read RADIO WORLD every week?

We want pictures of receiving sets with descriptions of how you overcame some difficulty, or of any additional part or unit that you have added to obtain better results. These are the things that, probably, the other fellow is looking for. Send in your information; pictures or whatever you have done to improve the art.

Remember the beginner is looking for them.

We intend to print in this paper, each week, pictured information and description of value to radio amateurs. If you have found a newer or better way of doing anything, don't keep the secret but tell it to your thousands of brother fans.

Send in a photograph of your set with or without accompanying diagrams and measurement. State whether you figure in the picture yourself, or not, and without any expense whatsoever to you we will make an engraving and publish it. Be sure to write your name and address plainly on photograph.

Send in your picture at once, or if you have not made a set or done anything else in making radio material, tell the boy next door all about this offer.

Address Technical Editor

RADIO WORLD, 1493 Broadway, New York City, N. Y.

Be a Booster for National Radio Week

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RHEOSTATS—SOCKETS
 POTENTIOMETERS
 SWITCH LEVERS
ROYHELE MFG. COMPANY
 Mfrs. of quality products
 169 Mercer Street New York City
 Write for prices—Representatives wanted

Variometers **\$3.95**
 Variocouplers **EACH**
 REGULAR PRICE \$6.00

These are standard MOULDED instruments which is all that is necessary to say.

Order now as these prices will be withdrawn very shortly. Your money back if not satisfied

W. A. DICKSON

Detroit 408 E. Fort St. Mich.

**RADIO CITIZENS
 WE SAVE YOU MONEY**

Send us a list of your radio needs for our prices.

If It's Radio, we have it and we sell it for less.

JOHN R. KOCH COMPANY
 CHARLESTON WEST VIRGINIA

Radio dealers since 1918

55c. each, 3 for \$1.00



Genuine Condensite Dial
 The dial that runs true.
 Numerals engraved on bevel and knob so shaped that fingers do not hide them. This edge with clear graduation to make accurate reading easy.
 Condensed set screw in metal insert. Will not warp or chip. Finish and enamel permanent.
 2-inch dial 35c
 2-inch dial for rheostat potentiometer use..... 35c
 2 1/2-inch dial 75c

Send stamps for literature.
ALDEN - NAPIER COMPANY
 52 Wilcox St., Dept. L. Springfield, Mass.

Antenella

No Antenna or Aerial Needed



Does away entirely with antenna and all outside wiring, lightning arresters, switches and all other inconveniences. ANTENELLA enables you to enjoy Radio pleasures in any room in your house. Place your receiving set anywhere and merely attach Antenella to any electric light socket. No current consumed.

At your dealer's—\$2.00

If he can't supply you send purchase price and you will be supplied promptly without further charge.

Chas. Freshman Co., Inc.
 87 Beekman St. New York City

RADIO WORLD

TELEPHONE, BRYANT 4700
 PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
 FROM PUBLICATION OFFICE,
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 M. R. HENNESSY, Vice-President
 FRED S. CLARK, Secretary

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Fifteen cents a copy. \$6.00 a year. \$3.00 for six months. \$1.50 for three months.

Add \$1.00 a year extra for postage to Canada and foreign countries.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their orders, is automatic acknowledgment of their subscription order.

Advertising rates on request.

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One page: One time—\$150.00.
 Half, Quarter, Third and Two-thirds pages at proportional rates.

One inch, one time—\$5.00. Per agate line, \$0.40.

On four consecutive issues, 10% discount.

On thirteen consecutive issues, 15% discount.

Cover and preferred-position rates made known on application.

Terms: 30 days Net. 3% 10 days.

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Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

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While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patent, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

Since Railroads Took to Radio

ELDERLY Lady: "Can you tell me whether this train plays 'Silver Threads Among the Gold?'"
 Train Caller: "No, ma'am. Take the WJZ local for that number."
 * * *

Beautiful Young Lady: "Can you show me what train to take to hear 'Kiss Me Again,' 'Love's Sweet Song,' 'I'm Crazy Over You?'"
 Train Caller (very embarrassed): "I certainly can. Step this way, please!"
 * * *

Indignant Commercial Traveller: "My train is two hours late again. What-zamatah?"
 Station Master: "It ran out of violin solos at Pittsburgh."
 * * *

Wild Business Man: "Say, looka here! What's the trouble with the 2.15 express?"
 Station Master: "Three hours behind time. It had to stop at Gopher Prairie for a new crystal set."
 * * *

Railroads may shortly announce the suspension of certain trains because of unfavorable static conditions.
 * * *

Travel Note: Mr. and Mrs. O. Howe Dumm, accompanied by Mr. and Mrs. A. Lott Dummer and radio sets, left today on the 12.20 for an extended railroad trip.—W. I. Phillips, in "The Globe," New York.

B Batteries That Last For 5 Years

22-600 VOLTS

Send for interesting circular Dept. B. Sidbenel Radio Equipment Mfg. Co. 1663 Jerome Ave. New York City

DOUBLE HEAD PHONES



BOYS! A REAL RADIO SET ABSOLUTELY FREE

RUSH your name and address and we will tell you HOW you can get this RADIO SET ABSOLUTELY FREE. RADIO SET comes to you complete, with single slide tuning coil, crystal detector and phone condenser. AND DOUBLE HEAD PHONES. No batteries required; no experience.

Write To-day for Free Radio Plan.
 HOME SUPPLY CO.
 110 Nassau St., Dept. 204
 New York City

VARIO COUPLERS



GEM \$1.25 List

We also make 6 other styles That List \$2.50 up

Jobbers—Dealers—Agents

Write for Discounts

Jewell Radio Sales Co.
 90 West St. New York City
 Phone Rector 1635



ALWAYS FOREMOST IN THE FIELD

Announces the New Duplex Cabinet

LOUD SPEAKER USING YOUR OWN HEADSET

Two complete loud speakers in one—one for each phone—eliminate the interference between phones of the usual type, giving much greater volume. Each tone chamber is two feet long but the SPIRAL construction allows a very compact instrument besides absolutely eliminating metallic distortion—REALLY GIVES A PERFECTLY NATURAL TONE.

Beautiful hand rubbed mahogany or dark oak finish, brazed throat and fittings... \$4.85

Hand rubbed black finish all over, nickel plated fittings... \$3.85

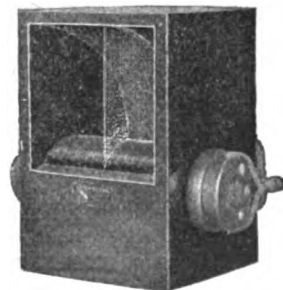
At dealers or postpaid (C. O. D. if preferred). MONEY-BACK GUARANTEE.

For those who own a Baldwin or other

LOUD SPEAKER UNIT

we make a single type SPIROLA with special clamp. Same prices as above.

L. H. Donnell Mfg. Co. Dept. B. Box 70 Ann Arbor Mich.



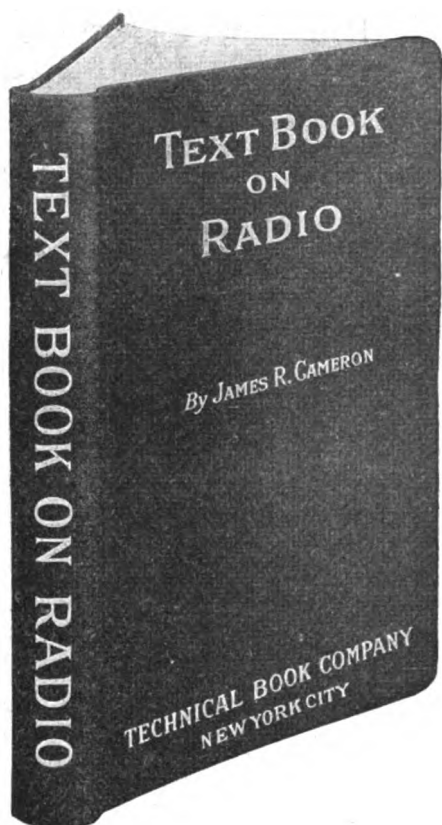
Fifty-two issues for \$6.00. Sub-Department, Radio World, 1493 Broadway, N. Y. C.—Advt.

Most Complete—Interesting—Informative Book
Ever Compiled on Radio

Textbook on Radio

By JAMES R. CAMERON

Whose textbooks are used and indorsed by the
U. S. Army, Navy, and Department of Public Instruction



350 Pages. Profusely Illustrated. Written so the amateur can understand it. At the same time—TEXTBOOK ON RADIO—is a standard textbook for the technical radio student.

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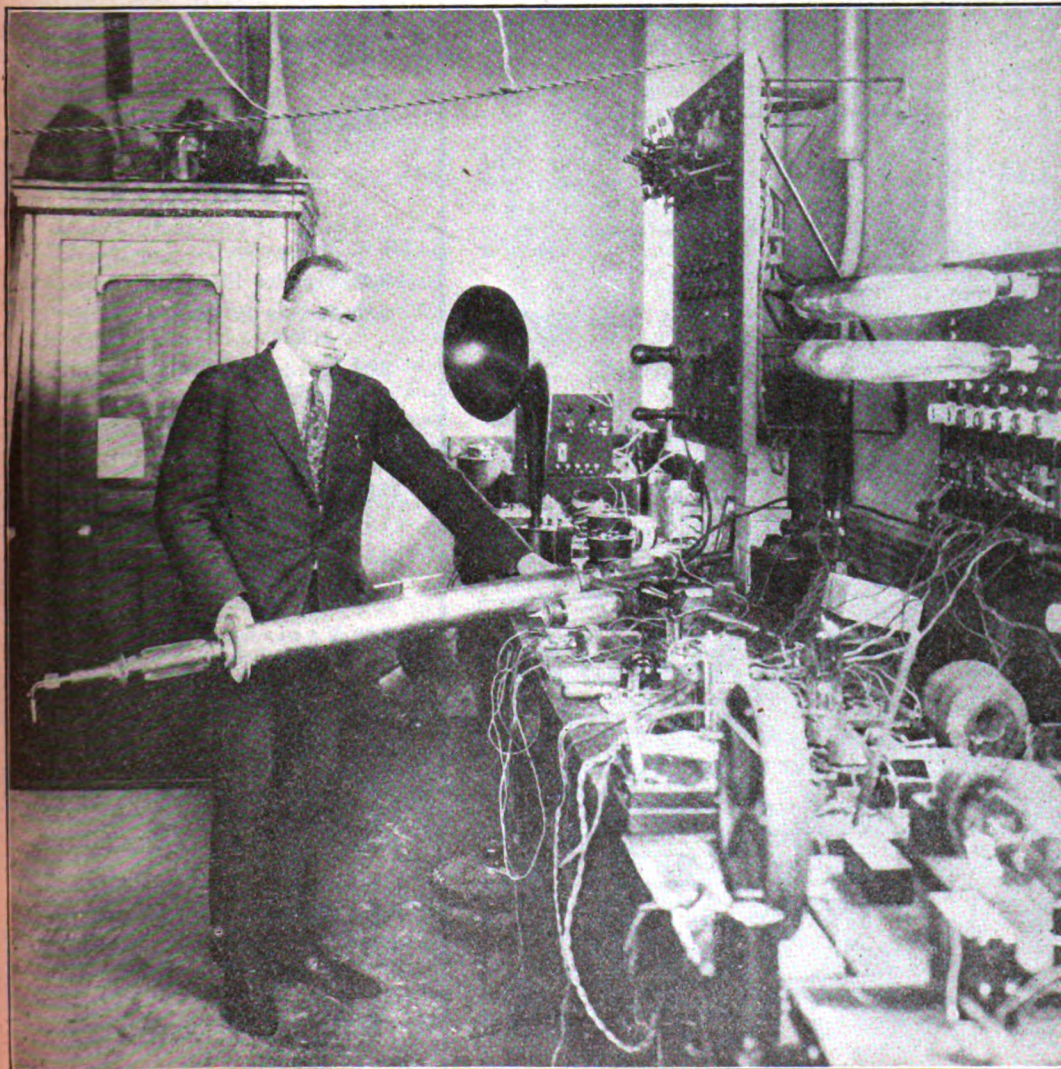
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RADIO WORLD

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ILLUSTRATED. WEEKLY

Million-Watt Tube Will Radio Voice Across Atlantic



A MILLION-WATT vacuum tube, the most powerful in the world, has just been developed by J. H. Payne, Jr., at the research laboratories of the General Electric Company, Schenectady, New York. Although still in a stage of development, it promises to result in a supertube that will handle unusually large amounts of current.

Its type is the Magnetron class. Its weight is sixty pounds, and it can supply energy equivalent to that required to light 40,000 25-watt incandescent lamps, the current necessary to illuminate 1,500 homes. The tungsten filament, if drawn into a filament of the size used in the home, would supply 175,000 lamps.

The output of this tube is, approximately, forty amperes at a pressure of 250,000 volts. This is about 1,000 kilowatts. The tube serves to act as a rectifier in changing alternating current to direct current. It is also adapted, in an inverted sense, to change direct to alternating current of any frequency, or to convert low-frequency alternating current to high-frequency alternating current.

This new tube is fifty times as powerful as the recent tube invented by Dr. Irving Langmuir, or five times as powerful as the Alexanderson alternator.

(See page 3 for "close-up" and detailed story of this remarkable device.)

(C. International News Reel)

HOW TO BUILD A 100-METER CONCERT SET—Page 4
LATEST NEWS ABOUT NATIONAL RADIO WEEK

REAL RADIO VALUES

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43 plate Universal Condenser, bakelite ends, .001 Mfd.....	5.00	3.00
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Bestone Filament Rheostat..	1.00	.60
Bestone Variocoupler, 3 inch dial, 150-600 meters.....	8.00	5.75
Bestone Variocoupler, 3 inch dial, 150-500 meters.....	7.00	4.75
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Federal Jr. Receiving sets, Dictograph Headset.....	25.00	15.00

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Radio Smiles By Arthur G. Shirt

HAVE you read it? The book which tells you how to make a receiving set with a range of 3500 meters out of grandfather's top hat and an old phonograph record?

Where are the novelty banks made in the shape of a radio receiver with a knob that really turns and a tiny bulb that lights up every time you drop in a nickel?

Even in this second winter of the radio craze, there are people who think of laundry starch when the name Armstrong is mentioned.

If every youngster hasn't a home-made radio set constructed by his own hands and at the absurd cost of \$3.64, it's no fault of the magazine articles on the subject.

Try our "Tinpanitone," the new radio diversifier. Each and every unrelated sound magnified and distorted to ten times its original volume! Can be heard for blocks! Splendid opportunity for weary 'phone owners to drive away undesirable visitors! You can't appreciate a good horn until you hear this one!

Have you written your radio book yet?

News head: "De Wolf Hopper broadcasts to thousands that he cannot see." That's nothing. The Sears Roebuck Company has a greater broadcasting radius than any radio station in the country, and daily takes money from thousands it will never see!

Have you heard of the guy who dwells so morbidly on the cost per minute of operating the set when he has company, that his visitors force him to shut the outfit down and talk about it for a while?

Already one-half of the world is plugged in on what the other half is saying.

If people listen-in this winter as they did last, the next generation of flappers is doomed to flat ears and the safe opening wrist twist.

It's coming! A book entitled, "What Every Ardent Suitor Should Know About Radio."

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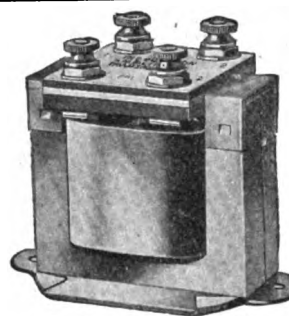
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22-1/2 V-large 1.85
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8.00 Federal Phones, 2,220 Ohms	6.25
16.00 Baldwin Phones	14.00
1.00 Rheostat, mounted type60
4.00 Variable Condenser, Bakelite ends, 43 plate aluminum ends	2.10
3.00 Variable Condenser Bakelite ends, 23 plate aluminum ends	1.60
1.50 Variable Condenser, Bakelite ends, 3 plate aluminum ends	1.00
7.00 Jefferson Transformer, No. 45 Navy Type....	4.50
12.00 Western Electric Phones, 1002	8.50

These are only a few of our many specials. We give 15% Discount on anything in Radio

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VOLUME TWO

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the act of March 3, 1879.]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. II, No. 7. Whole No. 33

November 11, 1922

15c. per copy, \$6.00 a year

“Close-up” of the Most Important Radio Development of the Hour

By John Kent

(Further description of the illustration on the front cover of this issue of Radio World.)

WHILE radio may be used for short distances, in place of telegraph lines, its real force lies, rather, in long-distance work, side by side with the cables. However, a most important development has taken place. It is the completion of a 1000-kilowatt supertube, the work of J. H. Payne, Jr. Mr. Payne created this tube in the research laboratories of the General Electric Company, Schenectady, New York, employing discoveries made by Dr. Irving Langmuir and Dr. A. W. Hull.

It is not intended or adapted for use on lighting circuits. Engineers had found that the major problem of tube development for radio has been solved insofar as the size tubes is concerned. They had demonstrated that almost any size tube could be made for radio work and operated successfully. But there was an undeveloped field for tubes in general engineering, especially where high-frequency generators or high-voltage rectifiers might be required.

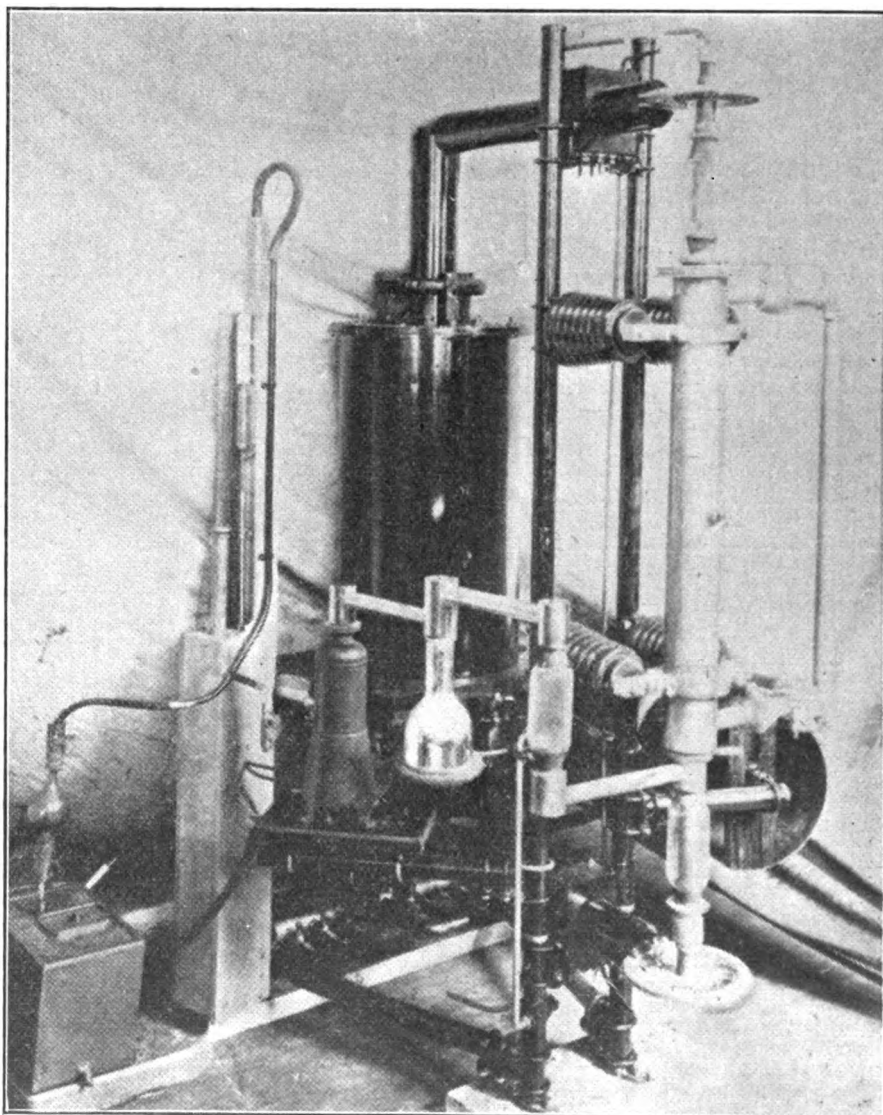
Attention was directed to the development of superpower tubes for use in the generation and transmission of high voltage, direct current, and other engineering work.

The supertube has an output of 40 amperes at 250,000 volts—about 1000 kilowatts, or 1,000,000 watts. Dr. Langmuir, in describing the tube, says:

“This tube consists essentially of a water-cooled cylindrical anode thirty inches in diameter. In the axis of the anode is a tungsten filament four-tenths of an inch in diameter and twenty-two inches long. This filament is excited by a current of eighteen hundred amperes at ten thousand cycles, the filament excitation requiring about twenty kilowatts.

Another line of development is, therefore in progress: the production of tubes of high efficiency as well as tubes of larger output. The progress in this direction is more difficult and is apt to be slower than in the direction which, thus far, seemed more important. These

developments will come gradually, for the practical construction of powerful tubes giving thoroughly satisfactory operation requires considerable development. It would be boasting, however, to predict the limitation of the ultimate use of the vacuum tubes in the power field.



(C. Underwood & Underwood, N. Y.)

Close-up of the million-watt vacuum tube, fifty times more powerful than any now in use, which has been developed in the Research Laboratory of the General Electric Company by J. H. Payne, Jr.

How to Build a 100-Meter Concert Receiving Set

By Frederick J. Rumford, E. E., R. E.

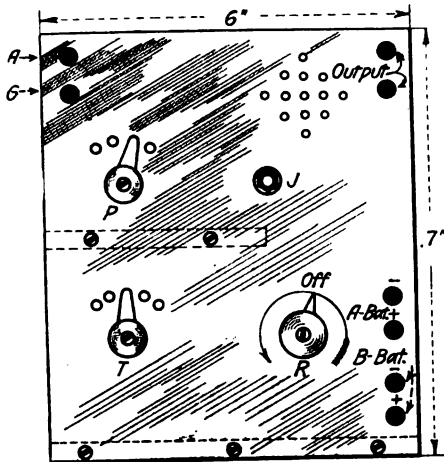


Figure 1—Layout of panel with distance of holes to be drilled; also the position of the binding posts, knobs, contact points and rheostat. Suggested by Frederick J. Rumford. Drawn by S. Newman.

IN the near future many broadcasting stations in the United States will transmit on a wave length of 100 meters, more or less, because this range gives a radiophone station a larger band of wave lengths to operate over and will reduce interference from other stations. For instance, KDKA has broadcast concerts which have been received quite often by the writer at his home in Roxbury, Massachusetts.

I advise any radio fan who is interested to build himself one of these little receivers and have it hooked up so that the throwing of a switch will connect it with the antenna and ground circuits.

If your concert-receiver is unable to tune in 400 meters and over use this little set. It gives very good results on 100 meters.

Below are listed the necessary parts, and their respective cost, for the making of this set:

1 panel formica, or bakelite, 6" x 7" x 1/4"	\$1.26
1 base 6" x 6" x 1/2"	.25
1 vacuum-tube socket	.75
1 rheostat	1.25
1 jack	.75
1 plug	1.00
1 five-contact switch assembly complete	1.00
1 six-contact switch assembly complete	1.10
1 vacuum-tube bracket for socket	.25
8 binding posts	.80
1 set of screws, wire and accessories	.50
1/4 pound No. 22 D. C. C., magnet wire	.30
1 cardboard, or bakelite, tube, 3 1/2" diam., 2" depth	.35

Total \$9.56

First, all the marking of holes on the panel must be completed. The panel is now ready to mount the switch-assembly rheostat, the jack and the binding post. After this is done, we are ready to make the coil which will consist of a primary and tickler winding. The tube is first given several coats of shellac and left to dry. After drying, the primary winding is started about 1/4 of an inch from the end of the tube. There are 18 turns in this winding, with taps at the 9th, 11th and 13th turns. On the 18th, or final turn, there is a 1/2-inch space.

Next, wind the tickler coil, which

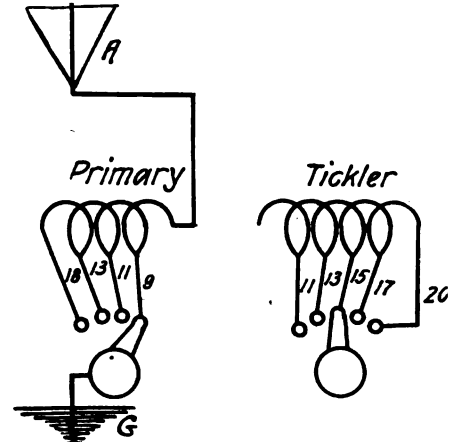


Figure 4—Wiring and connections of the taps of the primary and tickler coil. These make the set regenerative. Suggested by Frederick J. Rumford. Drawn by S. Newman.

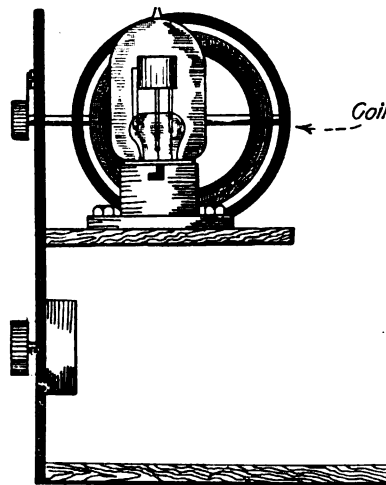


Figure 2—Rear of the panel, indicating how the instruments should be mounted. Suggested by Frederick J. Rumford. Drawn by S. Newman.

has 20 turns of the same size of wire as used on the primary. This is tapped as follows: At the 11th, 13th, 15th, 17th and 20th. After the winding has been completed, the coil should be given two coats of insulating compound.

After the coils have dried, they should be mounted at the back of the panel by means of two machine screws with nuts, fastened firmly at the back, holding the coil-form firm and rigid. The taps are then connected to their respective posts.

The set is now ready to be wired. Careful attention should be paid to the wiring diagrams, figures 3 and 4. Regarding the two binding posts marked

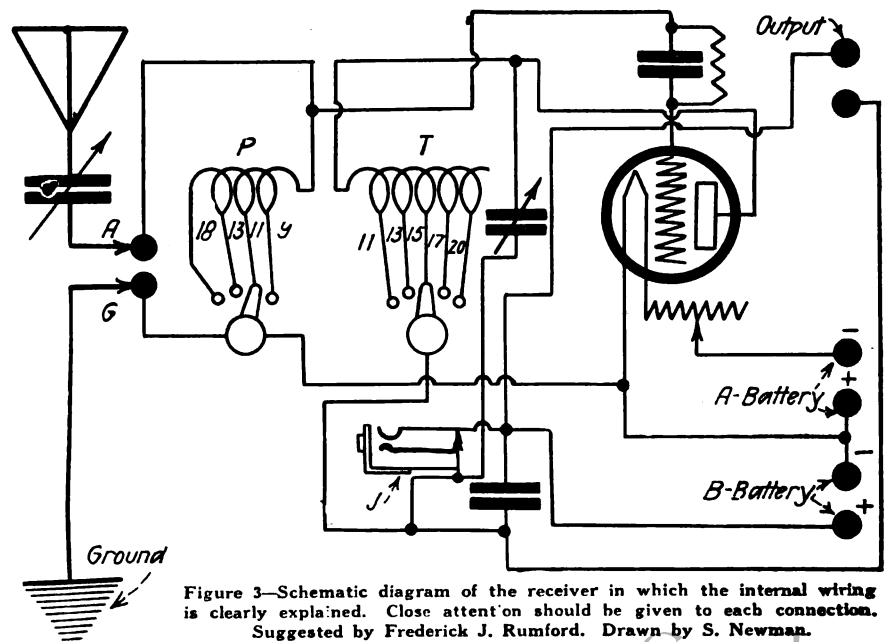


Figure 3—Schematic diagram of the receiver in which the internal wiring is clearly explained. Close attention should be given to each connection. Suggested by Frederick J. Rumford. Drawn by S. Newman.

United States May Be Divided Into Radio Zones

By Carl H. Butman

WASHINGTON, D. C.—The radio public is beginning to demand not only good entertainment and high-class transmission, but a greater range of reception. In other words, the listener-in wants to reach farther afield. His horizon is extending. He wants to hear the distant stations outside his city and state. The Department of Commerce radio officials, therefore, are making a survey of each radio district to see if there isn't some way by which this can be arranged.

One radio enthusiast says that, while he is appreciative of all his local stations, he sometimes wants "to go visiting by radio"—listen to some of the big stations outside the local field—just as he frequently likes to listen to the conversation of others than his immediate family whenever guests are present.

It's the same in radio broadcasting, he says.

In an effort to aid in seeking a solution of this new problem the Department of Commerce has written letters to its nine radio district-inspectors, stating that information reaching the department indicates that, throughout the country, a sentiment for silent local radio broadcasting periods is developing so that the listeners-in can hear the distant stations, which is often impossible when local stations are broadcasting. In some sections of the country steps for such an arrangement have already been taken. On the Pacific Coast, for example, what is known as the Pacific plan of time division has been amended so that, from 8 to 10 o'clock each evening, amateurs are silent, thus permitting the broadcasters to have a clear field.

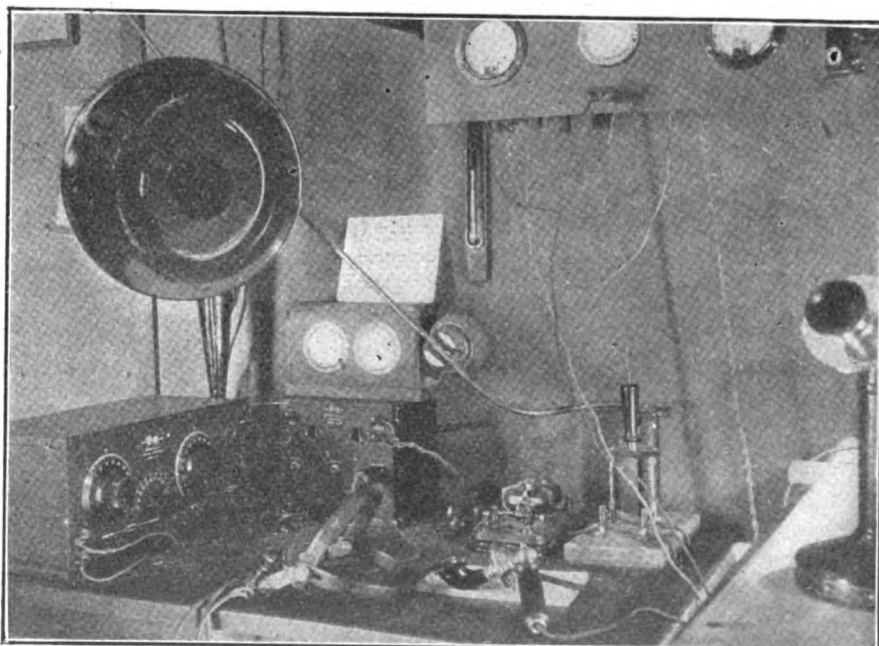
At 10 o'clock the amateurs have a period, during which they may communicate without interruption. In other sections the local broadcasters remain silent for one evening a week, or for a few hours one or two evenings a week, so that those having sets capable of long-distance reception may pick up some of the powerful broadcasters outside their district. The department points out that there is a great fascination in listening to distant stations, and it is the opinion of the Radio Section that this wish of the radio public will meet with the cooperation of most of the broadcasting stations when it is understood. Broadcasters and local enthusiasts should advise local inspectors as to what they think of the plan or take it up with the department directly.

It may be found desirable to divide the United States into zones somewhat as it is divided into time zones, the stations in a particular zone having silent nights or periods of two hours each. It might be arranged so that

the broadcasters in the Eastern Time Zone would not transmit on Monday night; those in the Central Zone keeping quiet on Tuesday; Mountain Section, Wednesday, and the Pacific Coast on Thursday; all sending on the other nights. The department inspectors have been requested to bring this suggestion to the attention of owners of broadcasting stations in their districts and explain it to broadcasting and listening-in organizations. Reports from inspectors will indicate the desire on the part of the public and the attitude of the broadcasters, who must arrange the matter, as the department's plan is only a suggestion.

Radio fans who complain of interference must not forget, officials point out, that the execution of such a plan will not enable them to get long-distance stations unless they have good sets and know how to tune in properly. The scheme is expected to receive the endorsement of the public and broadcasters alike, but it can only be successfully carried out with the close cooperation of every one. The reports of inspectors are awaited in Washington with interest.

This Is Radio Station 8 BVZ Send Radio World a Photograph of Yours



Here is a set we would all like to own—look it over, amateurs, with a view to copying its especially neat and compact arrangement. The batteries are in a locker under the table and hidden from sight. The call letters of this station are 8 BVZ. Its owner is Nicholai H. Hiller, Jr., Carbondale, Pennsylvania. Mr. Hiller has a few other complete outfits spread out over the valley, but this is his outfit de luxe. If yours can match it, send a photograph to RADIO WORLD for publication.

(Continued from preceding page)

"Output," which really connect with the points of the jack: The reason for one of these sets should desire to hook-up an amplifier with this unit, it can be easily made by connecting jumper wires from these posts to the posts provided from them on the amplifier unit.

The variable condensers used in this set are of a small value in capacity, and the grid condenser is, also, of a very small capacity. The grid leak is one-half megohm.

The vacuum tube used is a radiotron U-V 200. The B battery is of 22 volts and the storage battery, 6 volts, 60 ampere hour.

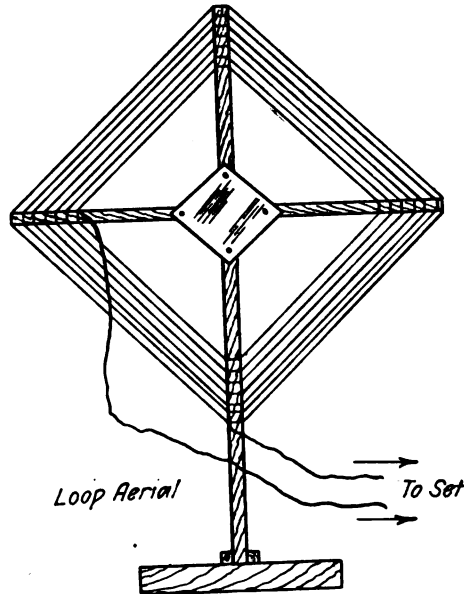
Wide Field for Experimenting With Aerials

Construction of Antenna Involves Many Details Which, if Properly Attended to, Will Increase Efficiency of Receiving Set

By Donald Van Wyck

FOR the radioist interested in experimenting, there is an interesting field that may be easily tapped—experimenting with aerials of various types. Although RADIO WORLD has made clear the working of aerials, I will endeavor to cover another phase of the subject. Radio enthusiasts who live in apartment houses, in many cases, find it inconvenient to stretch an outdoor aerial. Where circumstances prevent this, there are only a few schemes whereby broadcast programs may be picked up. A loop antenna, an indoor aerial, or an aerial plug which fits into the electric-light socket, and permits the use of the lighting socket as a means of absorbing the radio impulses, may be substituted for the outdoor wires; but in no case will the signal strength be as loud as with an outdoor antenna. One thing that the amateur must remember: crystal detectors will not function satisfactorily with the indoor loop, as they are not amplifying detectors—but sensitive mineral detectors which will pick up and rectify if the outdoor antenna is used. They will function all right, but the range of the broadcasting station must be five or ten miles. For distance with the indoor loop aerial, vacuum tubes must be used with two stages of amplification, for good results.

A convenient way of installing a simple indoor antenna is to extend a length of No. 20 single cotton-covered copper wire around the room or down the hallway. If it is run along the moulding, any effect which may detract from the appearance of the room may be prevented. We must look for the *ground*. This can be had by connecting the *ground* connection from the receiving set to the cold-water pipes or to the radiator. This wire can be run along the baseboard, or a crack in the floor, making the wire unnoticeable. When making the connections to the cold-water pipes, or radiator, make sure to file, or clean, the spots where you intend to make the connection. This will give you a good electrical connection when finished.



Loop aerial used in conjunction with radio-frequency or superregenerative receiving sets. Good results have been accomplished with such an aerial. It has well-marked directional properties. It also has the advantage of eliminating interference. The loop aerial is used exclusively throughout the United States Naval Radio Compass stations for locating positions of ships.

The loop antenna requires a sensitive set of instruments such as a radio-frequency or a super-regenerative set for its successful operation; as the loop aerial is a poor absorber of radio energy, due to the fact that closed circuits have a tendency to hold energy instead of absorbing or radiating the signal. The loop aerial gives the greatest volume of signals when pointed toward the source of the incoming wave, and thus has a directional effect. Of course, the small-sized loop is what makes the signals weak; but there is a great chance to try some experimenting with one.

There are various ways of connecting the aerial, or loop, to the set, depending on the type of set used. However, the general method is to connect one end of the loop to the antenna terminal of the set and the other to the binding post of the set marked "Ground." When the loop aerial is employed, no actual ground connection is necessary.

The construction of a loop is shown clearly in the accompanying sketch. The simplicity is at once apparent. Two light pieces of wood

are made up in the form of an X about 4 or 5 feet in height. Across the ends of these pieces, smaller pieces are screwed. These pieces need not be over 6 inches long and should be notched to take the wires and hold them in place. The number of wires needed must be determined by experiment; but, as a starter, try about 8 or 10 turns. For the wire, almost anything will do. No. 18 ordinary bell wire will do. If the builder wishes, he may use No. 22 or No. 24 cotton-covered wire. The fact that the wire is insulated will not make the slightest difference. Simply start the wire wherever convenient and wind the form full, keeping the wires spaced evenly.

The completed loop may be mounted in such a way that it revolves easily, so that the radio operator may get the loudest signals and, at the same time, cut out a large amount of interference.

Another method of eliminating the outdoor antenna is the use of the condenser plug which enables the radio fan to use the house-lighting wires as the antenna without the trouble of installation. In some apartments, the plugs work very well; but success depends upon local conditions, particularly the manner in which the wires are strung. If the wires are shielded by metal ceilings or conduits, signals will not be as loud as if the wiring is open. If the building is surrounded by steel structures, the results will not be so pleasing.

Experiments seem to indicate that the plugs work best on the second and third floors, especially in frame or brick buildings. A regenerative set with two stages of amplification works well with the plug and will pick up broadcasting easily.

The antenna plug is a condenser, or a number of condensers, encased, which serve to prevent the live-wire line from surging through the set. The function of the plug is to afford a coupling similar to a condenser in a circuit, allowing the high-frequency radio currents picked up by the house wiring to flow through the receiver.

National Radio Week Executive Committee Ready for Action

Subsidiary Working Committees Will Be Appointed This Week

MAJOR J. Andrew White, chairman of the Executive Committee in charge of preparations for National Radio Week, to be observed from December 23 to 30 (inclusive) has appointed the following to complete the personnel of five members suggested at the meeting reported in *RADIO WORLD*, No. 32, dated November 4:

H. Gernsback, Kendall Banning, Lawrence A. Nixon, Arthur H. Haloran, and Roland Burke Hennessey. Arthur H. Lynch is treasurer.

This committee, with Major White as chairman, held a very important meeting on November 3 at Major White's offices, 326 Broadway, New York City, full details of which will be published next week.

Committees to take charge of the music and broadcasting programs, the publicity, the special meetings of dealers and manufacturers will be formed.

Enthusiasm prevails everywhere and National Radio Week promises to be the one big event of the year. *RADIO WORLD* has received many messages of praise, not only for suggesting the idea, but for passing it on to the radio field at large in order that all may take an equal interest.

Among the newspaper comment is the following from "The Globe," New York. It shows the spirit of one of the big, progressive newspapers of the Metropolis:

A brilliant idea has been conceived by R. B. Hennessey, editor of the *RADIO WORLD*, a weekly radio publication. Mr. Hennessey makes the suggestion that a National Radio Week be held from December 23 to 30, inclusive, during which time short talks appertaining to the season are to be personally delivered by high government officials and broadcasted from all broadcasting stations. The idea is an excellent one both from the viewpoint of the country itself and from that of the radio industry.

It is Mr. Hennessey's intention to weld the country together for one whole week through the agency of radio. Political talks, speeches on art and literature, entertainment in lighter vein for those who care not for the heavier subjects, and religious and scientific addresses by leaders in their respective fields.

The dates selected come at the season of Christmas, an opportune time for a venture of this nature. The wholesome advantages of life in this country and



MAJOR J. ANDREW WHITE
Chairman of the Executive Committee of
National Radio Week.

particularly at this time could not be brought to the attention of the nation in a better way than through the chain of broadcasting radio stations now available.

Of course, there is another thought

Radio Development in Cuba

Amateurs Enthusiastic Over Establishment of New High-Power Broadcasting Station in Havana

OWING to the lack of adequate broadcasting facilities, radio development in Cuba has not kept pace with the progress of radio transmission in the United States, says Assistant Trade Commissioner Livengood, Havana, in a report to the Department of Commerce but recently a high-power sending center has been established in the capital and the market for small receiving sets is expected to widen rapidly. This station has not yet made arrangements to supply broadcasting service, but it will do so soon. The apparatus of the company operating this station, which has a capacity of 500 watts, is an exact duplicate of that used by the New York Telephone and Telegraph Company in its Walker Street station. Test messages from the new Havana station have been heard as far away as Princeton, New Jersey. As in all tropical countries, Cuban enthu-

siasm have met with difficulty because of "static" disturbances. In spite of all obstacles, however, a considerable number of Cuban amateurs have been experimenting in receiving and transmission. In order to receive from United States stations, apparatus of the more expensive kind is necessary. With such sets, messages have been received from Memphis, Detroit, Pittsburgh, Jacksonville, Wichita, Kansas City, and Schenectady. Messages from Atlanta have been most successfully received in Havana.

Havana dealers are well equipped to supply radio apparatus in anticipation of broadcasting from the new Havana station. Interest in radio matters is thoroughly active, and when United States facilities are available, merchants believe that Cuba will offer a promising market.

United States Senate,
Washington, D. C.

Editor *RADIO WORLD*:—

I have had the pleasure on several occasions during the present campaign of speaking over the radio, and I fully appreciate its practical value in very many directions. The whole world is coming to appreciate its unlimited possibilities.

I heartily endorse your plan for the celebration of a National Radio Week, and shall be glad to do anything possible to make that celebration a success.

Very truly yours,
WILLIAM M. CALDER.

National Radio Week is to be an important event. The executive committee is seeking suggestions to make it a huge success. All radio fans and amateurs are invited to cooperate.

To many anxious inquirers: *RADIO WORLD* has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

Be a Booster for National Radio Week!

Single-Tube Superregenerative Receiver

By C. White, Associate A. I. E. E.

THE interest taken by amateurs in the development of the superregenerative circuit indicates that there is a preference for the more scientific receiver, although its actual construction does entail many difficulties in wiring. Up to the present time, many designs of this famous circuit have employed either two or three tubes, but the objection to such sets has mainly arisen from the necessary complexities of the general connections. Some radio fans tried to build a multi-tube superregenerator, but failed because they attempted to crowd the apparatus into too small a space. This is a common fault with most amateur construction, and the poor results are commonly indicated by all sorts of howling, audio-oscillations, and extremely sensitive tuning-adjustment without the desired amount of selectivity. Frequently, such troubles are caused by improper shielding or a lack of shielding of the component parts or groups of parts; or, perhaps, poor condensers and loose connections. So, no matter what type of modern circuit the novice is considering, it is paramount that he pay very careful attention to minor details of construction, which often determine the actual efficiency of the outfit.

The demand for a circuit employing the superregenerative principle with a single tube has been apparent from the start. This demand has been due to two chief facts; first, the two- and three-tube outfits have been very bulky and by no means easy to carry around, especially since a storage battery of very large capacity is needed to supply the filament currents. Second, although the results obtained have been truly remarkable, the cost, both initial and maintenance, has been far in excess of that which the average amateur is so disposed to pay. Hence many

have been at work trying to perfect a single-tube outfit that possesses most of the points of advantage of the larger types and still retains the outward and inward simplicity in design, and, also, is immune from excessive costs. Since it is rather hard to definitely connect scientific perfection and financial economy, we frequently must compromise between the two and make some slight sacrifices in favor of one or the other. The single-tube superregenerative receiver does not have the flexibility of control and the extremely fine selectivity, although in size and cost it is really in the class with the average regenerative-set employing variometers and a double-tuning circuit. It is quite simple and it is possible to make up a receiver that is very

good for traveling and demonstrating purposes by employing a WD-11 tube which requires only a 22½-volt B battery and an ordinary No. 6 type dry-cell to light the filament. Personally, I have seen a lecturer's radio set made on this principle which measured only one foot in each dimension. Except for a loop aerial and a loud speaker this receiver was very complete and ready to work in a moment's notice.

In Figure 1 is shown the general wiring connections. A vario-coupler with the stator as primary and the rotor as tickler coil was used. But if the amateur so desires, he may change the general tuning-circuit by using a vario-coupler with two rotors; the stator for the primary of the antennae-ground circuit, one rotor for the secondary, and the other for the regenerative tickler coil. While a double-circuit arrangement adds a certain amount of scientific refinement, I do not think it is advisable to incorporate such an expensive item as a double rotor vario-coupler in a single-tube set, especially since, with a loop aerial, it is quite easy to obtain good selectivity and a minimum of interference.

As illustrated, a 43-plate variable condenser is placed across the terminals of the stator and thus provides a method of sharp tuning. The regenerative coils consist of two honeycomb

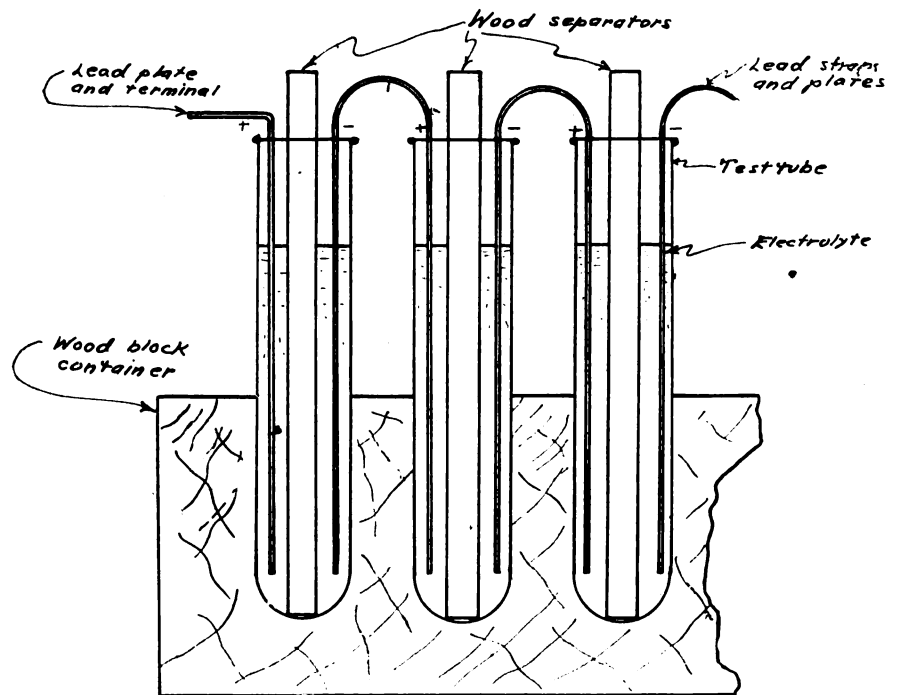


Figure 2—Schematic design of a plate potential battery for a single-tube superregenerative receiver. Drawn by C. White.

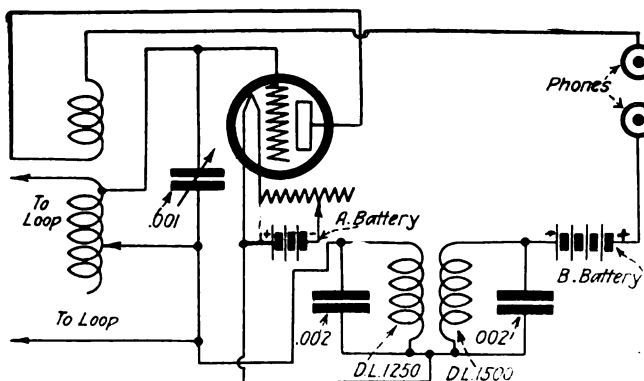


Figure 1—General wiring connections of the single-tube superregenerative set. If the amateur wishes he may change the general tuning-circuit by using a vario-coupler with two rotors; the stator for the primary of the antennae-ground circuit, one rotor for the secondary, and the other for the regenerative tickler coil. Suggested by C. White. Drawn by S. Newman.

Why it Is Necessary to "Tune In"

By Arthur G. Shirt

WHAT are you doing when you juggle with the slider on your tuning coil, or twirl the dials on your variable inductance?

"Why," you answer, "I'm tuning in." But there you stop. Why it is necessary to "tune in" perhaps never occurred to you. Therefore, an explanation couched in language everyone may understand, may not be amiss.

To begin with—the aerial. If no other explanation will quite cover the idea, the aerial is erected outside or inside, as the case may be, for the purpose of catching messages, music, speeches, and press reports, just as a rain barrel is given its place to catch rain water. Falling rain represents some energy, even if it is not generally utilized, and so does the entertainment which comes down through your aerial to your receiving set. It is of an entirely different kind, however, and peculiar to itself.

The sort of energy that we hope to capture when we string our antennae is what is known as "wave energy," so called because we can more readily conceive of it when it is compared to ocean waves. Every transmitting set in the

country sends out wave energy; but to avoid interference of the worst kind, the radioists send out waves of *different lengths*. Waves have length—and they are not spoken of as being so many feet long, or so many yards, but so many *meters*. Thus amateurs send on a wave length of 200 meters and less, broadcasting stations from 285 to 485, and government stations on 800 meters.

Whatever type of aerial you may put up, it will possess a neat little wave length all its own. It may be from 75 to over 200 meters, and may be determined beforehand by working out a well-known formula. If you had just a detector and a pair of phones attached to the end of your aerial, you would be limited to the reception of only those wave lengths which were the same as the natural wave-length of the aerial. Poor chance of ever getting anything with an arrangement like that. It is

"Radio will make this a bigger, better world."—Hoover.

apparent that you must have some means of raising or lowering the wave length of the aerial so that your receiver will respond to a wide range of stations.

This is done by means of a tuner. The tuner, as most of us know, is a coil of wire connected to the aerial and the ground, and forming the primary circuit of a receiving hook-up. All tuners—with the exception of block coils, such as honeycomb and spider—have some means whereby the number of turns of wire which are included in the circuit may be controlled. Either a slider or a dial will accomplish this; and by manipulating these devices you put your set in resonance—to use a word which means exactly the same as tuning—with as many different wave-lengths as the size of your coil will allow.

Hereafter, when you set out to tell anyone who is not familiar with radio why you are tuning in, say: "To place my set in resonance with the set which is sending out the music I want to get." Then they will understand, and, at the same time, give you credit for knowing what you are doing and why.

(Continued from preceding page)
coils, D-L 1250 and a D-L 1500, mounted so that they can be turned axially with respect to each other, thus varying the mutual coupling in order to definitely control the amplitude of the locally generated oscillations. It is highly recommended that a good make of mica condensers be used with these coils. If it is not possible to obtain .002 microfarads capacity in a single condenser, then such a capacity can be made up of two .001 microfarad condensers connected in parallel.

Although, as I have previously said, it is quite possible to make such an outfit extremely compact and portable by using a dry-cell type of vacuum tube with a low B-battery potential, still if the receiver is not to be moved about often, I would advise that a hard tube with a high-plate voltage be employed instead of the soft tube. With this set, a UV-202 tube with 200 volts, or thereabouts, on the plate will give far better volume and results in general than a UV-200 or UV-201. Naturally the average amateur will object to this on the ground that it is next to impossible to get a cheap reliable source of high potential that will stand the current drain of a power tube; but such is far from the actual fact. Small storage-cells for plate potential batteries can not only be purchased at an extremely reasonable price, but can be

made up by the amateur from \$10 to \$15 for a 150-cell battery (that is about 300 volts).

The general method is to obtain as many 1-inch by 7-inch test-tubes as there are cells, then cut from a 1/16th-inch lead sheet, strips about 1/2 inch by 18 inches in length for the plates. For the separators, a small stick of white wood may be placed between the two plates in each cell. Any type of device that will hold the cells rigidly in place, will suffice as a container for the whole battery; but as illustrated in Figure 2, it can be made up of ordinary wooden beams, bored just deep enough to make a firm resting place for the butt of the tube. This type of wooden base, or container, should be painted with at least two coats of black asphaltum paint in order to allay the eating action of the acid electrolyte. It is cheaper and safer to buy from some battery-service station, the electrolyte (dilute sulphuric acid) already mixed, then to endeavor to dilute concentrated sulphuric acid, which operation, if not properly done, will result in serious bodily harm to the mixer.

The potential of the terminal of the battery is determined by the initial potential of the first charge. Such a battery may first be charged and then recharged by either dividing the same into groups of three cells and connecting such groups in parallel with a 6-

volt D-C supply; or by dividing into groups of 55 cells, if a 110-volt D-C supply is available; or 110 cells for a 220-volt D-C system. The majority of amateurs will resort to the first method, using the same apparatus that they use to charge the 6-volt A battery. After charging has been accomplished, all the cells may then be connected in series for the regular B battery work.

I strongly recommend this type of receiver with a hard tube employing a high-plate potential. Under such conditions of operation, it is perfectly possible to receive from local stations using a loud speaker with a single vacuum-tube. For those who want the greatest possible results for the minimum amount of money invested, there is, possibly, no better style of vacuum-tube outfit to rival the superregenerative receiver employing one bulb. But the amateur who wishes an ultrafine receiver of the supertype, would do well to use a two- or three-tube outfit. The single-tube set is not as good, scientifically, as the multiple-tube regenerative. This is quite evident since we must sacrifice quite a bit of flexibility of control when we endeavor to make one tube play a dual role. Again I must say to anyone attempting to build any high-grade receiving apparatus that shielding must be perfectly accomplished if satisfactory results in sharp tuning are desired.

The Radio Primer

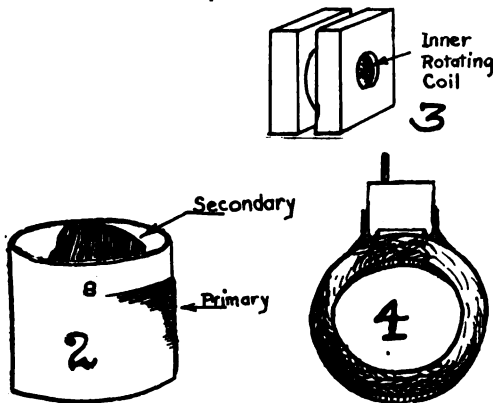
For Thousands of Beginners Who Are Coming into Radio Circles

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

What is a vacuum tube?

THE vacuum tube is a glass bulb shaped very much like the bulb of an incandescent lamp and of similar size. It contains three elements: grid, filament, and plate. It is called a vacuum tube because the air within it has been reduced to the lowest possible percentage.



In most of the present-day radio receivers, an instrument known as inductance, is employed to enable the fan, or novice, to operate his receiver on the different wave lengths. 2 is the variometer with its primary and secondary windings. 3 is the variometer used so much for the regenerative effect for amplification. 4 the honeycomb coil explained on this page. These instruments are important as they are mostly dealt with by the radioman.

What is the plate?

The plate may be either a wire mesh, a flat plate of nickel, or, as in some tubes, it may take a cylindrical form completely enclosing the other two elements.

What is the grid?

The grid is usually made of some fine wire mesh. It is a network of fine wire of tungsten, tantalum, or nickel, or a perforated plate of one of the same metals. One end of the grid is connected to the tuning coil and the other end is left free.

What is the filament?

The filament usually is made of finely drawn tungsten wire coiled in a spiral similar to the filament in the ordinary house-light. The filament is heated to incandescence by a 6-volt storage battery. The battery must not be over 6 volts.

What is a honeycomb coil?

In order to obtain the required

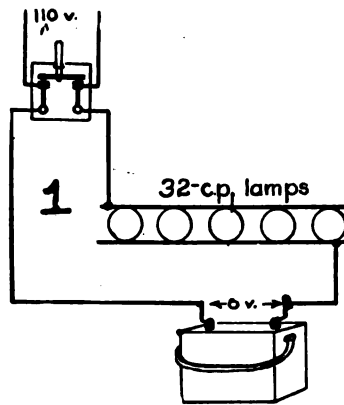
amount of wire for long wave-lengths it was found necessary to have large, or long, coils of bulky construction. Although at first thought it would seem preferable to wind the coils in more than one layer, radio engineers know that if this were done the final result would not be what it should be due to what is known as distributed capacity.

What is distributed capacity?

When the wires form a miniature condenser and these condensers are in their right places, they do not belong in a tuning coil—particularly when they are widely spread. So they are called “distributed capacity.” If the capacity were concentrated, the objection would no longer hold; but this is not so.

From what does the coil derive its name?

From the peculiar appearance of the finished coil. In winding inductances, none of the wires are ever parallel. They cross each other and always at right angles.



1 is a simple sketch showing the wiring diagram in connecting up a storage battery to the house current, when 110 volts direct current is available.

What is a variometer?

An instrument which serves to vary the inductance and the wave-length value of any circuit in which it may be used. It consists of a set of fixed windings and a set of movable windings, the latter being rotated on twin axes in the usual construction. When both sets of coils carry the current, or flow in the same direction, the variometer has the maximum inductance

Radio Hints

Useful Facts for the Beginner Who Wants to Know

FILAMENT rheostats are designed with a zero point which acts as a switch between the tube and the storage battery, but it sometimes happens that, in the hurry to close the station for the night, the rheostats are not turned off completely. This permits the storage battery in the circuit to discharge all night long through the resistance. To prevent this many fans have installed a separate switch, which, through practice, they accustom themselves to turn off before the rheostat is turned back to zero.

The increase in the use of the dry-cell tube is particularly noticeable. Up to a short time ago it was difficult to obtain these tubes, but the supply is now meeting the demand. For compact sets to be carried about in an automobile, or even in a pack on the back, dry-cell vacuum tubes are unusually well adapted.

All connections about a radio circuit must be soldered, but soldered correctly. There are some general hints that may be given, but judgment and experience are essential. The soldering copper must be clean and the tip well coated with solder. If the tip of the soldering copper is not bright it should be filed clean. It is then heated, care being taken that the tip is not in the soldering flux or paste, and the copper tip coated with solder. The wires are cleaned where the soldering is to be done, using fine sandpaper, then a small amount of soldering flux or paste is applied at the joint and the wires to be soldered are tinned or coated with solder before the wires are joined.

After the wires are tinned they are soldered together, using just enough solder to make the joint solid. The joint should not be jarred while the solder is still soft; to do so weakens the joint and gives the solder a dull appearance. A good soldered joint will be smooth and bright. All excess soldering flux or paste should be cleaned off. Gasoline or alcohol will assist in cleaning off the paste. This last point is sometimes overlooked, and the excess flux often causes the copper wires to corrode.

value or wave length. When coils are turned around so that the current flow in both sets is in opposite directions, the coils are said to be “bucking” one another. Then the inductance and wave length value are at a minimum.

De Forest Competitor Will Make "Movies" Talk

Device Invented by C. A. Hoxie, of the General Electric Company, Will Also Increase Scope of Broadcasting Entertainments

By B. S. Beach

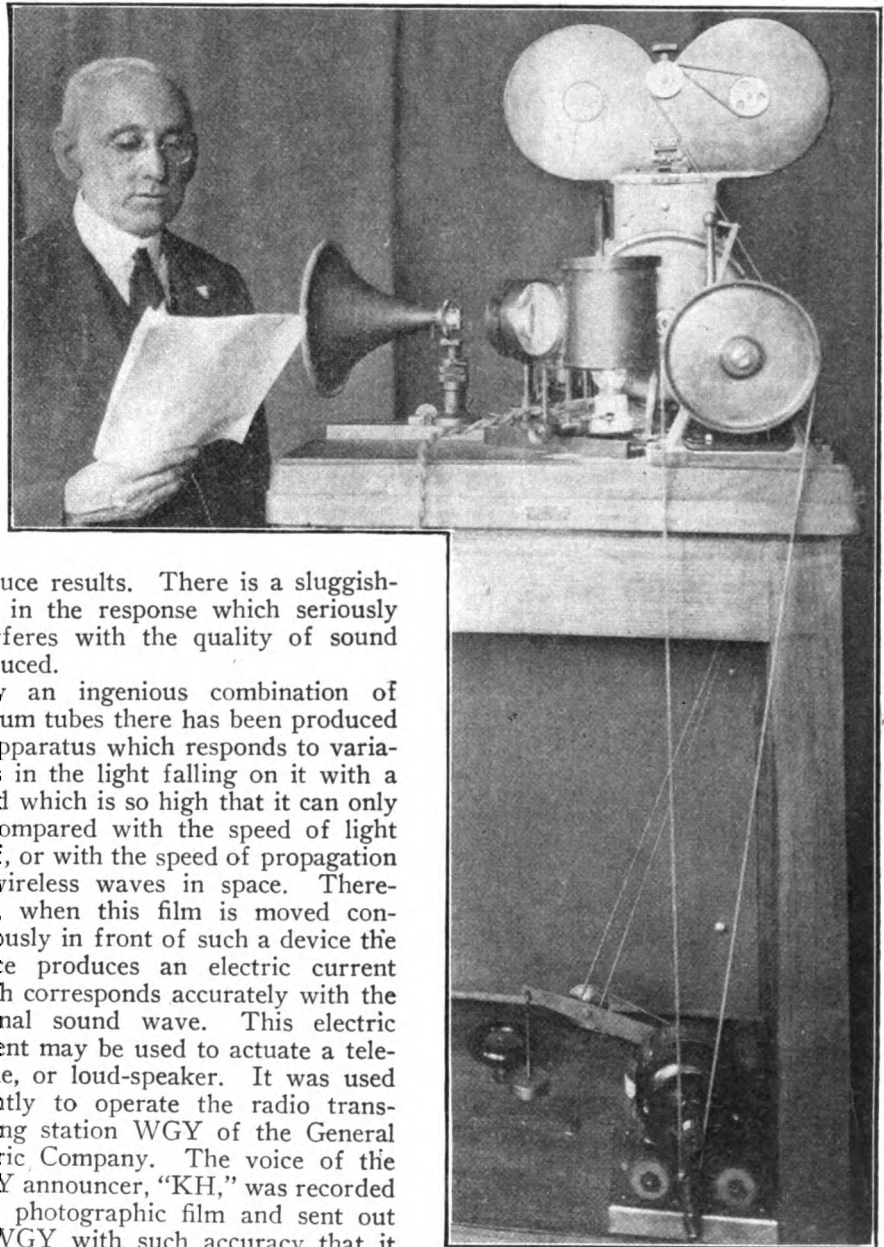
AN ingenious apparatus for recording sounds on a photographic film to such an extent that the sound may afterward be reproduced in ordinary telephones or loud-speakers has been developed in the general engineering laboratory of the General Electric Company, and brings immeasurably nearer the day of the practical talking-movie.

It also means a boon to radio broadcasting studios. From a central studio—say, in New York City—the world's greatest artists may sing or speak before this machine which produces the film. Copies of this film may then be made and sent to other stations and reproduced with clearness.

It is claimed that it makes possible the talking-movie, for on a film of normal width can be the picture of the voice of the actor as well as the photographic record of his action, both voice and action absolutely synchronized because they are part of the same film.

C. A. Hoxie is credited with the invention of the device. It is called the Pallo-Photo-Phone. The record is made by causing the sound waves to produce vibrations on an exceedingly minute and very delicate mirror. A beam of light reflected by this mirror strikes a photographic film, which is kept in continuous motion. The film, when developed, shows a band of white with delicate markings on the edges, which correspond to the sound which has been reproduced. On account of the exceedingly small size of the mirror and its low inertia it is possible, by this means, to produce a sound record which includes the very delicate "overtones" which give quality to speech and musical sounds. This has not been so successfully accomplished by any other method of recording sound waves.

The reproduction of the sound from the film is accomplished by moving the film in front of an exceedingly delicate electrical device, which produces an electromotive force which varies with the amount of light which falls upon it. In the past attempts have been made to produce these results by means of selenium cells; but a selenium cell, the inventor claims, though it responds to the changes in the amount of light which it receives, does not respond with sufficient promptness to



produce results. There is a sluggishness in the response which seriously interferes with the quality of sound produced.

By an ingenious combination of vacuum tubes there has been produced an apparatus which responds to variations in the light falling on it with a speed which is so high that it can only be compared with the speed of light itself, or with the speed of propagation of wireless waves in space. Therefore, when this film is moved continuously in front of such a device the device produces an electric current which corresponds accurately with the original sound wave. This electric current may be used to actuate a telephone, or loud-speaker. It was used recently to operate the radio transmitting station WGY of the General Electric Company. The voice of the WGY announcer, "KH," was recorded on a photographic film and sent out by WGY with such accuracy that it was impossible to distinguish it from his voice as ordinarily directly transmitted from the station.

Apparatus to be used to convert sound waves into vibrations and then recorded on a moving-picture film. When the film is developed it shows a band of white with delicate markings

Radiofacts to Remember—Signals

Signals which come in weaker than the critical point of the detector make no impression on the detector and, therefore, are lost entirely. No matter how many steps of audio-frequency amplification may be piled up after the detector, the signals which have failed to actuate the detector will not be heard. With radio-frequency amplification, there is, virtually, no critical point

and even the weakest signal is built up to the desired degree before it is passed on to the detector, there to be rectified to audio-frequency currents which, if desired, may be passed on through one or more stages of audio-frequency amplification in order to build up the signal strength. This is done when great amplification is needed by the operator.

Odd Ways of Identifying Stations

By *Washington R. Service*

BROADCASTING stations are coming to be known by the voices of their announcers, their slogans, and the stunts they perform in order to identify their stations, as well as by the cryptic call letters assigned by the Department of Commerce.

There is little romance or euphony in the letters WSB, but listeners-in are very familiar with the big gong which rings "Bong! Bong! Bong!" to announce the Atlanta "Journal." The unmistakable southern accent of the broadcaster announcing the "Voice of the South" is also an indication that WSB is sending.

As the radio enthusiasts well know, there are a number of other stations using identifying phrases and sounds. For example, the "Courier-Journal" and "Times," WHAS, Louisville, Kentucky, plays a few bars of "My Old Kentucky Home." WDAJ, the Atlanta and West Point railroad station, at College Park, Georgia, has uniquely established its identity by

blowing four blasts of a locomotive whistle. When you hear this in your receivers you may be certain that WDAJ is broadcasting. The Naval Station at Anacostia, D. C., NOF, is known by the deep bass voice of the announcer.

It is not only in the Southland that these slogans and phrases have become popular. In the West, for instance, is the Palmer School of Chiropractic, Davenport, Iowa. "This is WOC," the announcer states; "out where the West begins." Another station identifies itself with: "Out where the corn grows tall." The voice of the spokesman at WOH, the Hatfield Electric Company, Indianapolis, might confuse one at first. He has a southern accent similar to that of WSB in Atlanta. The pronunciation of the simple word "and" like "a-yand" would hardly seem to locate a station, but ask any one who has heard "Mister," KDKA, Pittsburgh. They will admit that the drawled "a-yand" is a most positive identification.

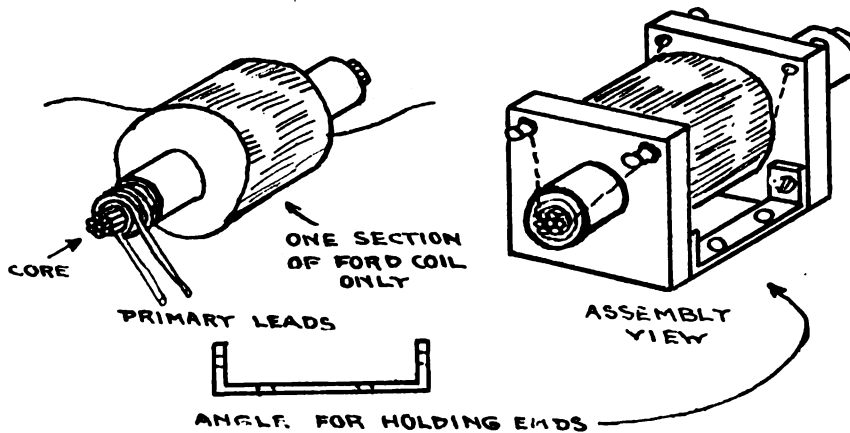
The voices of the evening storytellers are well known by the small radioites. Some of the broadcasters sound a signal on the telegraph key, giving their call or some single letter indicative of their station besides the customary announcing of the letters.

Methods of announcing the time also serve to establish who is at the transmitter. Those who hear the Louisville "Courier-Journal" say they like the method of telling the time, as the hour approaches, with a simple statement, "Ten o'clock," when the minute hand reaches twelve, better than the standard tick-system of the Naval broadcasting stations.

When the Detroit "News" signs off the exact time is given. This is a benefit to those who have not set their timepieces for the night. Probably the custom will grow rapidly, and familiarity with the voices of broadcasters all over the country, as well as the mottoes and slogans of stations, will extend the acquaintance of listeners-in with the voices of the air.

Utilizing Ford Spark-Coils for Audio-Frequency Transformers

By *Ortherus Gordon*



Illustrations to guide the amateur in making transformers of Ford spark-coils.

WHEN the time comes to supplement your detector bulb with amplifiers, you will need in addition to the bulbs, sockets, filament rheostats, and two audio-frequency transformers. Any amateur who wishes to avoid paying the price of these transformers may make them himself provided he can get hold of two old Ford spark-coils. Most cities have automobile wrecking companies. Such concerns always have some of

these coils on hand at a very low price. With a little care and discretion, the amateur can pull the coil apart so that he has the primary, the secondary, and the make-and-break device in separate pieces. This done, throw the vibrator into your spare-parts locker and proceed to construct the transformer with what is left. Leave the primary and the core just as they are, but remove one section of the secondary. Ford-coil secondaries are made in two sections.

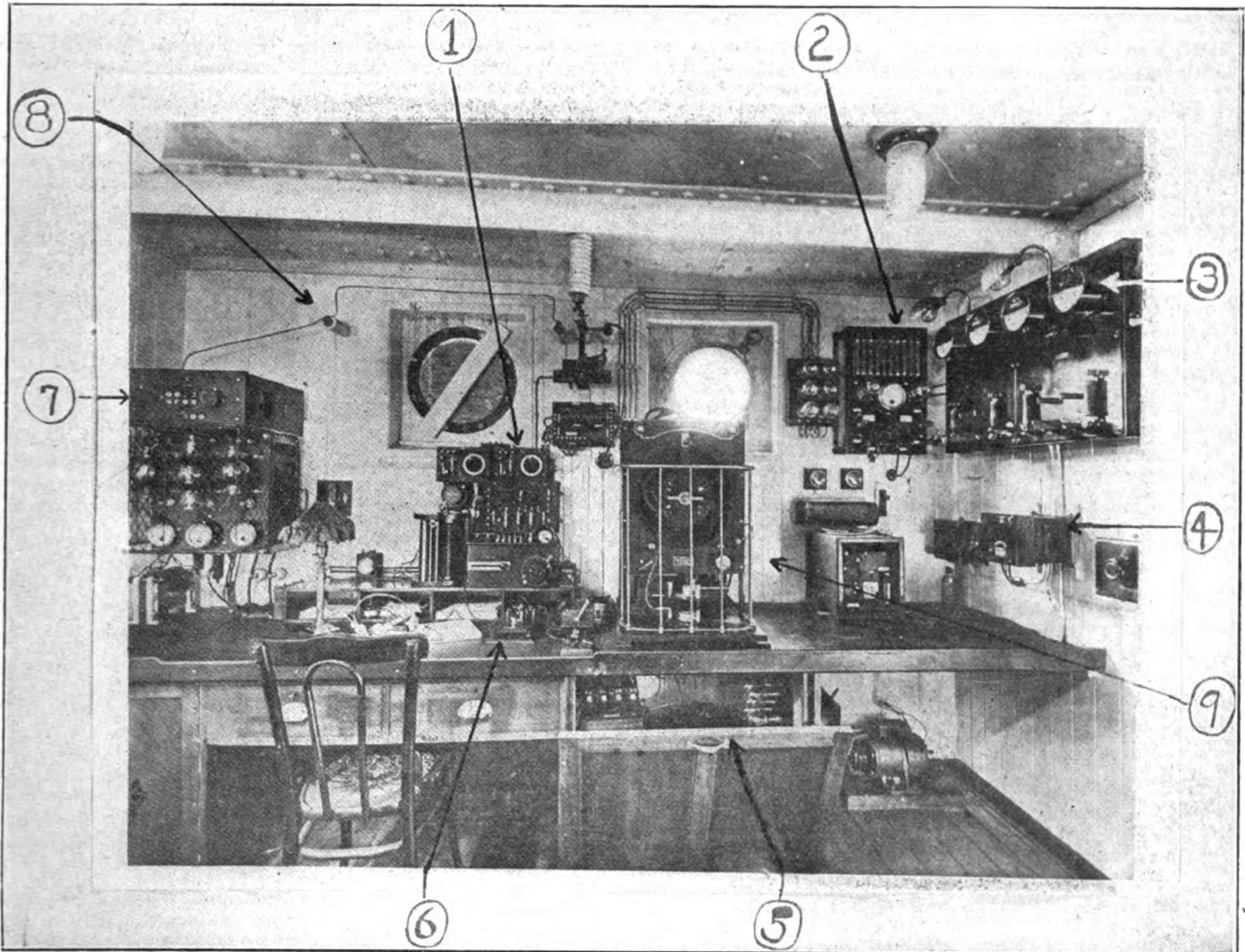
Place the remaining section in the center of the primary, bring the thin wires out free and block the ends with wooden partitions. Then you will have something similar to the design shown in the accompanying illustration.

Put two binding posts on one end and fasten the primary leads to them. The secondary leads may be taken and made fast to binding posts on the other end. A brass piece bent in staple shape, as shown, will serve to hold together the wooden ends and, at the same time, provide a means of screwing the finished transformer down to the table or baseboard. The whole makes a satisfactory audio-frequency transformer.

The Rheostat's Work

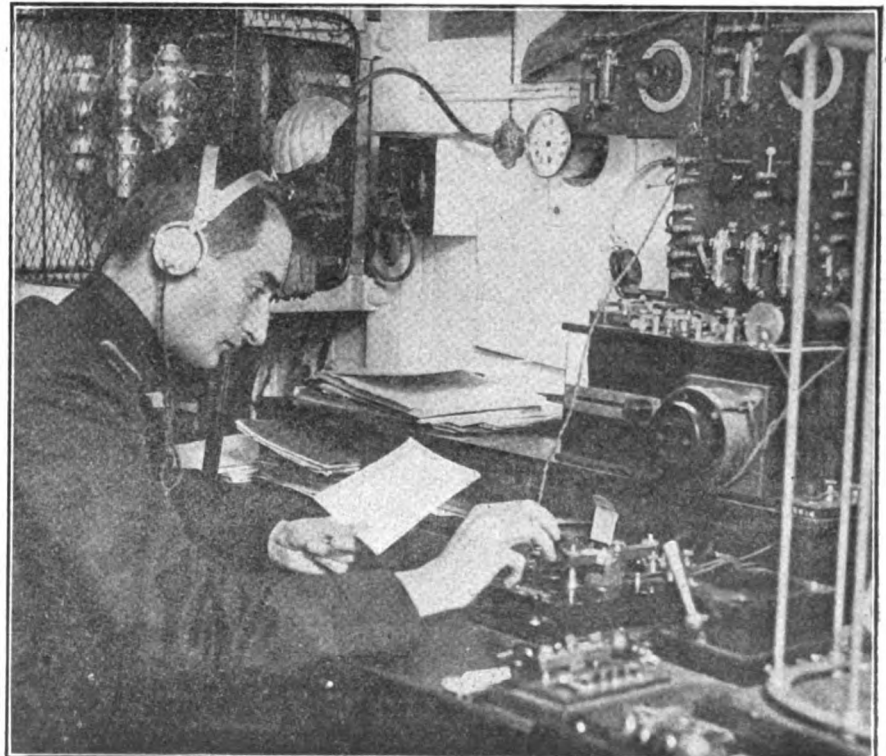
IN radio a rheostat connects the storage A-battery with the filaments of the vacuum tube. The rheostat is the valve which permits the operator to increase the electric current going from the storage A-battery to the filament. Rheostats are heat regulators. Heat drives off the electrons from the filament to the plate. When the tube shows a dull red glow the temperature is about 1800 degrees, and electrons are then beginning to be cast off. When the filament is white hot the temperature is 2050 degrees. As each degree of heat is increased from about 1800 degrees a tremendous increased proportion of electrons is cast off.

Elaborate Radio Equipment of the New Italian Liner "Julius Caesar"



(Both photographs C. Kadel & Herbert)

THE "Julius Caesar," the newest of fast ocean liners flying the flag of Italy, has one of the most modern radio sets on any passenger ship. Her transmitting and receiving equipment makes it possible for her to keep in communication with either continent when crossing the Atlantic. The photograph at the top shows the interior of the radio room. The numerals designate the various pieces of apparatus as follows: 1—The receiving gear. 2—Charging panel to keep the batteries charged in accordance with the laws of radio. 3—The main switchboard with its layout of meters. 4—The starting box by which the main motor-generator is set in motion to operate the main transmitting set. 5—The noise-proof cabin where the motor-generator is placed. 6—The main telegraph-key to operate the transmitter. 7—Continuous-wave (C-W) transmitter. 8—The wall; sometimes called the "deck insulators." 9—The wave changer which makes it possible to work on various wave-lengths. These cover all the important parts of the station. The illustration at the left shows Joseph Garosi, first radio operator, sending a radiogram in mid-ocean.



It is of utmost importance to employ all this equipment. When it becomes necessary to work long-distance (DX work) in order to clear the ship's daily traffic of messages, the continuous wave (C-W) transmitter is "cut in" the circuit and used. Not only does this transmitter enable the operator to cover a long range, but, at the same time—due to the wave being continuous—eliminates much of the interference that is found in undamped transmitters. Another feature of the C-W transmitter is this: It functions best when employing the higher wave-lengths. Usually 600 meters are used, but there are times when the transmitter is shifted to operate on a 2400-meter wave-length.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

RADIO was utilized successfully by a ship's surgeon on the high seas to secure advice for a passenger suffering from heart trouble. Henry W. Kibbe, an official of the Cadillac Motor Company, recently went to Argentine on the Lamport & Holt liner, "Van Dyck," for his health. He was suddenly stricken with rheumatism of the heart. On the return trip he was under the constant attention of two nurses and the ship's surgeon, Dr. A. R. Jenkins, who daily used the ship's radio in consultation with the best heart specialists in the United States in order to safeguard Kibbe's life. The patient was taken to Flower Hospital after the "Van Dyck" docked in New York City.

* * *

So many requests for assistance in solving radio problems have reached the Central Technical School, Toronto, Canada, that a special night-class has been started for instruction in building, operation and general care of radio receiving sets. There is a complete receiving-set in one of the electrical rooms and considerable research work is being done. Two hundred students have a good all-round knowledge of practical radio and are able to construct parts, in addition to efficiently handling receiving apparatus.

* * *

Legislation is about to be enacted in Chili, putting radio on a basis similar to its control in the United States, with broadcasting stations maintained by private enterprise.

* * *

A committee of radio experts in France, which have been conducting research with telegraphy on moving trains on the Paris-Orleans line, reports that its efforts have met with success. A small portable apparatus was used, and long-distance signals were clearly received while the train was moving at high speed. During their experiments members of the committee set up apparatus at some of the stations on the tour and invited farmers and others to listen-in.

* * *

The American Radio Relay League operating department will conduct the third series of transatlantic tests with the co-operation of the English, French and Dutch amateurs in December this year. While no definite dates for the final tests have been decided upon, pending suggestions from England, France and Holland, the probable dates are December 12 to 31, inclusive. During the first ten days of the tests American and Canadian amateurs will transmit signals for reception in England, France and Holland. The best American transmitters, as determined by reception reports from the European amateurs, will be selected to broadcast the result of the reception of signals transmitted by English and French amateurs during the last ten days of the tests, the same as MUU and WII did last year. Transmitting will be from 7 p. m. of one day to 1 a. m., the following day, during the first ten days; "listening-in" will be from 8 p. m. of one day to 2 a. m., the following day, in the second ten-day period.

Two Wizards of Electricity Meet



(C. International News Reel)

Thomas A. Edison and Dr. Charles P. Steinmetz, chief consulting engineer of the General Electric Company. Dr. Steinmetz is showing Mr. Edison a piece of wood which, but a few moments before, he had gouged from a limb of a tree with his new artificial lightning-making machine.

Weather forecasts sent out by the National Meteorological Office, France, for the benefit of agriculturists, are received on radio sets installed at parish schools or gendarmerie stations, at a cost of 200 francs. Weather warnings are given locally by sounding a bell.

* * *

A series of New England Radio Nights to take place during the fall and winter months, is the latest announcement in the broadcasting programme of the Amrad station. It is planned to devote specified meetings at periodic intervals to certain organizations who will be responsible for the programme during the time allotted.

* * *

Over two hundred Rochester, New York, radio fans have formed the Rochester Radio Telegraph Club, the object being to study the continental Morse code used in the transmission of radio signals. Headquarters have been established at 36 South Avenue. David Ryan, former navy radio instructor, stationed at Pelham Bay, New York, during the World War, will be the instructor.

* * *

The United States is now divided into eight radio districts with a radio inspector under the Department of Commerce in charge of each district. Radio inspectors have offices in Boston, New York, Baltimore, Savannah, New Orleans, Detroit, Chicago and San Francisco. The Department of Commerce has licensed about 20,300 stations, and of this number 3,575 are ship and commercial land stations, 11 trans-ocean, 560 special land stations such as colleges and experimental stations, 565 broadcasting stations and 15,780 amateur stations.

* * *

Montclair, New Jersey, has installed in its high school an aerial equal in size to some of the broadcasting stations. The receiving set is in the physics department and many of the pupils are licensed operators.

* * *

A radio station at Madras, India, will probably be converted into highspeed automatic plant for operation inland and also to Rangoon.

* * *

Over 18,000 ex-service men and women are receiving instruction in radio in the Knights of Columbus schools, New Haven, Connecticut, in special radio classes organized by the K. of C., and through the Knights' correspondence school. The latest figures compiled show that those taking courses in auto-mechanics under the same auspices approximate 35,000; but the proportionate increase in the popularity of the study gives radio a large increase over figures of 1921.

* * *

T. R. McElroy, of Boston, who won the receiving contest in Boston recently, broke his own record with a speed of fifty-eight words per minute, with five errors.

* * *

Portugal has awakened to radio! Consul General Hollis, Lisbon, reports to the Department of Commerce that by a recent bill the Portuguese government is authorized to contract with the Marconi Wireless Telegraph Co., Ltd., for a system of radiotelegraph and radiotelephone stations in Lisbon, the Azores, Madeira, Cape Verde, Angola and Mozambique. The bill provides that this authority must be exercised within three months from the date of approval so that all installations may be complete within four years. The Marconi Company must bind itself to organize a Portuguese radiotelegraph and telephone company, the board of directors of which shall be composed of seven members, five of whom shall be Portuguese citizens. At least two-thirds of the capital of the new company is to be reserved for subscription in Portugal. If this portion of the stock is not subscribed, the unsubscribed portion may be taken up by the government or by any other interest.

* * *

Over 2,000 hours of operating time, conservatively estimated to be worth \$150,000, has been saved to navigation interests in the Great Lakes in a single season by radio advice as to weather conditions.

* * *

All ships sailing from American harbors, and carrying fifty persons or over, are required by law to maintain and operate a radio set capable of covering at least 100 miles.

* * *

The broadcasting station of Spokane, Washington, has decided to suspend operations two nights a week so that owners of sets there may hear concerts from outside points.

Radio and the Woman

By
Crystal D. Tector

SINCE the last number of RADIO WORLD went to its readers, I have been besieged with telephone calls in regard to National Radio Week. It is too early for letters, but I expect that by the time I sit down to indite my next "copy" for this department, I will have heard from a great many of you—and I shall try to answer you all as cheerfully as I know you will write me. In fact, I have taken Friend Husband's advice, and engaged a secretary. She will open and sort my mail, and I shall dictate to her, as speedily as possible, answers to all letters that come to me, so there will be no delay. I will gladly help you to perfect any arrangements you have in mind to make The Week a huge success.

* * *

We—and when I use that much abused pronoun—I mean a partnership with all radioists who have the best interest of National Radio Week at heart; well, we want this very important event to extend as far as possible—even into every town in the United States. It does seem to me that it should be made a week of social functions—radio dances and dinners and parties—and even radio teas. I can imagine nothing more attractive than a beautiful reception room, flowers and greens everywhere, pretty girls as hostesses, and a receiving set hidden somewhere "exhaling" the most wonderful dance music with songs and recitations in between.

* * *

Teas are very much in vogue, here in the East. In fact, they have become one of the most popular forms of social pastime. The men seem to like them—and although they usually begin about four o'clock in the afternoon they frequently run far into the night. Recently a very charming friend of mine, who is noted for her social affairs, invited me to one of her teas. It was very gay, but she seemed to think that something new would have to be created in order to keep up the interest in such affairs.

* * *

I suggested to her that she give another tea and let me bring my radio set. Well, she knew as much about radio as a kitten, and when I asked her if there was an antenna on the roof, she replied that she didn't know because she "sent all her washing to a laundry!" However, that part of it has been overcome. She lives right in the heart of the most thickly populated

section of New York City and pays a rent that would stagger some of us. So, her landlord found no objection when the matter of erecting an aerial on his roof was finally explained to him. She became so anxious that she wanted to give the radio tea within two weeks. The most attractive cards had been prepared and were all ready to be mailed, when I prevailed on her to postpone her event until National Radio Week. She demurred—wanted to be first in the field and all that sort of thing; but when I told her how gay and festive and full of wonder that week would be, she gladly capitulated, and put it off.

* * *

She has asked me to be "hostess of honor." The event will take place on Tuesday afternoon, December 26. The invitations have been designed by a clever artist. The design is a pretty girl sitting before a receiving set and over the invisible ether comes a voice, represented by tiny waves, which is asking, "Will you come to my radio tea?" In one corner are the hostess' name and address, and the date. It is all attractive and neat, and very much in keeping with both radio and what the society reporters are pleased to call "A swell affair." Being a generous person, she has told me that I may go to any cost—and she will foot the bill—if I need anything to improve my set. "Get two sets, my dear, if you need them," was her *naïve* remark!

* * *

Friend Husband says that I will wear myself to a frazzle with all I have to do to make her affair a success. He always throws cold water on things I undertake—at first—but he always comes around when I succeed; and I generally do. And I am going to see that this affair does not slip up in any way.

* * *

I was mentioning the many telephone calls I have had regarding National Radio Week. I did not mind answering one of them—even if one—a man, at that—called one chilly night at one a. m., and—Friend Husband answered the call! He didn't say anything—just looked! My late 'phone caller wanted to know if I could suggest his name for a position as publicity disseminator. Don't blame the man. He is just a good example of the American spirit. He thought he saw a chance to make some money, and he wanted to be "Johnny on the spot." That man will succeed.

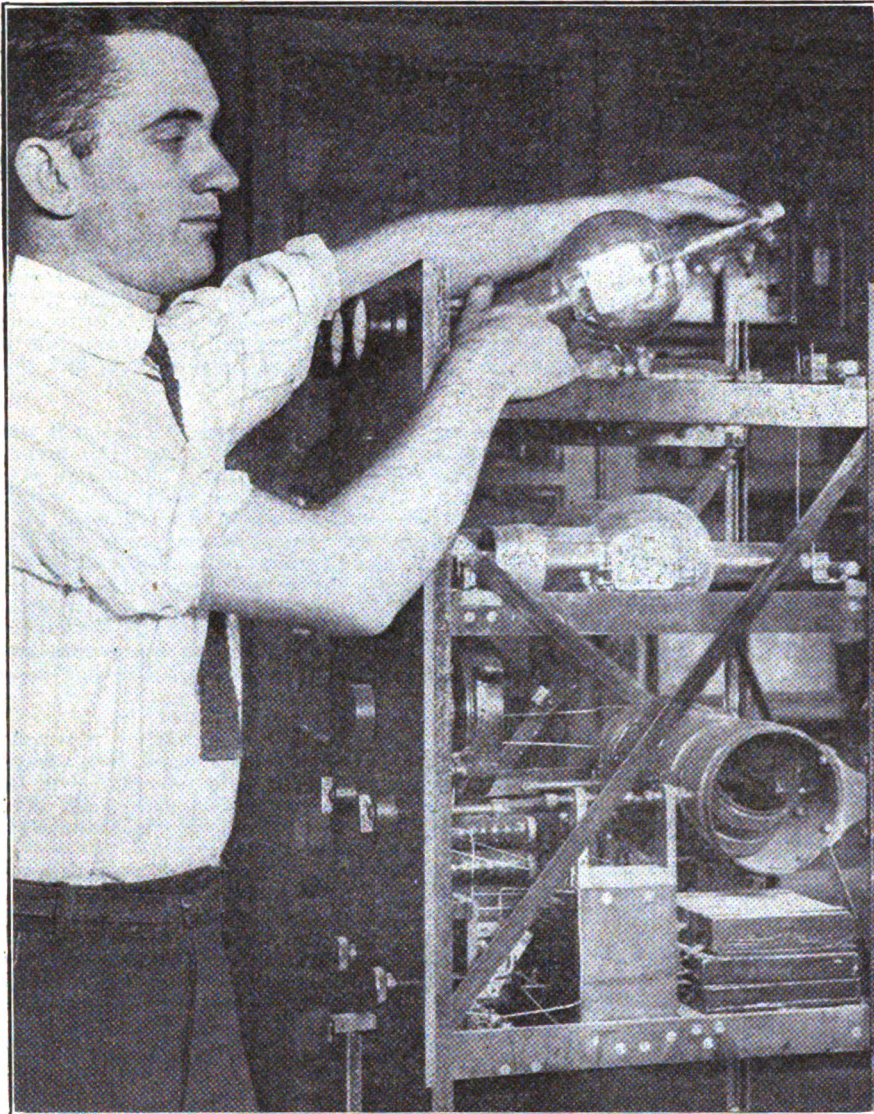
Boy Scouts Will Listen to Radio at Any Time



(C. International News Reel)

Remarkable photograph of a troop of Boy Scouts listening in while a broadcast story is coming over the ether. It is claimed that no other form of entertainment so deeply interests and holds the attention of boys.

Latest News-Photos Week in



(C. Kadel & Herbert)
(Above) The 1-kw. (C.-W.) telegraph transmitter shown in this photograph is used in Professor J. N. Morecroft's radio laboratories at Columbia University, New York City. Its output is as powerful as that of the leading broadcasting stations. Charles J. McCarthy is seen replacing one of the big vacuum-tubes.



(C. International News Reel)



(C. Kadel & Herbert)
(Above) A Y. M. C. A. class in high-speed code receiving. To become proficient in this phase of receiving requires considerable study and patience. The photograph shows J. L. Hornung, instructor of the class, giving some of the students under him an hour of hard work. Mr. Hornung is using a vibroplex high-speed key, used only by expert operators for transmitting signals. It is known as a "time-saver" when fast transmitting has to be done. These keys are used in all large radio-stations in the United States. It takes the average student about a year to learn code, although some have perfected themselves in six months.



(C. Central News Photo Service)
(Above) The interior of the after cabin of the flying boat Miami, Florida; Cuba, and the West Indies. The photograph in a small space, but the completeness of it has rendered the "boat." Note the big loop aerial and the receiving set. To withstanding the noise made by the propellers of the flying boat is distinctly heard.

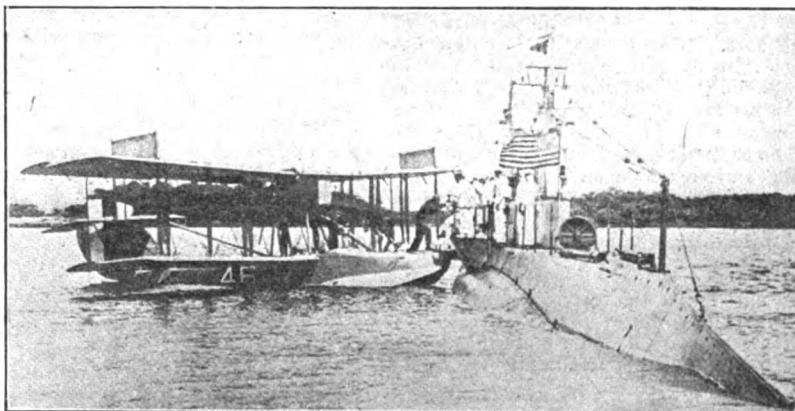
otos of a Busy Radio

(Right) When the Prince of Wales recently sent a radio message to the Boy Scouts of Great Britain, the event was regarded as something of unusual radio importance in his country. The prince has become a radio fan and has induced his royal father to install a set in St. James Palace. The photograph shows a company of Scouts listening to the message.



(C. Central News, Ltd., London)

(Left) Thomas A. Edison, on his first visit in twenty-five years to the General Electric Company's plant at Schenectady, New York, was introduced to some of the most recently developed tubes used in connection with radio broadcasting and reception. Mr. Edison is shown in the photograph with the new Langmuir 20-kilowatt vacuum tube which successfully hurled a radio message across the Atlantic, at the left is George F. Morrison, vice-president of the General Electric Company, in charge of the Edison lamp works at Harrison, New Jersey. In the center is Dr. Irving Langmuir, radio research engineer, of the General Electric Company, who invented the 20-kilowatt tube.



(C. Kadel & Herbert)

(Above) The first passenger in the world to be transferred to a submarine from an airplane was Secretary of the Navy Edwin L. Denby. The submarine was summoned to its position by a radio message from the airplane.

(Right) Alan Edwards, formerly a radio engineer, is now singing and acting his way to fame in "The Gingham Girl," one of New York's successful musical comedies. He is the proud possessor of one of the smallest radio sets in the world. It has a two-bulb regenerator honeycomb-coil, a detector, a two-stage amplifier, and can be tuned to 2,500 meters. It is built into a soap box which is covered with leather—the finished article closely resembling a camera. At a recent radio show in New York, this set won first prize. Between the acts of every performance, Mr. Edwards entertains the other members of the company with concert music and other broadcast numbers. By leaving the door of his dressing room open, the broadcast program wafts through the "back of the stage" area. Mr. Edwards, as one may surmise, built his prize set. He has also built similar sets for Richard E. Enright, Commissioner of Police, New York City; Miss Pearl White, the moving picture star; Miss Nora Bayes, singer of popular songs; and others. He is a young man of many talents and a staunch believer in radio.

(C. Central News Photo Service)



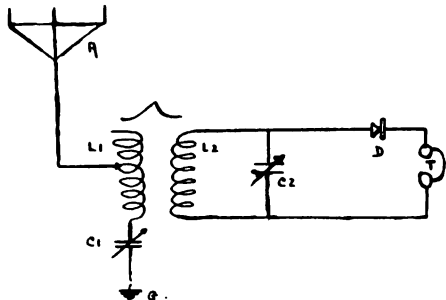
Buckeye, operating between
ows a lot of radio apparatus
icient service on the popular
erators are in charge. Not-
st, reception—even music—

Answers to Readers

I WISH to construct a two-tube super-regenerative set and am in doubt about the vario-coupler. Would an inductance do, and would it work better than a vario-coupler? The inductance to which I have reference, is wound on a tube 3 inches in diameter and about 8 inches long. The wiring is started in the center of the form and 80 turns are wound for the tuning inductances, tapped at 5, 10, 15, 20, 25, 30, 45, 50, 60, 80. Adjacent to the tuning inductance is wound the feed-back, tapped at 10, 20, 30 and every tenth turn until the 100th turn. I am using this coil satisfactorily in a regenerative set. I would like to use this coil because I cannot get a hundred turns on a rotor, as it isn't large enough. Would a smaller wire do?—Müller Hotchkin, Wichita Falls, Texas.

You will not get very satisfactory results with the tuning coil and feed-back wound on the same tube. With an arrangement of this sort, coupling cannot be secured perfectly. This is a very important function with the superregenerator. I would suggest that you rewind the secondary with a smaller wire, or you might try placing the variometer in series with the rotor coil having the variometer in an inductive relation to the vario-coupler. Its exact position as regards to the vario-coupler must be determined by experiment.

I have a crystal set, and would like to see a schematic diagram of the hook-up. I believe I have made a bad connection somewhere which makes it impossible for me to hear. Will you help me out?—Joe Thompson, Bar Harbor, Maine.



Schematic design requested by Mr. Joe Thompson, Bar Harbor, Maine.

The accompanying sketch shows the correct hook-up for a crystal set. When connecting your instruments, be sure to get the connections right.

I wish to construct a crystal receiving-set employing a double-slide tuning coil, and a variable condenser in the aerial lead-in with a fixed-phone condenser. It is desirable that the coil be as short as possible, but long enough to insure the reception of 400 meters. Assuming a properly installed aerial 100 feet long, with a 30-foot lead-in, what should be the diameter of the coil and how long the winding? Would a coil wound on a solid wooden block be as efficient as one wound on the regulation cardboard tube? If so, would a coil wound on a flat wooden block of equal circumference be equally as efficient?—Charles Manning, Toledo, Ohio.

Your coil should be about 3½ inches in diameter and wound for 3 inches of its length with No. 22 wire. A solid core is not as efficient when it is round and, therefore, a flat wooden block is much less efficient than a round one.

My set consists of a loose coupler, a crystal detector, a fixed condenser, a head set of 2,200 ohms, and a one-wire aerial about 100 feet long. The primary of my loose coupler is 8 by 4 inches, and has 253 turns of No. 22 enameled wire. The secondary is 6 by ¾ inches, and has 240 turns of No. 24 covered enameled wire, with 72 taps taken off every 20 turns. What broadcast stations should I get? How far can I receive? What is my approximate wavelength?—Nicholas Mikoff, Salt Lake City, Utah.

It is quite impossible to tell your range, and guarantee the stations you will hear. Sets of the type you have generally have a maximum range of 25 miles. You should hear the broadcasting stations near you within this radius. Your maximum wavelength is, approximately, 1,500 meters.

Can I use an Arkay horn with my galena set? I have one pair of phones—and my wife and two children must look on.—Herbert Harrison, Floral Park, N. Y.

Unless you hear the music a foot from the phones, it would be very little use to install a horn. It would be better to buy two more pairs of phones, hook them all up in series, and hand one to each member of the family.

I have a regenerative set and am using an aeriotron detector tube. What parts will I need to amplify it one step? Is it necessary to disconnect the B battery when the set is not in use?—Edgar Smith, Pasadena, Cal.

You will need an amplifying transformer, a tube socket, an amplifier tube, a rheostat—preferably a good rheostat—and a 45-volt variable B battery.

I am making a variometer at home, but I find that it is difficult to make a ball-shaped rotor without a turning lathe. Is a cylindrical rotor as satisfactory? I intend to use the variometer to tune the plate circuit to make my set regenerative.—Arthur Beal, Flatbush, N. Y.

In order to produce regeneration, the control of the tuning in the plate circuit should be unusually fine. This means that the two windings of the variometer should be as close together as you can make them. For this purpose, a ball-shaped rotor is far superior to a cylindrical rotor. In a variometer of the latter type, the two windings are eccentrically coupled and the control of the inductance less fine. Some amateurs improve their cylindrical rotors by building them up with strips of paper, gradually decreasing the width of the strip as it is wound on.

Who is NOM and where located?—Paul Reiser, New York City.

Probably you heard NOF, the Naval experiment station at Anacostia, D. C.

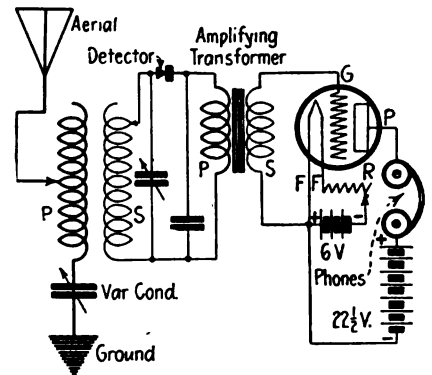
What are the advantages of a vernier rheostat?—Frank Malone, Pawtucket, R. I.

A vernier adjustment is absolutely imperative in a regenerative receiver in order to get what is known as the zero-beat adjustment for the reception of radio-telephony. This is the adjustment at the point where there is no self-heterodyning in your set, or between the set itself and the carrier of the transmitting station. It is the point where the music is purest and freest from distortion, and may be obtained only by a very minute adjustment.

Will a tin roof beneath my aerial have any effect on the signal? How will this effect long-distance receiving?—John Mohaupt, Omaha, Neb.

With a tin roof under your aerial some of the signal strength will be absorbed by the metal. It is more or less a means of bringing your ground up to the roof. By all means keep your aerial and lead-in free from all metal structures. It will be noticed that with a properly erected aerial, free from any metallic structures, and a short lead-in, there should be satisfactory reception. Do not try to hear distant stations all in the first week. Learn your set and the direction from which the loudest signals come and make changes accordingly. By all means be patient with your set. One wrong connection will make the whole set sound like a boiler shop.

I understand that an amplifier may be connected to a crystal-detector set. Is this possible? If so, will you publish a diagram showing how it is done?—Peter Lesser, Phoenix, Arizona.



Schematic design requested by Mr. Peter Lesser, Phoenix, Arizona.

Your understanding is correct. An amplifier may be used with a crystal detector. The accompanying diagram shows how. Be careful of the connections.

I intend to change my crystal set to a bulb set. Is the 2½-bulb as efficient as the usual type of detector? What kind of a B battery is required?—Paul Luke, Montclair, N. J.

You can change this set very easily, but the tube to which you refer is the 1½-volt type, the Aeriotron tube. This tube is just as good as the regular kind. The B battery should be about 22½ volts. Sometimes, however, slightly less is found to be an improvement.

How are the rotor and stator of a variometer connected? Is a regenerative set composed of a vario-coupler and two variometers? Why is it that I can only hear WJZ at the same place that I hear WVP?—Frank Ludwig, New London, Conn.

The rotor and stator are connected in series with each other. The two-variometer set is the most efficient. You will sometimes hear WVP, although on a 1,450 meter, on one of its harmonics, which is about 360 meters, is same as that of WJZ.

If U-V 201 tubes are used on the super-regenerative set, what adjustments are required?—Fred Nagel, Port Richmond, S. I.

If you use U-V 201 tubes in place of 202, it will be necessary for you to cut down on the amount of the plate voltage. In that event we suggest that 80 volts be used on the plate circuit of the first two tubes and 120 volts on the plate of the third tube. No other change is necessary.

Building Your Own Fixed Condenser

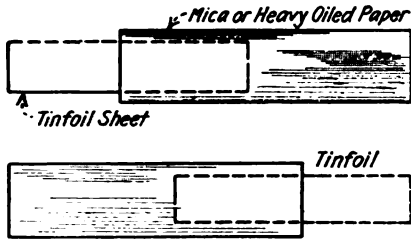


Figure 1—How the tinfoil should be placed. Dotted lines indicate the tinfoil. Even lines indicate the mica. Drawn by S. Newman.

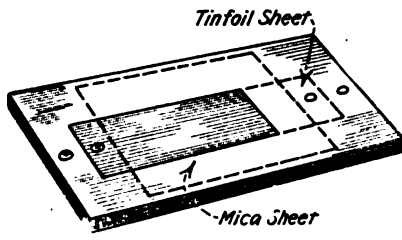


Figure 2—Showing how the tinfoil rests upon the mica. Drawn by S. Newman.

FOR the best results with a receiving set, be sure to have a small fixed condenser connected across the head set. A fixed condenser of this type is very easy and simple to construct; but some care must be taken to smooth out the tin foil to avoid blisters and the sheets must be uniform. A condenser for this purpose may be made by most anyone. By securing the following material, you will have, approximately, the capacity of a .002 mfd., condenser. Purchase 7 sheets of tin foil, 1½ inches long by ¾ of an inch wide; 7 sheets of mica, 1 inch wide by 1¼ inches long; the

mica running about three-thousandths of an inch in thickness. Place a piece of mica on the table. Next take a piece of tin foil and lay it in such a manner that it laps over, as shown in Figure 1. Follow these operations until you have alternated the tin foil strips each time. Here you will notice that, when completed, there will be 3 tin foil taps on one side and 4 on the other. By bunching each of the tin foil laps on each side, they may be connected to a binding post and the other sides bunching to another binding post. They may be compressed and placed in a box ready for any receiver.

Frequency and Wave Length Tables

W. L.—Wave Lengths in Meters. F.—Number of Oscillations per Second. O. or √ L. C. is called Oscillation Constant. C.—Capacity in Micro Farads. L.—Inductance in Centimeters. 1000 Centimeters = 1 Microhenry.

W.L.	F.	O. or L.C.	L.C.
50	6,000,000	.839	.7839
100	3,000,000	1.68	2.82
150	2,000,000	2.52	6.35
200	1,500,000	3.36	11.29
250	1,200,000	4.19	17.55
300	1,000,000	5.05	25.30
350	857,100	5.87	34.46
400	750,000	6.71	45.03
450	666,700	7.55	57.00
500	600,000	8.39	70.39
550	545,400	9.23	85.19
600	500,000	10.07	101.41
700	428,000	11.74	137.83
800	375,000	13.42	180.10
900	333,300	15.10	228.01
1000	300,000	16.78	281.57
1100	272,730	18.45	340.40
1200	250,000	20.13	405.29
1300	230,700	21.81	475.70
1400	214,300	23.49	551.80
1500	200,000	25.17	633.50
1600	187,500	26.84	720.40
1700	176,400	28.52	813.40
1800	166,670	30.20	912.00
1900	157,890	31.88	1016.40
2000	150,000	33.55	1125.00
2100	142,850	35.23	1241.20
2200	136,300	36.91	1362.40
2300	130,430	38.59	1489.30
2400	125,000	40.27	1621.00
2500	120,000	41.95	1757.70
2600	115,300	43.62	1902.00
2700	111,110	45.30	2052.00
2800	107,140	46.99	2207.00
2900	103,450	48.66	2366.30
3000	100,000	50.33	2533.20
4000	75,000	67.11	4504.00
5000	60,000	83.90	7038.00
6000	50,000	100.7	10130.00
7000	41,000	117.3	13630.00
8000	37,500	134.1	18000.00



WHEN you buy a Magnavox, you are not just buying a horn connected to the ordinary telephone receiver. The electrodynamic principle involved in the construction of Magnavox Radio is recognized as the only satisfactory principle by which a reproducer may be constructed.

With the Magnavox, the incoming signal is electrically amplified—the horn or bell merely projects this amplified signal into the air.

R-2 Magnavox Radio with 18-inch horn



THIS instrument is intended for those who wish the utmost in amplifying power: for large audiences, dance halls, etc., but requires only .6 of an ampere for the field.

Price, \$85.00

R-3 Magnavox Radio with 14-inch horn

SAME in principle and construction throughout as Type R-2. Is ideal for use in homes, offices, amateur stations, etc.

Requires one ampere field current from your filament battery.

Price, \$45.00



Magnavox Power Amplifier—Model C

CAN be used with any "B" battery voltage which the power tube may require for best amplification.

AC-2-C, 2-Stage.....\$80.00
AC-3-C, 3-Stage.....\$110.00

Magnavox products may be had of good dealers everywhere.

Write to us for illustrated booklet

The Magnavox Company
Oakland, California
New York Office: 370 Seventh Ave.

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

Let "Radio World" Test Your Goods



MANY buyers of radio goods have been "STUNG." At some time they bought something that was not right or would not work.

Inexperienced manufacturers have rushed into the manufacture of radio goods in the past eight months while the public in its eagerness to buy has been willing to take almost anything. Buyers are now twice shy and cautious. They want to **KNOW** the goods are right before parting with their money.

Our seventy thousand radio buyers who read **RADIO WORLD** each week, have faith in it. They know that **RADIO WORLD** does no merchandising, has nothing to sell, that its opinions cannot be bought. Therefore, **RADIO WORLD'S** endorsement means something.

Manufacturers, send a sample of your goods to our Technical Editor, Fred Charles Ehlert, 9006 Pleasant Street, Queens, Long Island, N. Y. It will be carefully tested and returned. If your goods satisfy our experts, **RADIO WORLD'S** endorsement will be published in our merchandise department without charge or obligation of any kind on your part. When the radio purchaser sees a published test in **RADIO WORLD** with the seal accompanying this editorial attached, he will know that the product stands for perfection and has the guarantee of **RADIO WORLD**.

22 Exhibitors Already for American Radio Exposition

TWENTY-TWO representative manufacturers have already contracted for space in the American Radio Exposition to be held at Grand Central Palace, New York City, December 21 to 31 inclusive.

These firms are the following:

- Western Electric Company, Inc., New York City.
- Radio Corporation of America, New York City.
- C. Brandes, Inc., New York City.
- National Carbon Company, Long Island City, New York.
- Novo Battery Company, New York City.
- Sleeper Radio Company, New York City.
- General Insulate Company, Brooklyn, New York.
- Sound Wave Corporation, Brooklyn, New York.
- Pacent Electric Company, New York City.
- Stromberg - Carlson Manufacturing Company, Rochester, New York.
- Holtzer-Cabot Company, Boston.
- National Airphone Corporation, New York City.
- Clapp-Eastham Company, Cambridge, Massachusetts.
- Hutchison Radio Company, New York City.
- Henry Hyman & Company, New York City.
- DeForest Radio Tel. & Tel. Co., Jersey City, New Jersey.
- Dubilier Condenser Co., Inc., New York City.

In addition to the twenty-two contracts mentioned, nineteen more of the principal manufacturers have made reservations for space.

Heard at the Radio Counter

A Conversation Between Customer and Radio Clerk

(Part IV)

I AM seeking information regarding my aerial and would like to know if you can help out a good fan."

"Shoot! I'll tell you anything regarding aeri- als if within my power, Mr. Customer."

"Well, I own my house and have erected an inverted L about seventy-five feet long, directional north by east, fifteen feet high from the top of a fifteen-foot pole—which is at the front of the house—to another fifteen-foot pole erected on the house in the rear of mine. Now, when I use this aerial, I can only get the broadcasting station from a certain direction and, sometimes, find it hard to tune. Signals are also of a weak nature. The receiver is O. K."

"May I ask what your roof is made of?"

"The roof is of tin—on both houses."

"Well, I'll explain your trouble regarding weak signals. When your aerial is in operation, one may say that the earth, or ground, is your roof due to the fact that the tin roof is grounded. It acts, in this case, as a ground. Try and get your aerial so it lays in a position over the actual ground. Point your aerial towards the station you wish to hear. Take off the lead-in at the nearest end of this wire. Use about seventy-five feet and try out your set. I am sure this will aid you in every respect."

"Thank you for this advice and, by the way, give me three small electrose insulators."

"Right! Here they are—and success to the re- modelling of your antenna."

"Good-bye."

(To be continued)

Stable Firms Will Aid Radio

A SHORT time ago, one of the leading manufacturers of automotive equipment appeared on the radio horizon with a new line of well-designed and exceptionally well constructed apparatus. Every part of the equipment exhibited the thought and care

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

American Lamp-o-Phone Corp., Manhattan, make phonographs, \$50,000; H. H. Stevens, M. H. Elvidge, F. Riera. (Attorney, L. J. Feinstein, 47 West 34th St., New York.)

Ipcos Electrical Sales Co., Manhattan, electrical contracting, \$10,000; H. E. Kreindler, F. Padwe. (Attorney, L. Perkin, 261 Broadway, New York.)

Sta-Brite Electric Corp., Manhattan, \$10,000; same as preceding.

Associated Radio Manufacturing, New York, \$760,000. (U. S. Corporation Co.)

Capital Increases

The Bakelite Corporation, New York, has increased its capital stock from \$3,100,000 to \$5,100,000.

Radio Real Estate Corp. of America, Manhattan, \$2,000,000; S. B. Howard, G. V. Reilly, H. C. Hand. (Attorney, S. Ryan, Albany, N. Y.)

Jaworsky Electrical Co., Buffalo, supply business, \$25,000; L. A. Jaworsky, M. Polcyn, J. Mayer, Jr. (Attorney, A. B. Borkowat, Buffalo, N. Y.)

Change of Name

The Philadelphia Radiophone Company has changed its name to Durham & Co., Inc.

Coming Events

The editors of **RADIO WORLD** will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31. Colwell & Korbell, Fisk Building, New York City, directors of publicity.

INTERNATIONAL RADIO SHOW, Madison Square Garden, New York City, November 20 to 25, inclusive. E. C. Buchignani, director of publicity.

SOUTHEASTERN RADIO EXPOSITION, Auditorium Armory, Atlanta, Georgia, December 4 to 9, inclusive. Co-operative Radio Sales Assn., 295 Peachtree St.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

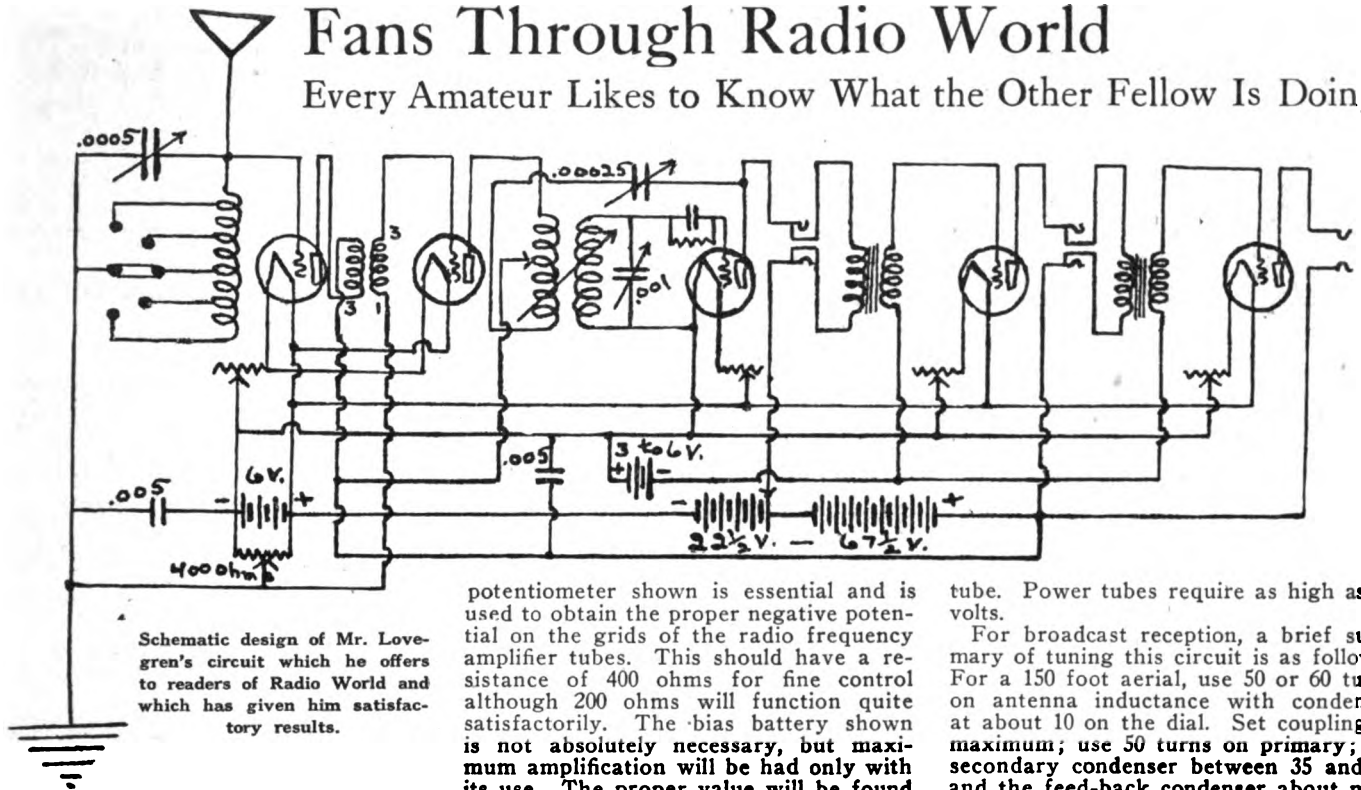
of an established manufacturer of precision mechanisms, says "The Globe," New York.

Within the last few days a second manufacturer whose name is synonymous with old-fashioned conservatism appeared in a small way as a maker of refined radio parts. This firm, like the first, had appreciated the business that awaited them in the radio industry, but unlike a large proportion of manufacturers that have sprung up over night, these old time concerns were satisfied to wait until they had perfected a line of goods that they knew were right.

Still a third company, long affiliated with things electrical, is reported to be deeply interested in the invention of a scientific worker in the east. This invention, if found to do all that its discoverer claims for it, will go far toward relieving the intense patent situation that has been the bogyman of radio manufacturers and dealers.

Share Your Radio Knowledge with Your Brother Fans Through Radio World

Every Amateur Likes to Know What the Other Fellow Is Doing



Schematic design of Mr. Lovegren's circuit which he offers to readers of Radio World and which has given him satisfactory results.

potentiometer shown is essential and is used to obtain the proper negative potential on the grids of the radio frequency amplifier tubes. This should have a resistance of 400 ohms for fine control although 200 ohms will function quite satisfactorily. The bias battery shown is not absolutely necessary, but maximum amplification will be had only with its use. The proper value will be found by experimenting. From 3 to 6 volts will be required for the UV-201 amplifier

tube. Power tubes require as high as 10 volts. For broadcast reception, a brief summary of tuning this circuit is as follows: For a 150 foot aerial, use 50 or 60 turns on antenna inductance with condenser at about 10 on the dial. Set coupling at maximum; use 50 turns on primary; set secondary condenser between 35 and 45 and the feed-back condenser about midway. The rest of the tuning is easy. Send RADIO WORLD your hook-up.

IN response to RADIO WORLD's request for any interesting constructive work in radio that might have been perfected by its readers, Mr. F. W. Lovegren, Box 649, Virginia, Minnesota, sends the accompanying circuit which he has been using for some weeks and which, he declares, is hard to equal. "This hook-up," writes Mr. Lovegren, "is not original, but is the Radio Corporation of America circuit with changes."

This circuit, he further declares, is very desirable for the following reasons:

- 1.—It gets all the stations.
- 2.—It is extremely selective.
- 3.—It diminishes static considerably.
- 4.—It does not radiate.

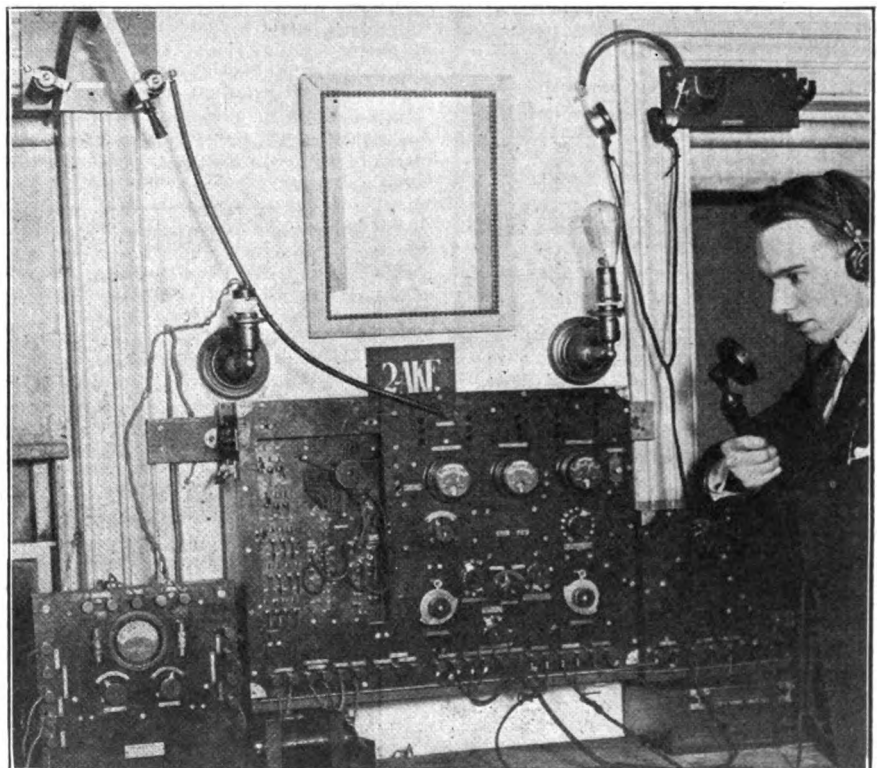
"For day time receiving," writes Mr. Lovegren, "I have heard WJAP, WWJ, WLAG, WBAH, WOC, CJCG and several others loud enough to be audible half a block from the Magnavox. Using no antenna but simply the usual ground connection, I have heard WSB, WHB, WOR, WDAP, KYW, and others too numerous to mention, loud enough, without exaggerating, to be audible a block away. I need not mention what it will do using the regular aerial."

Description of the circuit is as follows:

The antenna inductance consists of 100 turns of No. 20 or No. 22 wound on a 3 1/2 inch tube, tapped at every 10 turns. The condenser may be either used in shunt, as illustrated, or may be in series with the antenna. No condenser is necessary across primary of the variocoupler, the tuning being done by the secondary condenser and the coupling. Regeneration in this circuit is accomplished by an .00025 mfd., variable condenser which is inserted between the plate of the detector and primary of coupler.

This is an excellent means of controlling regeneration. It will be found that little will be required in this circuit. The detector is not critical in adjustment, therefore no vernier rheostat for the filament or potentiometer, for fine control of plate voltage, are necessary. The

\$2,100 Radio Set Auctioned for \$175



(C) Kadel & Herbert

Here is a photograph of Sterling G. Sears and a United States submarine-chaser radio-set, valued at \$2,100 which he purchased for \$175. This is one of the finest receiving and sending sets made. Recently, the Navy called for sealed bids on this set and Mr. Sears's bid of \$175 was accepted. On the extreme left may be seen the power-panel for generator-control filament and plate supply. Next to this is the transmitting unit. Note the multiple-switch tuning section for antennae adjustment and the vernier helix. In the same cabinet with the transmitting unit is the receiving unit which covers a wave-length range from 150 to 600 meters and, also, two stages of audio-frequency amplification. In the cabinet on the extreme right are three additional stages of amplification.

PHANTOM-CIRCUIT

BUILD YOUR OWN. This marvel of mystery, using no aerial, no loop, no ground, brings in music instead of static showers. We consistently hear concerts on Magnavox, from stations 550 miles distant, audible 100 feet from horn. The simplicity of this set will surprise you. No radio frequency. Complete instructions with photo of circuit sent prepaid for 80c.

VESCO RADIO SHOP, Box W-704, Vaseville, Calif.

35c. each, 3 for \$1.00



Genuine Condensate Dial
The dial that runs true. Numerals engraved on brass and knob so shaped that fingers do not hide them. This edge with clear graduation to make accurate reading easy.

Condensate set screw in metal insert. Will not warp or chip. Finish and enamel permanent.
3-inch dial 35c
2-inch dial for rheostat potentiometer use 35c
3/4-inch dial 75c

Send stamps for literature.

ALDEN - NAPIER COMPANY
62 Wilcox St., Dept. L. Springfield, Mass.

PRICES SMASHED

Each sale has created new friends and customers with the result that we now announce drastic reductions in our quality lines. All goods prepaid. Send card for complete price list. You'll be surprised. You'll tell your friends. A sample saving follows:

COMPLETE REGENERATIVE VACUUM TUBE SET	Our Price	Others
Panel—Bakelite—7"x12" drilled.	\$1.65	\$2.40
Cabinet of 3-ply wood to fit panel.	1.50	2.50
Two dials—each 35c.	.70	1.40
Sixteen switch points with nut.		
Each 1c.	.16	.48
Four switch stops with nut.		
Each 1c.	.04	.12
Eight binding posts. Nickel plated @ 3c.	.24	.48
Two switch levers @ 25c.	.50	.90
1 filament rheostat. Highest grade.	.65	1.10
1 vario coupler. Fourteen taps.	2.25	4.00
1 23 plate variable condenser.	1.95	3.50
1 tube socket—Molded.	.45	.85
1 grid condenser and leak.	.10	.25
1 phone condenser.	.10	.25
1 tube socket support.	.15	.25
12 feet spaghetti tubing @ 4c.	.48	.84
15 feet tinned copper connecting wire.	.30	.45
Blueprints showing details to assemble.	.10	.25
	\$11.32	\$20.02

Other articles taken at random from our late price list are—

Detector tubes—Cunningham—NOT rebuilt.	\$3.95	\$5.00
Crystal detector of closed type.	.60	1.00
Transformer—Audio frequency.	2.95	4.50
Double slide tuner—knocked down.		
Coil wound.	2.50	....
Loose coupler—knocked down. Coils wound.	3.75	....
Loose coupler—assembled.	7.50	12.50
Variometer—Hardwood stators 4 1/2". Assembled.	2.25	4.00
Frost Fone—2000 ohms.	3.95	5.00
Kellogg—2400 ohms.	8.75	12.00
Western Electric 2200 ohms.	9.25	12.00
Blueprints giving detail of 2 step amplifier.	.10	.25
Two step amplifier—knocked down. Panel drilled.	12.95	23.50
Two step amplifier assembled. In cabinet.	18.95	35.00
Vacuum tube set in cabinet 7 1/2" x 12". Wired.	17.95	35.00

Send for list today or order direct from above. Goods sold subject to return for rebate or exchange. YOU MUST BE PLEASED.

Radio Parts Manufacturing Co.
15 Park Place West Detroit, Mich.

Broadcasting Still Grows

Fifteen New Stations Bring Total Up to 565

SOME pessimists predicted that broadcasting would begin to drop off in this, the second, year of radio; but to-day there are 565 stations using the 360-meter wave and 15 Class-B stations operating on the new 400-meter wave, assigned to the larger stations giving high-class programs. There is no indication that this means of disseminating education, news, music and many other forms of entertainment will cease; on the other hand, it seems to be growing, and continues to be one of the most popular American pastimes. With broadcasting as general as it is, stations now operating in every state, the popularity of radio, with the listeners-in, at least, is assured, and initiated neophytes join the numberless throng daily.

Last week fourteen new stations took up broadcasting on 360-meter in as many states. One—the Atlanta "Constitution"—joins the elite class of B stations on the 400-meter wave.

Supplemental List of Limited Commercial or Broadcasting Stations on 360 Meters.

WQAP—American Radio Co., Lincoln, Neb., 500 watts.

WDAG—Apollo Theatre, Belvidere, Ill., 20 watts.

WQAA—Horace A. Beale, Jr., Parkersburg, Pa., 500 watts.

KFBS—Chronicle News & Gas & Electric Supply Co., Trinidad, Colo., 150 watts.

KFCH—Electric Service Station, Billings, Mont., 10 watts.

WOAD—Friday Battery & Electric Co., Sigourney, Iowa, 50 watts.

WNAM—Ideal Apparatus Co., Evansville, Ind., 500 watts.

WGAK—Macon Electric Co., Macon, Ga., 50 watts.

WOAC—Maus Radio Co., Lima, O., 100 watts.

KYG—Radio Service Bureau, Inc., Portland, Ore., 100 watts.

WNAR—C. C. Rhodes, Butler, Mo., 200 watts.

WNAN—Syracuse Radio Telephone Co., Syracuse, N. Y., 250 watts.

WOAB—Valley Radio, Grand Forks, N. D.

WWAX—Worman Bros., Laredo, Texas, 100 watts.

Limited Commercial Class-B Station, 400 Meters.

WGM—Atlanta "Constitution," Atlanta, Ga., 500 watts.

List of Radio Stations Published

AN index to commercial and government radio stations of the United States has just been issued by the Department of Commerce, and is available to the public for fifteen cents at the office of the Superintendent of Documents at the Government Printing Office, Washington, D. C. It gives complete lists of all commercial and government stations, both on land and sea, licensed up to June 30, 1922, including the broadcasting stations. The list of amateur stations is still on press, but will soon be available for distribution by the Superintendent of Documents at about 25 cents a copy.

College Courses in Radio

A HOME course in radio is being given by the extension department of the University of California. The course has been prepared in a style that can be easily understood by the average broadcasting fan. This is not the first home study radio course, however. Last year the University of Wisconsin—one of the first educational institutions to popularize radio—prepared an excellent popular treatise on radio which they distributed at nominal cost to residents of the state.

RADIO PANELS

High dielectric resistance;
6" x 24" \$1.90
8" x 24" 1.25
12" x 24" 1.75
Manufacturers' special sizes solicited. Cuts easily with wood-working tools.

PAGESON COMPANY
Agents wanted. Merchants Station, St. Louis, Mo.

Spirola HIGH GRADE CABINET LOUD SPEAKERS

Do not be deceived by our low prices. SPIROLAS are not cheap instruments made to sell at a low price. They are rather a remarkable development made possible by the invention of the SPIRAL tone chamber (patent pending), which not only allows us to market a cabinet instrument of the highest grade in every respect at an almost sensational price, but gives many exclusive advantages over the common cabinet type speaker, which is nothing but an ordinary horn enclosed in a cabinet—great compactness for a full-sized tone chamber and a really complete elimination of metallic "horn" noises. SPIROLAS are especially recommended to music lovers who can appreciate an absolutely pure, natural tone.

We make a complete line—of equally high-class construction throughout, with fine hand-rubbed finishes. ALL SPIROLAS ARE SOLD UNDER ABSOLUTE MONEYBACK GUARANTEE—ten days to see and try them for yourself.

SPIROLA CONCERT—Complete with special, powerful built-in unit and cord ready to hook up in place of phones, beautiful mahogany or oak finish, bronzed throat. \$12.50

SPIROLA DELUXE—New, improved duplex type for use with your headset, two complete speakers in one, eliminating the usual interference between phones. \$4.85

Satin black finish, nickel plated fittings, otherwise same \$3.85 as DELUXE

We also make the DELUXE and black finish types for use with a single loud speaker unit. In ordering state whether for use with headset or unit.

At dealers or postpaid (C. O. D. if preferred).

L. H. DONNELL MFG. CO. Dept. B, Box 70 Ann Arbor, Mich.



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RADIO WORLD

RADIO WORLD

1493 Broadway, New York City.

Please send me RADIO WORLD for months, for which

please find enclosed \$

SUBSCRIPTION RATES:

Single Copy	.....\$ .15
Three Months	.....1.50
Six Months	.....3.00
One Year (52 Issues)	..... 6.00
Add \$1.00 a Year for Foreign and Canadian Postage.	.....

That Armstrong Circuit

So much interest has been displayed in the special article, "TESTED INVENTION OF MAJOR ARMSTRONG AMPLIFIER SET 100,000 TIMES," by John Kent, that appeared in RADIO WORLD No. 12, dated June 24, 1922, the publisher decided to put aside a number of copies for those who were not able to get this issue when published. Copies will be sent, postpaid, on receipt of 15c. or send in your subscription, \$2.00, for one year (52 issues), \$3.00 six months, or \$1.50 three months, and subscription will be started with the issue containing the article about Major Armstrong's Amplifier.—RADIO WORLD, 1493 Broadway New York.

Rocky Mountain Crystals

BETTER THAN GALENA
The most sensitive mineral rectifier known. Can also be used with one or more stages of amplification.
Mounted, 25c.; Unmounted, 20c.; Postpaid Manufacturers, Jobbers, Dealers, Clubs. Apply for Special Trade Prices
Rocky Mountain Radio Products, Inc.
9 CHURCH ST., NEW YORK, N. Y.

"WEB" CRYSTALS

Best Crystal Yet. Single Mountings of **Galena, Silicon & Iron Pyrites**
Sold under a replacement guarantee; at all dealers or by mail direct on receipt of **PRICE, 25c**
Distributed by **WALTER E. BATHGATE**
ROOM 42, 9 CHURCH ST., NEW YORK CITY
Manufacturers, Jobbers, Dealers write for prices.

Triple Mounted SHAMROCK CRYSTALS

Triple mounting of the three crystals—Galena, Silicon and Iron Pyrites.
Sold under a replacement guarantee; at all dealers or by mail direct on receipt of **PRICE, 50c**
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Law Storage Battery

Constant voltage, large amperage. Will run two months without recharging.
Attractive Dealers' Discounts
Write for Details
WILLIAM LAW COMPANY
Aborn and Sabin Streets, Providence, R. I.

A Vacuum Tube Dry-Cell Set

That has a wave-length of 150 to 1000 meters.
Dealers and Jobbers Write to

LINCOLN RADIO CORP.

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116 West 65th Street New York, N. Y.

GENUINE

Nathaniel Baldwin Phones

\$16.00 a Pair

Do not confuse these with Master Baldwin Phones.

ELECTRIC SERVICE ENGINEERING CO.

105 W. 47th Street N. Y. City

GITHENS TRUTONE RADIO HORN—LOUD SPEAKER



First one to sell on ten day trial Money back Guarantee

Retail Price \$21.00 Includes Loud Speaker

Trutone has been pronounced the best on the market by experts. It has a clear true tone. Every radio fan should try Trutone and compare it with others. If YOU don't find Trutone the best, your money will be refunded. It is sold on a ten-day trial money-back guarantee. If not carried by your dealer write us.

Distributors and Dealers, write!

AUTO PARTS MFG. CO.
1815 Trombly Ave., Detroit, Mich.

Radio Talks by Naval Officials

THROUGH the co-operation of the Naval Communication Service and the American Marine Association radio talks will be broadcasted by representatives of the Navy Department in Washington from November 8 to 11.

A large radio receiving-set and loud-speaker was installed at the Grand Central Palace, New York, by the naval radio experts, and the talks broadcast from Washington are available Wednesday, Thursday, Friday and Saturday evenings of this week for those attending The American Marine Association Show. The broadcasting will be done from NAA, Arlington, over the new radiophone set at 2050 meters.

The speakers selected include Admiral Coontz, chief of operations; Rear-Admiral Robison, engineering; Rear-Admiral Washington, navigation; Rear-Admiral Moffett, aeronautics; Captain McNamee and Captain Overstreet. It is understood that each of the speakers will talk on subjects under his direction in the Navy Department in connection with sea transportation.

The United States Naval Band, well known to those who pick up NOF, will play several selections each evening during the latter part of the exposition week.

At this, the second American Marine Exposition, the Department of Commerce has radio exhibits in connection with the work in the Light-House Service, the Bureau of Standards and the Radio Section, an inspector being detailed to explain the work of the department to those interested. Exhibits are also planned by the Navy and Shipping Board.

Radio As You Ride

ABOUT the first thing the radio novice learns is that to operate his receiving set he requires a long antenna suspended high in air and a "ground" connection to establish an electrical circuit through the surface of the earth, says Henry Smith Williams, in "The American," New York. The establishment of this antenna system is much the most difficult part of the work of installing a radio receiver. So it is rather hard to get away from the idea that it is an essential part of the radio mechanism. Yet in reality it is quite feasible to do away with this cumbersome apparatus altogether, provided certain other conditions are met. These alternative conditions involve merely the making of a receiving apparatus that is more sensitive than the one with which the novice usually starts.

In a word, it is necessary to have an electron tube (triode) amplifier, preferably more than one of them.

With one or more such tubes installed before the "detector" tube we obtain what is called radio-frequency amplification. Messages that would otherwise be too faint for recognition are amplified to the stage of audibility, and radio messages of ordinary intensity may be received on a small loop aerial, no cumbersome antenna being required.

Almost any coil of wire will serve for such a loop aerial. Five-inch coils have been used, but ordinarily it is expedient to use a loop of about two or three feet in diameter. No "ground" connection is required. The apparatus is self-sufficient.

The convenience of such an apparatus, which can be installed on a card table in your drawing room or office, with no bother about wires up on the roof or water pipe "ground" connections, is obvious. Moreover, you may adjust the entire apparatus on your automobile if you wish and "listen in" as you ride anywhere within a hundred miles or so of the broadcasting station.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

V-A-C-U-U-M-T-U-B-E-R-E-P-A-I-R-I-N-G
A C U U M T U B E R E P A I R I N G
Save on 1.50 Detectors | Save on 3.00 Amplifiers
Repairing all detectors and amplifiers using a single tungsten filament such as the following listed tubes, Marconi, Monoband, DeForest, A. P. Mostron Bell, Radiotron UV-200, UV-201, Cunningham C-200, C-201.
Detectors and Amplifiers repaired for \$2.50.
The repaired tubes, we warrant, will give you the same absolute satisfaction that you would expect to receive from new tubes.
We are now in a position to give guarantees for prompt deliveries with satisfactory results. A reasonable trial will confirm our reliability.
George H. Perall Co., Inc.
WEST SOMERVILLE, MASS.
V-A-C-U-U-M-T-U-B-E-R-E-P-A-I-R-I-N-G

LITTLE GIANT RECEIVING SET

including set of Double Head Phones. 2500 Ohms. Guaranteed.

\$8.75

Extra set of Phones at time of order **\$3.50**

Listen in on all nearby broadcasting. Enjoy the music, concerts, lectures, weather reports, market reports, time signals, code, etc.—in fact everything in the air. Entertain yourself and friends throughout the winter evenings.

LITTLE GIANT LABORATORY
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NA-ALD DE LUXE V. T. SOCKET

Contact strips of laminated phosphor bronze press firmly against contact pins, regardless of variation in length. No open current Condensite. Fractionally unbreakable. Special protected slot, with exterior reinforcement. Unaffected by heat of bulbs or soldering iron. All excess metal eliminated, aiding reception. May be used for 5 Watt power tube. Highest quality throughout. Price, 15c. Special proposition for dealers and jobbers.

ALDEN-NAPIER CO.

Dept. L. 52 WELLOW St. Springfield, Mass.

CRYSTAL SET \$4

"THE LITTLE WONDER" \$2.50 UNMOUNTED

Wonder in name and a wonder in performance. Cannot be equalled for the price. Catches distinctly everything broadcasted within 30 miles.

Send for FREE catalog, describing our "Little Wonder" set and listing radio supplies.

GUARANTEED, TESTED CRYSTALS
Galena and 20c. Radiocite..

Radi-O-Plate Panels. All sizes cut to order.
Holloway Electric Supply Co., Inc.
238 Third Avenue New York City

Do You Like Clear Tone—Sharp and Distinct? If so try

MARSH'S

Vernier Variable Condenser AT LAST

Made in Three Styles. Dial Knob and Screws Complete. Fully Guaranteed.

27-Plate @ \$5.50
23-Plate @ \$4.75
11-Plate @ \$4.25

Mail orders promptly filled.

F. P. Marsh, 145 Nicoll St. NEW HAVEN, CONN.

Subscribe for Radio World, \$6.00 a year, \$3.00 six months, \$1.50 three months.

INSU-LITE

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1/8" —.01 per sq. in.
3/16" —.015 per sq. in.
1/4" —.02 per sq. in.

DEALERS: Write for discowr. is.

General Merchandise Co.
140 Market Street, Newark, N. J.

Radio Wonders

ATTENDANCE at our meeting house Was limited to one starved mouse; Until the thought struck Deacon Snow To make us good by radio. The folks they all turned out for fair To get religion from the air; But Deacon must have crossed his wire— 'Cause that dern box up in the choir Yelled out, "Babe Ruth is now at bat, Dusted the plate off with his hat. Strike one—the crowd in great suspense; Busted a homer to the fence."

A fool kid whooped right out, "Eeyow!" And Deacon mopped a clammy brow; But our folks 'ten church as they should, Since science came to make us good.
—M. H. R. in "Louisville Courier-Journal"

Mr. Ford Issues a Denial

A report was widely published, last week, that Henry Ford intended to establish 400 broadcasting stations throughout the United States. Following our rule to run down the source of such a statement, in the interests of accuracy, RADIO WORLD wrote Mr. Ford for further information. His letter, which follows, is self-explanatory:

EDITOR, RADIO WORLD:—In reply to the query contained in your letter of October 23rd, the writer wishes to advise that there is no truth in the report.—Frank Campsall, Assistant Secretary to Henry Ford.

Air-Mail Radio Stations

Station	Call letters	wave	Calling wave	W'r's wave
		Arc.	Meters	Meters
Eastern Division:				
Washington, D. C.	WWX	3,800	*3,750	†1,950
				†1,100
Hazlehurst Field:				
Garden City, L. I., N. Y.	WWU	3,800	3,400	
Bellefonte, Pa.	WWQ	3,800	3,450	
Cleveland, Ohio	(navy) NRH	3,800	4,250	
Byran, Ohio	KDEL	3,800	3,100	
Chicago (Gt. Lakes)	(navy) NAJ	3,800	4,900	
Central Division:				
Iowa City, Iowa	KDTS	3,800	3,530	
Omaha, Neb.	KDEF	3,800	3,658	
North Platte, Neb.	KDHM	2,900	3,400	
Cheyenne, Wyo.	KDEG	2,900	2,700	
Rock Springs, Wyo.	KDHN	2,900	3,200	
Western Division:				
Salt Lake City, Utah	KDEH	2,900	3,600	
1. Interrupted continuous waves:				
Elko, Nev.	KDEJ	2,900	3,400	
Reno, Nev.	KDEK	2,900	2,900	
San Francisco, Cal.	(navy) NPG	2,900	4,900	

*Arc. †ICW. ‡Phone set.

Mary, Up to Date

MARY had a radio set, With nickel-plated trimmin', She took it everywhere she went, And even when in swimmin'.

She turned the little knobs about, Until they tuned three-sixty, And listened in on broadcasting, With a smile that was quite nifty.

Now, Mary had a beau, y' know, A lad who pounded brass, He taught her all the code there was, Till she was quite the class.

So now she turns the knobs again, But to a different place, She listens on two hundred now, And keeps up with the pace.

And so it came about one night, When Joe was on the air, And Mary had her license, too, A parson tied the pair.
—"The Modulator."

An Audiotron Record

Editor, RADIO WORLD:—How is this for a record on an old audiotron (double filament) and two-variometers (regenerative receiver). Tune out WDAP, tune in KDYL, "Salt Lake Telegram," Salt Lake City, Utah, 1,320 miles. Tune out KYW, tune in CJCG, "Manitoba Free Press," Winnipeg, Canada, 750 miles. Have 2-step amplifier with loud-speaker. The aerial I have is about 54 feet long, 11 feet high at one end and 18 feet high at the lead-in end; 3-wire inverted-L type, No. 18 bell wire.

I have tuned nearly all the eastern and southern stations with one tube.

I think it is the way the set is wired and the sensitive detector that has a lot to do with tuning DX. 73-O.M.—Eugene L. Mueller, 8012 Kimbark Avenue, Chicago.

I Want a Radio Worker In Each Community To Work For Me

My work fits in nicely for those men and women who have spare hours or full time at home and wish to earn from \$5.00 to \$40.00 weekly, depending on time you devote to it. It is not radio work, but I believe anyone energetic enough to interest themselves in Radio will make an excellent "TANGLEY BRANCH MANAGER," to operate a branch for us in their home. Pleasant, easy work, no canvassing, immediate profits. No experience or special talents necessary. We furnish complete outfit, train you for the work, and assist you in building up a business you will be proud of. Don't wait until another grasps this offer, write today for literature, and make your spare hours earn.

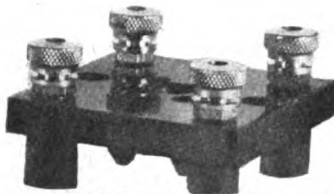
TANGLEY CO., 187 Main, Muscatine, Iowa

No Experience Necessary

Full or Spare Time at Home

METRO SOCKETS

"METRO SOCKETS" for Westinghouse Aerotron 1½ volt dry cell tube. This socket is perfectly finished using a 2" square highly polished moulded base. This base is supported with insulated legs. Springs are of nickel silver, insuring perfect contact. Price60c.



MOULDED BASE

Single V. T. Socket—Brass tube, heavy nickel plated and countersunk contacts....\$1.00

FIBRE BASE

Single V. T. Socket....\$0.75
Double V. T. Socket.... 1.50
Triple V. T. Socket.... 2.25

METRO JACKS

Nickel silver spring, coin silver contact points, all insulation is high grade bakelite. High class finish, made in 5 sizes:

No. 1—Single Open\$0.55
No. 2—Single Circuit65
No. 3—Double85
No. 4—3 Spring Filament Control.....\$0.95
No. 5—5 Spring Filament Control..... 1.15

We also make regular V. T. Sockets with fibre and moulded base.



ELECTRIC MFG. CO. INC.

121 PRINCE ST.
NEW YORK

RADIO PARTS AT CUT PRICES

VACUUM TUBES

UV200 \$4.00
UV201 5.00
VT1 6.25
VT2 7.25
WD11 1½ Volt..... 6.90
Meyers 3.75

VARIABLE CONDENSERS KOEHLER HIGH GRADE MOULDED ENDS

3-Plate\$0.95
11-Plate 1.35
21-Plate 1.75
43-Plate 2.15

HEAD SETS

\$6.00 Murdock's\$4.95
8.00 Brandes' 6.90
22.00 Brown's 14.00
6.50 Turney's 2.95
\$10.00 Stromberg-Carlson\$5.75
16.00 Baldwin Master12.75
9.00 Baldwin Single 7.75
8.00 Federal's 6.45

WESTERN ELECTRIC HEAD SETS, THE SUPERSENSITIVE PHONE USED BY THE SIGNAL CORPS AND NAVY. BOUGHT FROM THE U. S. GOVERNMENT. TYPE 194W (THE BEST MADE).....\$8.90

MAIL MONEY ORDERS—NO CHECKS

LIBERTY RADIO COMPANY

106 LIBERTY STREET, N. Y. CITY

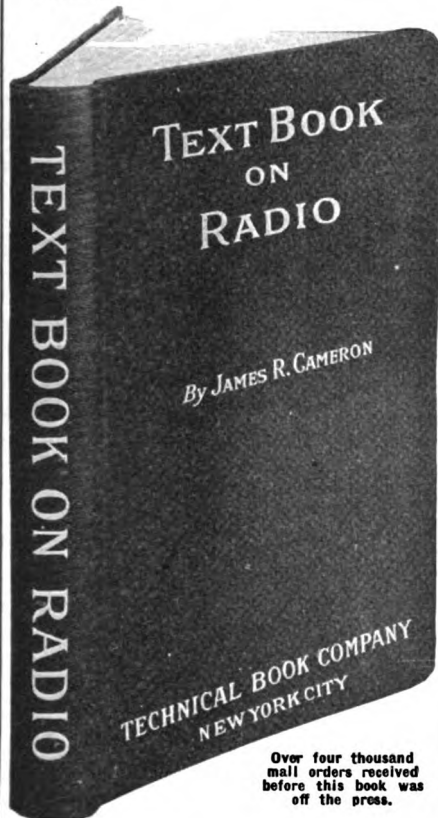
Reference: Bradstreet's and Bank of The Manhattan Co., Rockaway Park, N. Y.

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Aerials may be easily grounded by stray loops of wire which, thrown carelessly or by intent across the strands, touch the guys or metal poles. Lead-ins may be grounded in the same way. It sometimes happens that the lightning arrester gap drops together effectually producing a one-way circuit to the ground.

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Broadcast Bill's Radiolays

By William E. Douglass

FOUR years ago Ol' Kaiser Bill got scared an' yelled, "Enough," because he said the enemy wuz treatin' him too rough. An' so in Brussels Sprouts each year we aim to celebrate November the eleventh as a most important date. It seems like it's been forty years instead of only four since we wuz in the Argonne wishin' we could end the war. In June of nineteen eighteen I wuz down along the Marne so blue an' doggone homesick that I didn't give a darn what happened. Then the orders came fer us to go up front an' bein' sorter reckless that's the time I pulled the stunt of bringin' in some Heinies an' I got my D. S. C. It made

the home-folks here in town all mighty proud of me—that's why the Armistice Parade is run by Private Bill. I've run it now fer four years an' I guess I always will. As long as I've been doin' it things never have gone blooey. Sometimes I think I'm smart enough to be a second Lieutie. Now take fer instance this year, my scheme worked out purty nice, it didn't cost me very much but it was worth the price. I had my radio hooked up in the reviewing stand an' then "picked up" a station where a Military Band played patriotic music. I left Min to watch the set; the celebration this year wuz the best one we've had yet. I had the Brussels Sprouts police head up the big parade. Yep, both of them right in the front, no need to be afraid of traffic interferin' when we're marching down

the street. I tell you in their uniforms our cops look pretty neat. Then come the Golden Cornet Band, they made a lot of noise an' marchin' right behind them wuz the Hook an' Ladder Boys; an' then some flivvers all dolled up in red an' white an' blue—Chuck Walker had to butt in here just 'cause his car wuz new. An' then I an' my buddies finished up the grand procession. Our luck wuz breakin' mighty good to make a fine impression, fer just as we got up to where my wireless set wuz playin' we heard Star Spangled Banner an' it goes without my sayin', I had the boys halt on the spot an' yelled, "Comp'ny attention!" Believe me this here Radio's a wonderful invention.

(Copyright 1922, Westinghouse Electric & Manufacturing Company.)

How to Make a Decremeter

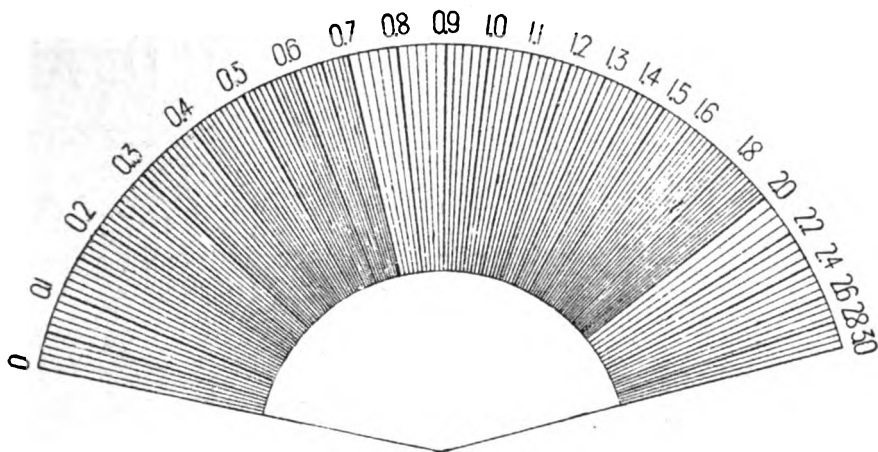


Figure 1—This diagram may be cut out and used as a decremeter.

IN RADIO WORLD, No. 32, dated November 44, there was published, complete, an article of first value to radioists entitled, "Wave Meter for Amateur Operators," describing how to construct the device which enables one to adjust his set and comply with the law. This article was prepared by the United States Bureau of Standards experts. Frequently it is necessary to employ a decremeter with a wave meter.

It is possible to make a decremeter out of a wave meter by placing a suitable scale on the variable condenser. For a wave meter

having a condenser with semi-circular plates or any condenser such that the graph of its capacity against its setting is a straight line, the capacity being very small at zero setting, it can be shown that the decremeter scale to be used is one in which the graduations vary as the logarithm of the angle of rotation. Such a scale, designed for a semi-circular plate condenser, is shown in Figure 1. This scale may be copied, or cut, from this issue of RADIO WORLD and trimmed to fit the dimensions of the condenser dial with which it is to be used. It may be made stationary with a moving pointer traveling over it, or it may be mounted on a dial rotating under a fixed pointer. At the setting corresponding to maximum capacity the scale reading should be zero. Since the scales of most condensers read counter-clockwise, this arrangement usually places the decremeter scale in the unused space opposite the capacity scale.

A measurement of decrement is made by first observing the current squared at resonance, then reading the decremeter scale at the settings on either side of resonance where the current squared has one-half its value at resonance. The scale is so constructed that the difference between these two readings is equal to the decrement of the transmitting circuit plus the decrement of the wave meter itself. It is then necessary to subtract the wave meter decrement from the total just obtained. The decrement of the wave meter is determined as follows: the wave meter is coupled and tuned to a source of unmodulated continuous waves. The sum is measured as just described. Since the waves are continuous, the decrement of the waves is zero and the result obtained is the decrement of the wave meter alone.

From determinations of the decrement of the wave meter made at different points on the scale, the calibration curve of decrement plotted against condenser setting is obtained. The conditions necessary to permit the use of this scale in the manner described are as follows:

1. The condenser must have semi-circular plates. Condensers with plates of a different pattern will have different decrement scales just as they have different capacity calibrations.
2. It must be remembered that only when resonance is indicated by a current-square meter is the deflection to be reduced to one-half its maximum value in detuning to either side of resonance. If a milliammeter is used, the reading must be reduced not to one-half its maximum value, but to the maximum value divided by the square root of 2 or to 0.71 of the maximum value.
3. The generator must have an output sufficiently large that the coupling employed may be loose enough to prevent any considerable reaction of the wave meter on the generator.
4. Neither the generator nor its coupling with the wave meter must be changed during the measurement of decrement.

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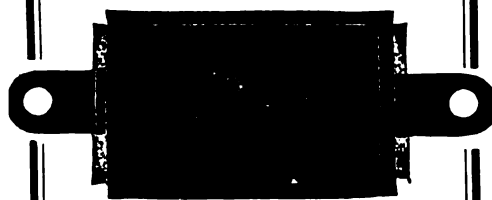
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GOLD MEDAL San Francisco 1915



GRAND PRIZE San Diego 1916

RADIO WORLD

(Trade Mark)

ILLUSTRATED. WEEKLY

Field Sets Used by U. S. Navy



(C. Underwood & Underwood, N. Y.)

Here is a transmitting set used exclusively by the United States Navy. It should be of interest to every radioist. It is different from sets in ordinary use in this respect: It is made so that it fits in a suitcase, making it possible to carry it ashore for land duty. In the left of the photograph is the transmitter with its compact inductance coils, making it possible for the operator to broadcast on a wave-length fixed for any particular purpose. With radio transmitters, high voltage must be secured to apply to the necessary tubes. In this case, a special machine is used as shown at the right to supply this power.



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VOLUME TWO

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the act of March 3, 1879.]

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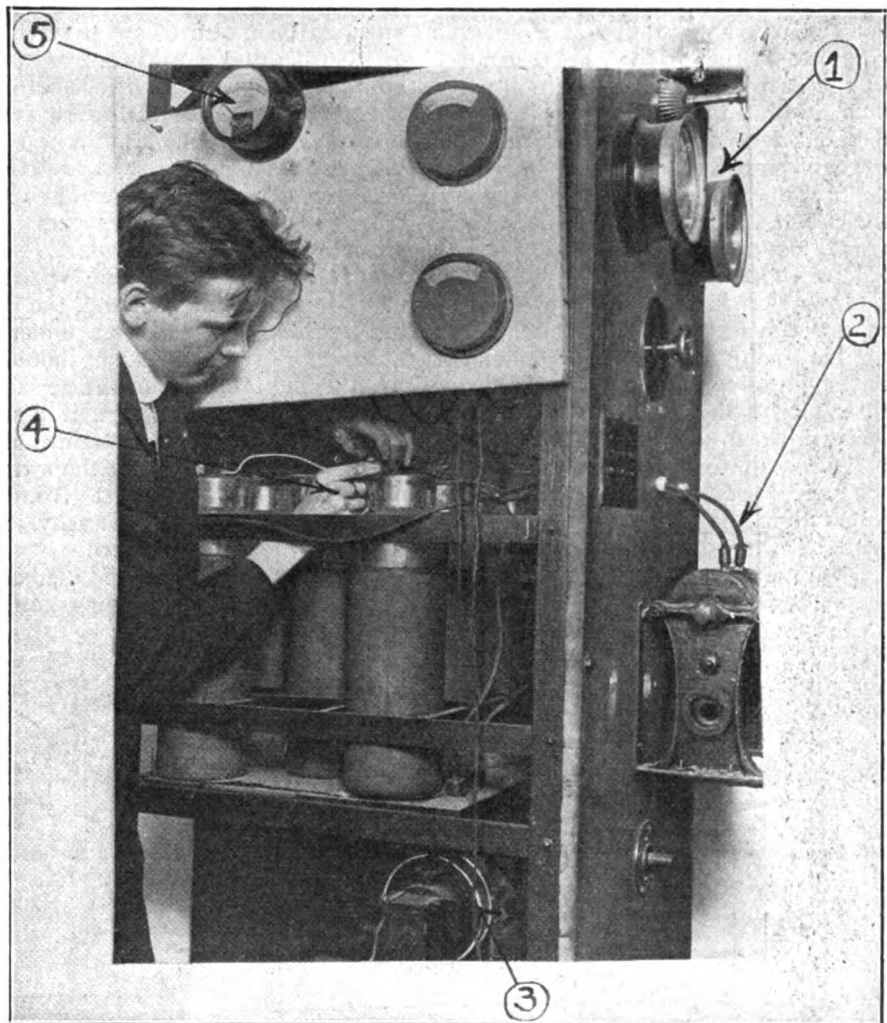
Vol. II, No. 8, Whole No. 34

November 18, 1922

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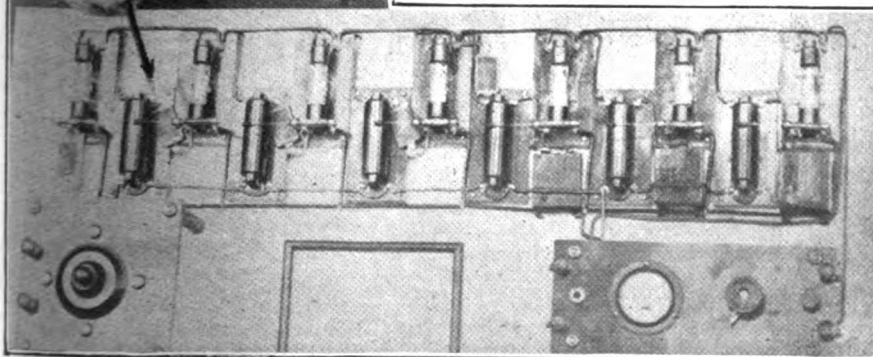
Radio Devices You Should Understand

THE lower picture shows Elman B. Myers, inventor of the Myers vacuum tube, photographed with his new radio-receiver. Mr. Myers is using the well-known circuit of radio frequency—three stages of radio frequency before the detector tube with which to amplify weak signals. When weak signals are amplified after having surged their way through the three amplifying tubes, they are then sent through the detector tube for rectification. The detector tube rectifies the radio frequency to audio frequency, making it possible for the signal to be heard in the telephones. After the detector tube, Mr. Myers employs three more



(C. Kadel & Herbert)

Spark transmitter and leyden-jar condenser



(C. International News Reel)

Elman B. Myers with apparatus for three stages of radio- and audio-frequency.

stages of audio amplifiers. With 3 radio-frequency amplifiers, 1 detector, and 3 audio-frequency amplifiers. Mr. Myers should hear everything.

The radio transmitter shown in the (upper) larger photograph is one of the old-type sets that made its appearance about six years ago. The explanation of the numbers is as follows: 1, The pair of meters for registering the motor-generator. 2, The quenched-spark gap. 3, The power transformer. 4, The leyden jars, better known as the condensers. 5, The hot-wire ammeter.

The Counterpoise

Its Advantage as a Complete Reducing Agent in the Resistance of the Antenna Fully Explained

By *Frederick J. Rumford, E.E., R.E.,*

THE counterpoise is a sadly neglected hook-up. Few radioists have experimented with the counterpoise since Sir Oliver Lodge, as far back as 1890 made a number of experiments.

The advantage of the counterpoise for the receiving station is a general complete reduction of the resistance of the antenna, or aerial, which with this reduction would result in a decided decrease or lowering of the decrement of the circuit, or circuits, in use and would increase greatly the circuit, or circuits, selectivity which would also increase the intensity four-fold or more.

The writer in one particular instance of experimenting found that with one of his many experimental antennas and counterpoises he had decreased the resistance of the circuit from about 50 ohms down to about 8 ohms when he had used the counterpoise instead of the usual water-pipe ground connection. Radio fans who live where the earth is very dry should try one of the counterpoise connections illustrated in the four figures accompanying this

article; for the earth being dry, it functions very poorly as a ground conductor of radio waves.

Figure 1 represents the antenna and the counterpoise as erected—when the antenna is on the roof—on the usual masts or poles. Should the antenna be mounted on poles about 12 feet from the roof top with the counterpoise exactly 6 feet below it, the method of mounting is as follows: The antenna should be either or 1 or 2 wires—No. 14 bare copper or any other good aerial wire—from 60 to 100 or 150 feet long, spaced about 3 feet apart. That is, if 2 wires are used with the usual insulators at each end, the counterpoise should be 6 feet under the antenna. If possible, it should be several feet longer than the aerial and spaced about 4 feet apart, if 2 wires are used. The method explained above is for the fan who hasn't the space to erect his aerial on mast from the ground up; who, by necessity, must have his antenna on the roof.

Figure 2 shows another method of making an efficient antenna counter-

poise. This method is for the fan who has plenty of room to erect his antenna on masts implanted in the ground. This counterpoise may be of either 1 or 2 strands of No. 14 bare copper or any other good aerial wire. It should be at least 30 feet high from the ground's surface and either 60, or 100, or 150 feet long. If 2 wires are used, they should be spaced from 2 to 3 feet apart and the counterpoise should be mounted about 6 feet from the ground. If possible, it should be several feet longer than the antenna. At the double end, these wires should be spaced at least 5 feet apart. This type counterpoise is known as the V anti-ground conductor. If this type is chosen, the writer feels certain that the prospective builder will have no reason to be disappointed.

Figure 3 shows another view of the antenna counterpoise which may be erected where one end of the antenna and the counterpoise may be connected to the attic or the weather-head of the house by means of suitable insulators, and a pole of 30 or 40 feet high and 60, or 100, or 150 feet from the house. The antenna in this particular instance, was 1 No. 14 bare copper, or any other efficient aerial wire, with its respective insulators. At either end, the counterpoise is of 2 wires spaced about 3 feet apart and, if possible, several feet long. The antenna should be erected about 7 feet from the ground so as to not interfere with anything passing beneath it. It is insulated at either end with the usual insulators. This hook-up has proved

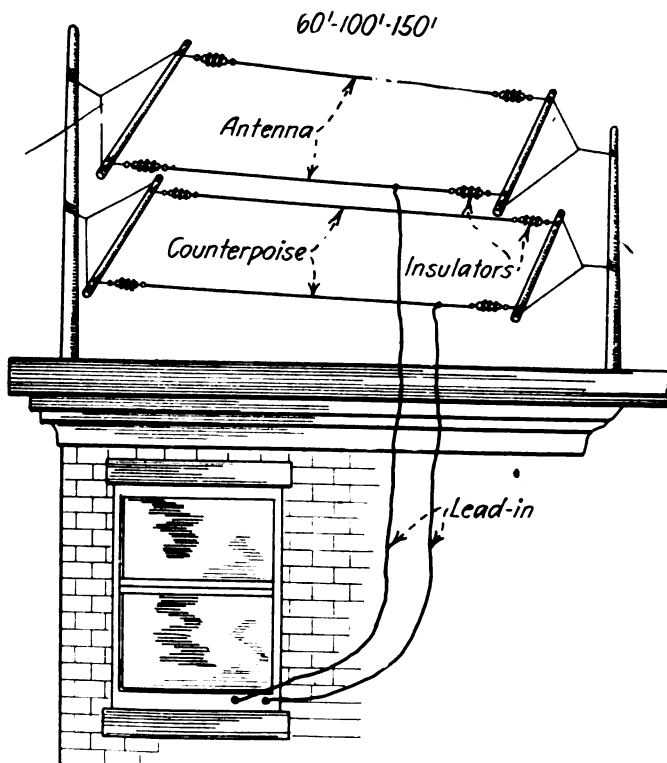


Figure 1—The antenna and counterpoise as erected when the antenna is on the roof of the house. Suggested by Frederick J. Rumford. Drawn by S. Newman.

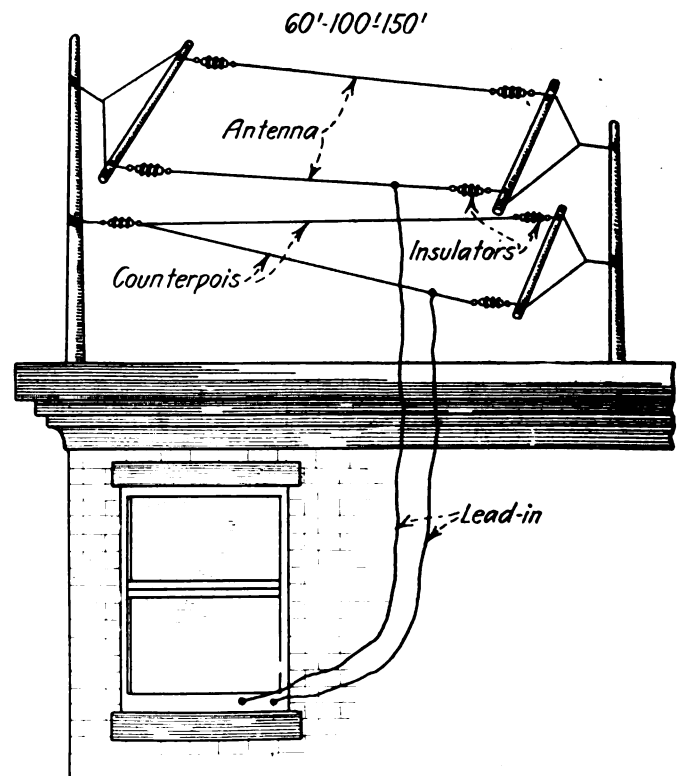


Figure 2—Another method of erecting an efficient antenna counterpoise. This method is for the fan who has plenty of room. Suggested by Frederick J. Rumford. Drawn by S. Newman.

Radio Don'ts

- DON'T** hook-up a pair of poor phones with a good receiver.
- Don't** drop the ear pieces on the floor. Keep the magnetism intact.
- Don't** take the covers or caps off just to see the inside. Leave well enough alone.
- Don't** add a loud-speaker to any type of crystal receiver.
- Don't** expect an amplifying horn to produce the same results as a loud-speaker.
- Don't** connect the house lighting-current to your tubes.
- Don't** forget that rheostats are used to light the filaments.
- Don't** apply too much current to the filament.
- Don't** use plate batteries to light the filament.
- Don't** expect too much from a crystal receiver.
- Don't** touch the mineral in the detector with your fingers.
- Don't** use lead or solder in mounting the mineral.
- Don't** be afraid to occasionally clean the crystal with alcohol.
- Don't** forget that a fixed adjustment on a mineral detector will not hold its sensitivity permanently.
- Don't** leave your tickler coil at maximum with your tube oscillating and generating radio-waves.
- Don't** insert condensers in series with the ground and expect to increase your wave length.

Changing Inductance and Capacity

By Fred. Chas. Ehlert

THERE are various methods of changing inductance in a circuit. A straight wire has very little inductance. Make a coil of the same wire and the inductance is considerably increased. The coil may be made either by winding it smoothly over a form, such as a broomstick, or by winding it spirally in the same place. Electrician's tape may be purchased in a roll. The inductance of a coil is changed by changing the number of turns of the coil in the circuit.

There are, also, various methods of changing the capacity in a circuit. A second method is by changing the capacity of a single condenser. This is

done by having both sets of plates that make up the condenser movable in respect to each other. When every part of the plates in one set is opposite the plates in the other, the capacity is the greatest. Capacity is made smaller by having only a part of each plate in one set opposite the plates in the other.

The inductance and capacity needed in an oscillating circuit is contained in the antenna of a radio transmitter. The antenna of radio set is that part of the set which radiates the energy by setting up the waves in the ether as explained. The wires making up the antenna give both the capacity and inductance.

(Continued from preceding page) very practical, but it is mostly for the fan who has the space to span his wires any number of feet from the house.

Figure 4 is the antenna counterpoise the writer experimented with and which he found efficient, reliable, and practical. This antenna counterpoise is intended for fans who have any amount of space at hand in order to erect it complete. The instructions:

Erect 2 masts, or poles, of some seasoned wood; or, better still, erect 2 steel towers. These should be from 30 to 60 feet high and spaced 60, or 100,

or 150 feet apart, to suit the convenience of the prospective builder. One wire, either No. 14 bare copper or any other efficient aerial wire, should be stretched from mast to mast with suitable insulators at either end. The counterpoise is then erected about 7 or 8 feet from the surface of the ground. It should be several feet longer, if possible, than the antenna and should have suitable insulators at either end for perfect insulation. It must be placed sufficiently high from the ground so as not to interfere with anything passing under it.

The following are necessary in the

erecting of any of the above antennas or counterpoises.

They must be thoroughly insulated from the ground.

The lead-ins must be thoroughly insulated from the ground.

The counterpoise lead-in connected with the ground is usually connected up on the receiving set.

The writer feels certain that the builder will not meet any great difficulty in erecting one of the counterpoises described, but if he does, I will answer gladly any questions that he may ask, if accompanied by a self-addressed, stamped envelope.

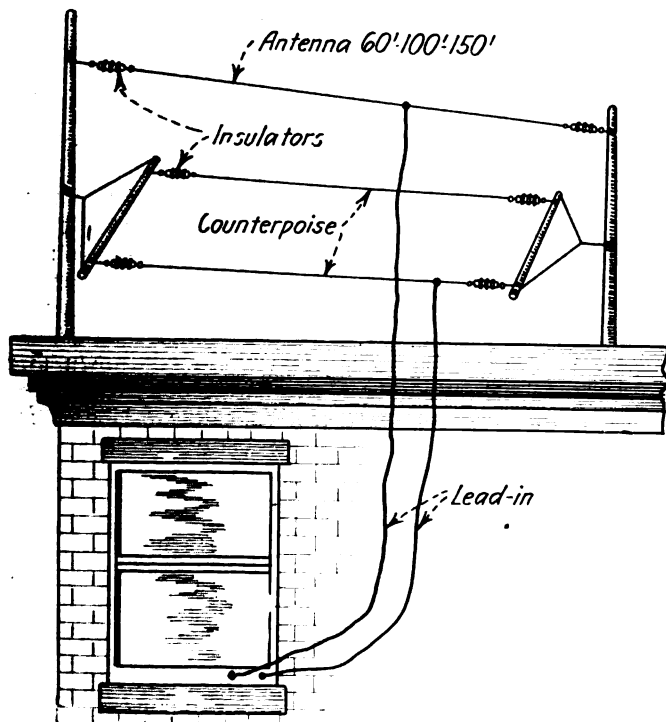


Figure 3—The antenna counterpoise so erected that one end of the antenna and the counterpoise may be connected to the attic of the weather-head of the house by means of suitable insulators. Suggested by Frederick J. Rumford. Drawn by S. Newman.

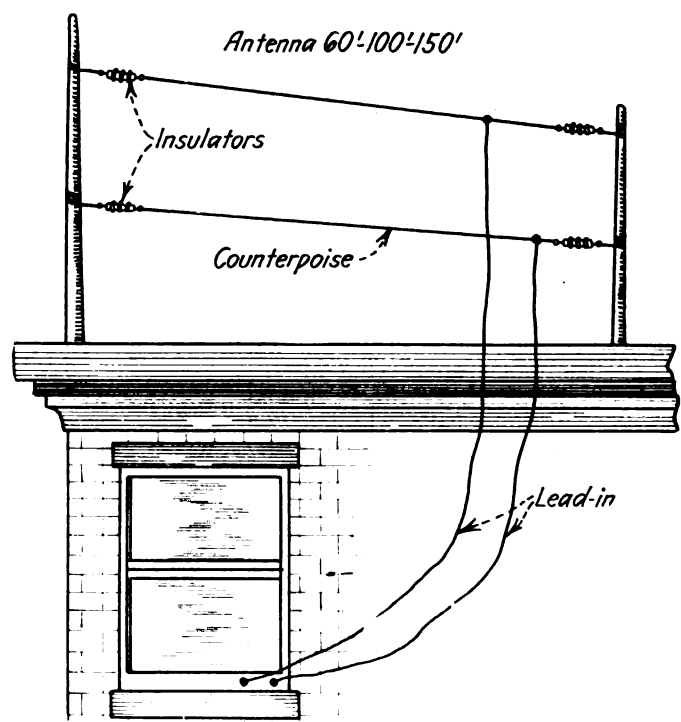
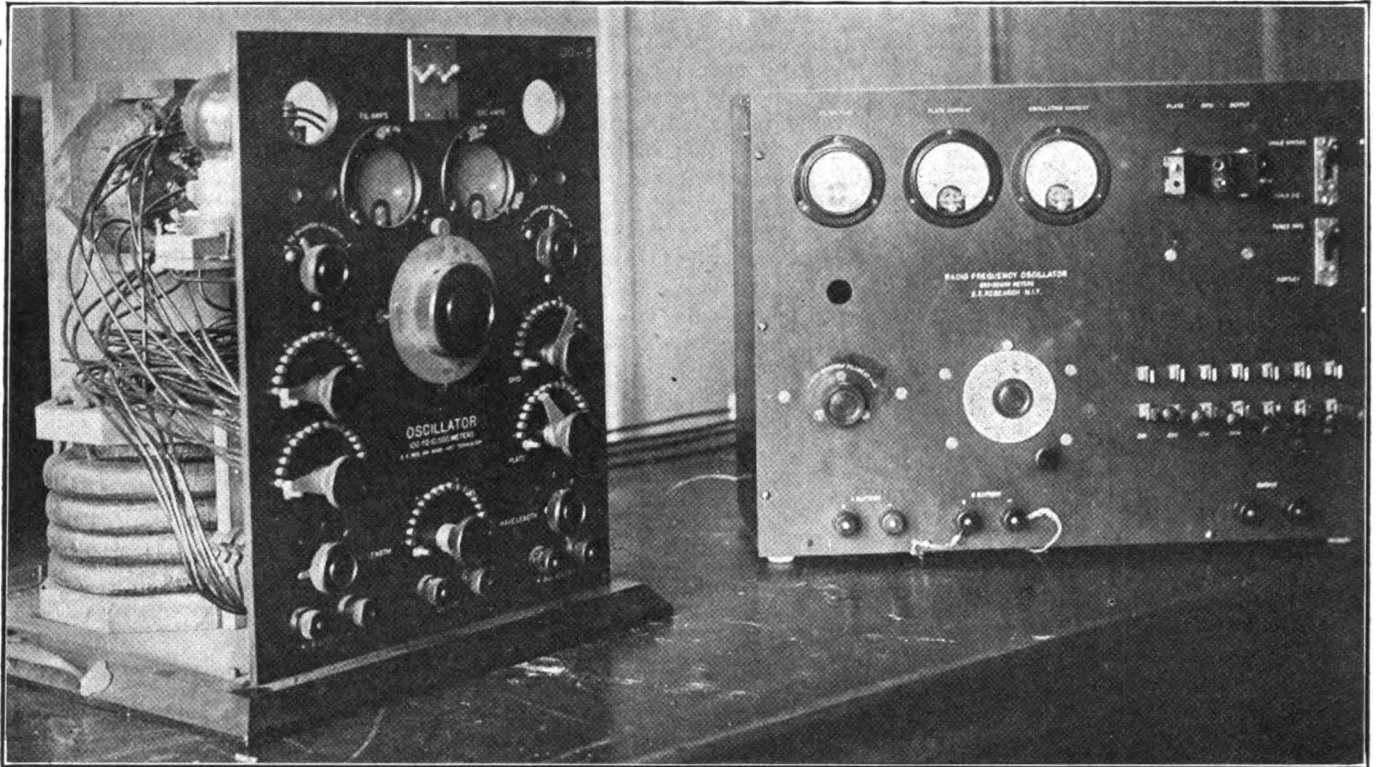


Figure 4—An antenna counterpoise that was found efficient, reliable and practical. It is for fans who have plenty of space in which to operate. Suggested by Frederick J. Rumford. Drawn by S. Newman.

The Importance of Understanding and Testing Radio Apparatus

By C. White, Consulting Engineer



Radio testing apparatus used by Mr. C. White in the tests described in this article.

THE general practice of scientific-laboratory testing and research has been neglected in the radio field. While it is quite true that certain manufacturers have taken special interest in the practical trying-out and testing-station work conducted by various scientific and semi-scientific journals, still there are comparatively few who have actually put themselves to the additional trouble and expense to have a definite line of scientific experimenting on their apparatus. Although an actual try-out will bring to light many of the serious inherent troubles in a radio receiver, yet, owing to the uncertainty of varying atmospheric conditions, it is utterly impossible to determine the absolute or definite relative value accurately by such methods.

We are about to enter upon the second year of our unusual radiophone popularity, and it would do well for many of us to think over the problems that must be solved if the wireless science is going to progress. And the most important problem we are facing for solution is the development of more supersensitive receivers. From developments and inventions brought forth during the past year we do know that, by means of more sensitive receiving apparatus, we could be able

to receive from stations (radiophone) at least 5,000 miles or more distant. At present such a feat—if, indeed, it could be fully realized—would be considered a miracle.

Research is more than testing for defects in goods already manufactured; it is the searching out of new and fertile fields for development on the border line of the unknown. For the past year I have been trying out—by means of definite and well-founded scientific principles—the comparative values of the different amateur receiving sets on the market. To receive from a certain station is not a very good test for a receiver because, perhaps, reception was due to some freak atmospheric condition, under which even an ordinary crystal set is said to produce marvels. Not even the repeated reception from a certain distant station can be taken as a good basis of judgment, for the quality of the received signal will largely depend on the amount of power received and the modulation of the transmitter, all of which is quite variable from day to day. So, in conducting this work, it was very necessary to construct within the narrow confines of our laboratory a small sending-station which we could absolutely regulate and control to give us various amounts of power.

In other words, we tested out the various receivers on what might be called a phantom signal, and by carefully arranging and shielding the various pieces of apparatus used we could quite effectively try out our theories and delve into the troubles in present receivers and at the same time compare them with newly developed circuits of our own.

In Figure 1 is illustrated two types of oscillators used in our receiving experiments. The one shown on the right used honeycomb coils for tuning inductances, while the apparatus on the left makes use of ordinary inductance coils so wound as to cut down to a minimum point distributed capacity. The former is a better oscillator for short waves, especially since it is wired up for two types of oscillating circuits, thereby allowing close and quick check operations by means of two tumbler switches. We obtain an artificial modulation by placing the secondary of a small modulating transformer (audio-transformer) in series with the plate potential supply (the B battery). The primary of this transformer is fed from a small 780-cycle alternator. So, theoretically, all we do is to impose a 780-cycle audible note on the high radio-frequency carrier wave. The output terminals of our oscillator are

Do Not Force Power Tubes

By Peter Gray

IT is unwise to overload or force a radio-tube power-tube, as its operating life will be menaced. It is a better plan and more economical to operate two tubes in parallel than it is to force one tube to deliver a power output far in excess of its rating. Economy will result from burning tubes slightly below normal brightness—to double the filament emission will reduce the operating life of the tube one-half. Burning the tube at 95 per cent of its normal brightness will multiply its life fourfold.

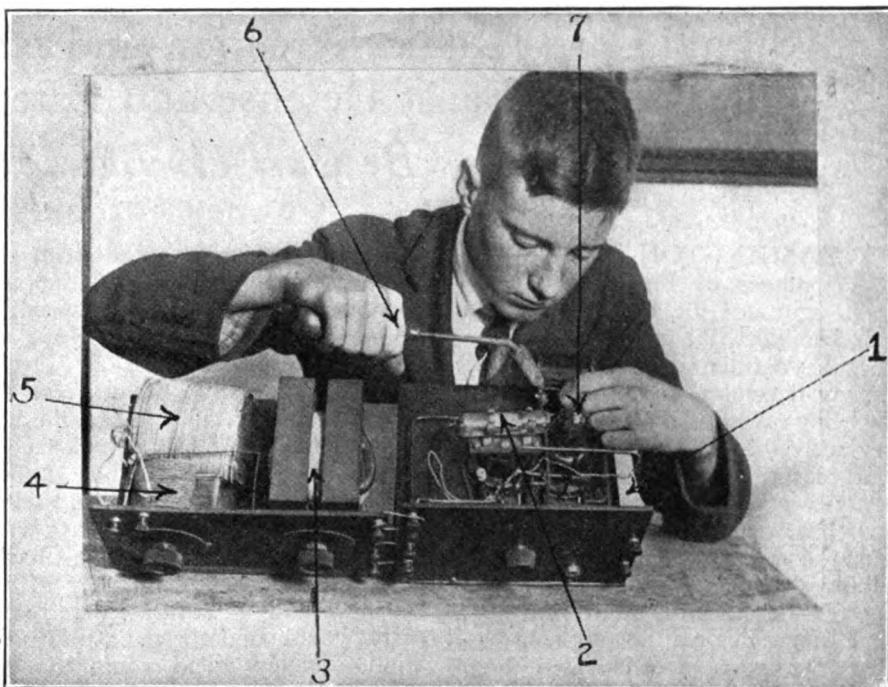
When first testing the circuit, or when the set has not been operated for some time, cut down all voltages to one-third of the normal voltage. This will greatly reduce the possibility of burning out the tube through a wrong connection which has been overlooked. The fault will then instantly be detected before the damage is done.

In a radiotelephone transmitting circuit a modulator tube is employed and a buzzer substituted frequently for the microphone to send out interrupted continuous waves. This imposes voltage strains on the oscillator tube.

Important Insulation Necessary

IN powerful C-W transmitting sets, the circuits should be so arranged that the center tap on the filament coil and, also, the negative lead of the direct-current high-voltage source are both at ground potential relative to high-frequency potentials in order to insure safety. Great care should be taken to thoroughly insulate the grid and plate leads to the tube and the coil sections connected to these leads or to any apparatus in them.

He Built This Set for \$21



(C. Kadel & Herbert)

The above is a photograph of Charles Murphy, radio student at Fordham University, New York, completing a regenerative receiver with one stage of amplification, which cost him \$21. With this set Mr. Murphy can hear the distant stations. By means of the Armstrong circuit which is produced by the aid of the variometer in the plate circuit feeding back the energy into the grid circuit, and a condenser, he is able to eliminate the taps on the coupler of this receiver. For a detector tube, he is using an old audiotron-tube and a V-T No. 1 as an amplifier. 1 is the amplifier case containing the detector tube and the amplifier. 2 is the detector tube. 3 is the variometer in the plate circuit. 4 is the variable condenser. 5 is the coupler, with its peculiar winding. 6 shows the method of soldering a connection in the amplifier. 7 is the amplifier tube or the V-T1. These comprise the complete receiver.

(Continued from preceding page) fed through a mutual inductance coupling, which is nothing more than a specially constructed vario-coupler, to the antennae and ground terminals of the receiving set to be tested. By this method we not only control the frequency of the modulating circuit, but we can carefully control the relative amplitude of both the audio-wave and the radio-frequency carrier wave. Therefore it is quite easy for us to actually assimilate a nearby, or distant, station by so doing. The brief outline of this method clearly shows the theory behind the operations, but there are many practical points and considerations that must be fully taken into account before a good and authoritative comparison may be materialized.

First, we must carefully intershield all of the component apparatus we are employing in the test hook-up. This does not only include a complete shielding of the generators, radio-frequency oscillators and audio-frequency alternators, but all the parts of the oscillator. In addition to this we must place the audio-frequency set in another room to get rid of its noise, and we must carry out the tuning and audibility test on the receiver in a specially screened-off corner of the laboratory.

After all apparatus for generating the phantom signals are adjusted and set in operation the tester must crawl into his screened-off cage with the set that is under consideration. Generally a well-planned selectivity test is carried out to determine the relative amount of selectivity by means of slightly changing the wave-length impressed. Next, the audibility of the volume received is measured by means of an instrument known as the audibility meter; then comes the distortion test. This test is accomplished by photographing the wave-form of the audio-frequency wave as generated by the high-frequency alternator and then photographing the wave-form as received by the phones. The actual photographing of this wave is done by the aid of an oscillograph—an instrument that traces with light the wave shape of an alternating electrical-impulse. It has been proved by practice and experience that a good set, or circuit, may be readily picked out. Not only has it been able to measure volume and sensitivity, but it has been possible to incorporate many important design changes while the set was on test without the long and tiresome method of sitting up for half-a-dozen nights to get a good average of its new performance. Although this method of

testing is by no means fool-proof in operation, manufacturers who lack facilities for such work avail themselves of such service, for it is well understood that many improvements can be made on the best outfits

While I have only outlined the phantom reception test, there are many more tests—resistance, inductance, capacity, and leakage tests—that lack the complexity of the one previously outlined, yet they are quite essential and important. If we intend to perfect radio for the home, just as the kodak has been simplified and perfected, we must carry on more aggressive research. It is not enough to hitch a set up to an aerial and turn the dial until a sound is heard. We must do more. We must investigate relatively the volume and the tone quality of the same. We must try out different types of arrangements and see if the general quality can be improved. The modern radio amateur is quite willing to accept the better grade of goods, and it will not be long before he not only will request a better scientific instrument for his home, but he will demand it. Since we are facing National Radio Week let us all—manufacturers and amateurs—turn to the right and realize the possibilities of radio for home and business.

Radio Takes on More Wartime Duties

Signal Corps Radio Direction and Range Finders Will Aid in Coast Defense and Extend Distances

By *Carl H. Butman*

(Copyright, 1922)

WASHINGTON, D. C.—The ranges of the shore-defense guns of the United States in all probability will be extended twenty-five miles farther to sea by virtue of a newly developed radio range-finder now being tested on the Atlantic Coast. Previously the maximum range of the great coastal guns was approximately twenty-five miles when visibility was good, but with the perfection of the signal corps radio devices poor visibility is not a handicap, and it is expected that a maximum range of about fifty miles can be reached, provided the guns are elevated high enough to be fired that far. Enemy ships will have to stand farther out at sea to be safe; at least, the fleets will be prevented from anchoring or disembarking troops within fifty miles of our shores in wartime.

Employs Radio, Aviation and Plotting

Three factors make up the essential principles of the new long-range fire control—radio, aviation, and plotting. For the first time in history the post-war developed radio-compass will be employed for a purpose other than to locate stations or give ships their bearings. The use of an airplane equipped with radio for spotting the fall of projectiles is not new, but the unique feature today is the fact that the airplane itself will be out of sight over the target or ship. Without awaiting the fall of sighting shots the observer will send a series of radio signals which

will make it possible on shore to plot the successive positions of the ship and determine its course and speed.

One of the problems of the joint coast artillery and air service maneuvers, now under way off the Virginia Capes, was a test of the new radio fire control devices and a comparison with the old method. A boat visible from the shore will run various courses in an area several miles wide, stretching seaward from Cape Charles and Cape Henry, the master of the vessel keeping an accurate time record of his course and speed. An airplane from Langley Field equipped with radio-sending apparatus will fly out, locate the ship, and remain over it as much as possible by executing the figure 8 in the air. Flying at a height of several thousand feet, calculated to be safe from anti-aircraft fire, this observation plane will send special signals to the shore only when it is exactly over the vessel, continuing to do so until ordered in by the shore stations.

Radio Direction Stations Ashore Get Signals

On shore two radio-compass stations, several miles apart, have been set up and direct lines of communication laid to the batteries. Operating just as when a ship's bearing is furnished these two stations will pick up the signals sent by the observing plane when it is over the target ship. In other words, they will turn their com-

pass coils until the radio signal is received with equal strength in both receivers, then the direction, or angle, from the stations will be read and plotted. With the angles at each station read simultaneously, and the distance apart known accurately, it is a simple problem in trigonometry to locate the position of a ship and its distance from the battery. It is even simpler to plot the location of the ship on a map by laying down the angles from the two stations, extending the lines and noting their intersection. Within a few seconds a second signal comes in, then another; all of which, when carefully plotted and timed, give the course of the moving target and its speed.

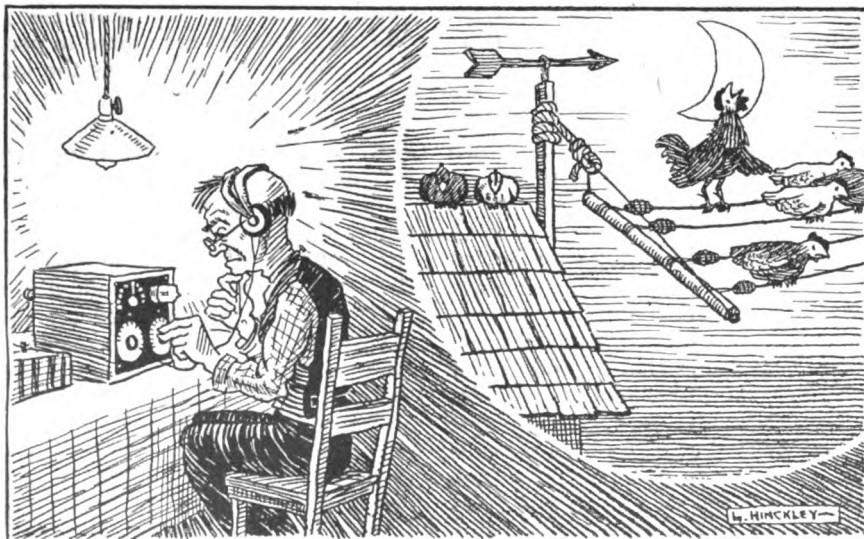
Firing at Unseen Targets Miles Away

Firing may or may not be undertaken in the initial test. This does not matter, as it is solely a problem of ordnance and ballistics after the ship's course is plotted. The artillery men do the rest, although they see nothing of their target many miles at sea. The most important feature of the scheme is its adaptability to night operations and in thick or foggy weather. Conditions do not matter so long as the observing plane can find the ship and fly over it. The distance from shore does not matter; but the range may be increased over the old range, limited by visibility from the observing towers, planes, or balloons ashore, by many miles beyond the horizon.

A comparative test made by another plane flying nearer shore will also be made; but as the data this observer can give will be only in the form of estimates as to the bearing, or azimuth, of the vessel, and its distance from Fort Munroe, it is not thought this old method can furnish the plotters with sufficient accurate information to compare with the more exact radio direction finding system.

Coöperating with the board of coast artillery and air service officers conducting the test, Captain G. W. Morris, of the Signal Corps, is in charge of all radio operations during the first tests of the army's new radio direction finder now applied to gunfire.

Among other experiments to be conducted during the week will be tests to determine the extent of interference to radiotelephone and telegraph messages caused by neighboring radio communications in operation.



(Cartoon by Lawrence B. Hinckley)

RADIO ON THE FARM HAS ITS DRAWBACKS

Farmer Dill: "I wonder what kin be wrong with this contraption! Just about this time every night it seems to pick up some very familiar noises."

Operating a Three-Unit Honeycomb Regenerative Receiver

By John Kent

A TYPE of tuning apparatus, operating under the inductance principle, is the honeycomb-coil unit. These coils are single units and are used in conjunction with the adjustable mountings, the coils with the mounting making up the tuning unit. Similar mountings are made for the two-coil unit.

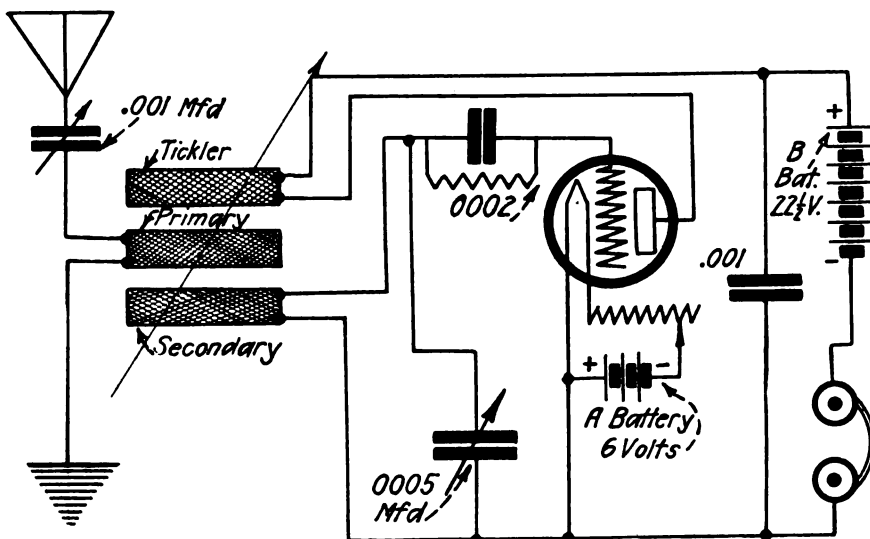
When the honeycomb-coil mounting is used, the same advantage is taken of electrical phenomena as in the case of the vario-coupler and the loose-coupler, that is, oscillatory current flowing through the honeycomb coil, which acts as a primary, creates magnetic lines of force. When flowing through the secondary coil, the lines of force induce a current. As the angle is changed between the two coils, the magnetic lines of force affecting the secondary is varied. Therefore, the angle, or adjustment, of the secondary controls the magnetic lines of force.

Instead of tapping the coils, a number of honeycomb coils must be on hand to be inserted—as the length of the broadcast wave requires. A three-coil schematic diagram is shown herewith, in which the third coil is used in the plate circuit to produce amplification. A table published in RADIO WORLD, No. 32, dated November 4, showing the different coils needed to receive from the various wave lengths.

To operate the set, light the filament of the tube to as near brilliancy as possible, the tickler coil being set at zero. Increase the brilliancy of the tube until the hissing sound is heard in the ear pieces. When this is heard, decrease sufficiently to stop the hissing. Set the coupling at maximum and the primary and tickler at its lowest value. Then, very slowly, vary the secondary coupling from zero to maximum.

If no signals are heard during this operation, change the primary setting five or ten degrees and vary the secondary through its range. Do this until signals are heard. If they are not heard, increase the tickler setting and repeat. When the signal has been heard, adjust the controls for best results, remembering that, in order to obtain selectivity or freedom from interference, the coupling must be decreased considerably to zero. This should be done gradually in order not to lose the signal.

The tickler coil may be increased to best position, but not so far as to oscillate, as oscillation spoils the signals.



Schematic diagram showing how a third coil is used in the plate circuit to produce amplification.

Oscillation becomes a small generator of high-frequency currents. In turn, this current acts as a transmitter causing current to be sent out similar to that of a sending station. Whenever hissing sounds, varying in pitch, are heard, it is a certain sign that some re-

ceiving station nearby is radiating waves because its tickler coil is turned up too far.

When attempting this hook-up, be careful to watch each connection in order to be certain that the right polarities are made.

Radio Laws and Regulations of the United States

THE owner of an amateur radio-transmitting station must obtain a station license before it can be operated if the signals radiated therefrom can be heard in another State; and, also, if such a station is of sufficient power as to cause interference with neighboring licensed stations in the receipt of signals from transmitting stations outside the State. These regulations cover the operation of radio telephone stations as well as radio telegraph stations.

Station licenses can be issued only to citizens of the United States, its territories, and dependencies.

Transmitting stations must be operated under the supervision of a person holding an Operator's License. The party in whose name the station is licensed is responsible for its activities.

Government licenses granted for amateur stations are divided into three classes as follows:

SPECIAL AMATEUR STATIONS known as the "Z" class of stations are usually permitted to transmit on wave lengths up to approximately 375 meters.

GENERAL AMATEUR STATIONS which are permitted to use a power input of 1 kilowatt and which cannot use a wave length in excess of 200 meters.

RESTRICTED AMATEUR STATIONS are those located within five nautical miles of Naval radio stations, and are restricted to 1/2 kilowatt input. These stations also cannot transmit on wave lengths in excess of 200 meters.

EXPERIMENTAL STATIONS, known as the "X" class, and school and university radio stations, known as the "Y" class, are usually allowed greater power and also allowed the use of longer wave lengths at the discretion of the Department of Commerce.

All stations are required to use the minimum amount of power necessary to carry on successful communication. This means that while an amateur station is permitted to use, when the circumstances require, an input of 1 kilowatt, this input should be reduced or other means provided for lowering the antenna energy when communicating with nearby stations, in which case full power is not required.

Prevent Tube Accidents

THE principles of construction and operation in the larger power-tubes are no different from those applying to the smaller ones. Many effects negligible in the smaller

tubes are magnified in the larger tubes, and certain precautions are necessary. Accidents to power tubes and their auxiliary apparatus occur during the period of development of circuits, testing, and adjustment rather than during operation.

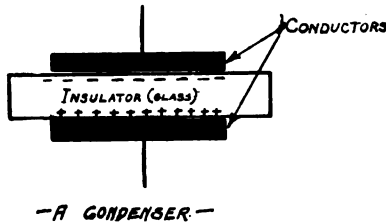
The Radio Primer

*For Thousands of Beginners Who
Are Coming into Radio Circles*

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

WHAT is capacity? The condition of the earth is constant. This is because it has a limitless capacity. Capacity is an important factor in electrical work, and it is necessary that we have a thorough understanding of what it is. In order to thoroughly understand capacity let us take two metal balls, one twice as large as the other. Put twice as much electricity in the larger ball as in the smaller one. Now, if



Schematic diagram of a condenser and radio circuit. Note the insulator and the conductor with the negative and positive charges.

we connect the two balls by a wire there will be no change of electricity. There can be no difference of potential (voltage) between them, or there would be a transfer of electricity; that is, the two balls have the same potential and it will require twice as much electricity to bring the larger ball to this potential because the larger ball has twice as much capacity as the smaller ball.

* * *

What is the use of capacity?

Capacity is the ability of a body to hold an electric charge. If the body has a large capacity it will take a large amount of electricity to raise its voltage. If it has a small capacity it will take only a small amount of electricity to raise its voltage. Thus capacity deals with two things: First, quantity of electricity; second, voltage.

* * *

How is capacity measured?

Capacity is measured in farads. A body has a capacity of 1 farad if an ampere of current flowing into it for 1 second raises its potential 1 volt. This is such a large unit that it is divided into a million parts and each

one of these parts is called a microfarad.

* * *

How does capacity operate in a receiver?

Instruments that are built to give capacity are called condensers. Condensers are important in a receiving set. A beginner should fully understand capacity as tuning and other methods of employing receivers cannot be successfully accomplished without it.

* * *

How are the condensers made?

Condensers are made of plates or sheets of conducting material separated from each other by a non-conductor. Evidently the more and larger sheets used the greater capacity of the conductor. The closer together sheets are placed the greater the capacity, as the attraction of the opposite electricities is stronger at shorter distances. The capacity also depends on the kind of non-conductor used between the sheets, as the attraction of the opposite electricities is stronger through some kinds of non-conductors than through others.

* * *

What amount of electricity will a condenser hold?

The amount of electricity a condenser will hold depends not only on its capacity, but also on the voltage of the charging current, or charging instrument. There are various kinds of condensers made for various purposes. They are widely used. In using a condenser be careful not to apply a voltage greater than that for which it is built. If you do a spark will pass through the non-conductor between the plates and ruin the condenser.

* * *

What is a variable condenser used with?

A variable condenser is usually connected with an inductance—one of the elements that makes radio possible. The accompanying diagram gives the complete radio circuit of an inductance coil and a variable condenser. Capacity and inductance are the two main elements used in every radio transmitter and receiver. Without them it would be impossible to work.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

Radio Hints

Useful Facts for the Beginner
Who Wants to Know

IN using the vacuum-tube receiver it often happens that the filament flickers or fails to light. In such a case it is a good principle to remove the tubes and clean the ends of the contacts. This is done by either a file or sandpaper. Sometimes the jacks are at fault. When this happens attention should be given the connections of the jack.

Before attempting to make changes on the jacks remove all plate-battery connections before making jack adjustments to prevent a short circuit, which may result in the burning out of the vacuum-tube filaments. Should both stages of amplification fail to produce, the trouble may be placed at the B batteries. Sometimes defective tubes cause a majority of other troubles. It is desirable to test the tubes in various combinations; that is, try them in each socket.

* * *

If you are interested in radio and want to receive broadcast concerts don't let lack of technical knowledge deter you. The most marked recent developments of radio have been in making available receiving sets which anybody can operate by following a few simple directions. Operating a complete receiving set, which can be installed in any home, is no more difficult than operating a phonograph.

* * *

The crystal is the very heart of a radio set. On it depends the entire operation. There are many minerals that may be used for the detector, but up to the present time galena is the best that can be obtained. Do not handle the mineral any more than is necessary, as a coating of oil forms on the surface of the mineral, making the signals weak. Sometimes it will cut down the sensitiveness of the crystal and make the detector inoperative.

* * *

When employing the detector-amplifier unit to a receiver it should be placed as close as possible to the receiver in order to avoid long connections. Always make certain that the battery leading from the storage battery and the B battery are connected to their proper terminals, and, also, that the polarities are not reversed.

* * *

A panel mounting does not allow one to experiment with his hook-up and to show his friends how the circuit actually works. But, to the contrary notwithstanding, a panel-mounted receiver is by far the most attractive in appearance and is often better scientifically if shielded from body effects.

Additional Committeemen Named for National Radio Week

It has been a busy week at the headquarters of the Executive Committee of National Radio Week—December 23 to 30 inclusive—the offices of Major J. Andrew White, chairman, 326 Broadway, New York City.

Major White and his staff have been kept pretty well occupied answering the many telegrams and letters of inquiry that have begun to pour in from all parts of the country. The interest in this important radio event is increasing every day, and is spreading rapidly to all parts of the country.

William B. MacNeary, of "The Sunday Call," Newark, New Jersey, has accepted the position of chief of publicity.

Elmer E. Bucher, author of several important works on radio, and sales manager of the Radio Corporation of America, is to be chairman of the Committee on Dealers.

Because of the amount of work attending his regular duties, Kendall Banning, editor of "Popular Radio," found it impossible to take on the extra work required of a member of the Executive Committee. His resignation was reluctantly accepted, and Arthur H. Lynch, editor of "Radio Broadcasting," was appointed to fill the vacancy.

The following men, all important in the wide-spreading field of radio, have written to the Executive Committee, offering their services to make National Radio Week a genuine success from every angle:

Raymond F. Yates, radio editor, "The Mail," New York; Robert S. Wood, radio editor, "The World," New York; E. L. Bragdon, radio editor, "The Globe," New York; William H. Eaton, "Judge," New York; Pierre Boucheron, Radio Corporation of America; E. H. Rice, General Electric Company, Schenectady, New York.

Radioists of Sandusky, Ohio, are planning a program of special radio festivities for the big week.

Among the letters received during the week were the following:

Robert Curtiss, radio editor, "Guardian Magazine," Ashland, Ohio:

"I will do all I can for National Radio Week."

Arthur G. Shirt, Fall River, Mass., magazine writer and newspaper correspondent:

"Hooray for National Radio Week! I am preparing copy about it—its conception, its boosters, its aims—for the New England papers for which I

write. I will let that be my contribution toward making the week a success."

C. White, Cambridge, Mass., consulting engineer in radio and electricity, and one of the chief contributors to RADIO WORLD:

"I am greatly in favor of a National

Radio Week, and think that the subject of more vigorous cooperation on the part of radio manufacturers for active research and testing as outlined in my article in this issue of RADIO WORLD will certainly raise the trade to a higher plane, which is certainly desirable."

Nine Microphones Start First Complete Church Service by Radio to Waiting World

RADIO listeners and their friends in all parts of the United States, Canada, and even on the ocean liners crossing the Atlantic, were part of the congregation of St. Thomas' Episcopal Church, Fifth avenue and 53d street, New York City, on Sunday, November 5, when the entire service—ritual, sermon and singing—was broadcast by radio.

The singing of the choir and congregation, the sermon of Dr. Ernest M. Stires, the organ playing of Dr. T. Tertius Noble and every word and sound throughout the service was picked up by nine microphones placed in different parts of the church, carried by wire to Newark and there sent broadcast for thousands of miles in all directions. This was the first time a complete church service was sent over the world by radio. It is said that even the clinking of coins dropped in the collection plates was heard.

Commenting on this interesting and important radio event, "The Mail," New York, says editorially:

"The sermon preached in a Fifth avenue church was heard by radio in thirty States, besides Canada, Cuba and Mexico.

"This opens possibilities in the religious field similar to the service by the Associated Press and syndicates to the newspapers. The smallest congregation can hear sermons every Sunday from able and eloquent preachers, the music of the best organists and the songs of elaborate choirs. This particular service had the singing conducted by a choir of seventy-five male voices. So well was the sound transmitted that the slightest noise made by people going up the aisle and

taking their seats was heard by the radio receivers.

"In many villages there are now more churches than the community adequately supports. Denominations are struggling along with small congregations unable to pay their preachers adequate salaries. In the rural districts it is not uncommon for a preacher to have several congregations miles apart and alternate the services in their churches.

"With the radio any denomination can have the most elaborate service and costly sermons at slight expense. The home mission boards of the different denominations can arrange radio services. The congregations can gather in the church and maintain their existence without further contributions than enough to keep the church in repair and heated and put in the radio receiving sets.

"Suppose the biblical accounts of the adventures of Moses had stated that the religious services at Mount Sinai were heard in Egypt and Greece and Italy? People of little knowledge and less faith might have called that an impossible miracle."

Tube Suspension

THE life of radiotron power-tubes may be prolonged by mounting them in the proper position. Radiotrons No. 13248, type UV-202 and No. 13247, type UV-203 should be operated in a vertical position, whereas radiotron No. 13246, type UV-204, may be operated in either a vertical or horizontal position. If mounted horizontally, the plates should lie in a vertical plane, with the seal-off tip down.

FANS, AMATEURS, DEALERS, BROADCASTERS, MANUFACTURERS,
AND THE GENERAL PUBLIC

Are Looking Forward to

NATIONAL RADIO WEEK
DECEMBER 23 TO 30, INCLUSIVE

All Interested in Radio Should Help to Make This Event a Smashing Success.

If you want to know more about it address:

NATIONAL RADIO WEEK EXECUTIVE COMMITTEE

MAJOR J. ANDREW WHITE, Chairman

326 BROADWAY

NEW YORK

Radio Supplanting Land Lines in Northwest

By *Washington R. Service*

RADIO is slowly supplanting government wire lines in the far reaches of the Yukon. Much of the romance of the Far Northwest is passing with the reeling up of miles of wire stretched by men of the Signal Corps, and kept in operation, despite severe winter storms and intense cold, since long before the days of the gold rush.

The first radio station erected in any United States possession to handle commercial business was built in 1903 at St. Michaels, Alaska. Radio then reached to Nome, replacing many

cables and wires. Winter ice across Norton Sound was constantly carrying the hundred-mile cable away and its replacement was expensive, so the stations at St. Michaels and Nome were erected and are still in operation. Later on more stations were erected, chiefly in the interior, until fifteen spark stations were completed.

Arcs and Tubes Replace Spark Sets

During the past summer, all these stations were modernized by a Signal Corps field detachment under command of Captain C. H. Burkhead, who will remain at Fairbanks all winter to

carry on observations as to the efficiency of the newly installed radio equipment. All spark sets were replaced with arc sets, at important points and with tube transmitters at the smaller stations. To-day there is not an army "spark" in Alaska. The modern equipment, it is estimated, will save about 75 per cent of the old operation costs and improve the transmission materially.

Signal Corps radio operators are now working direct from Fairbanks to Nome, a distance of about 540 miles, by radio. The resultant improvement in radio communications has made possible the abandonment of about 200 miles of land wires which had been a tremendous effort and expense to keep in condition, requiring the services of a small army of Signal Corps men, especially in winter time. To-day the army uses a wire from Fairbanks to its cable station at Valdez, but the line from Fairbanks to Fort Egbert was abandoned and the wires west of Hot Springs and Nulato taken down, as well as many lines to the mining centers.

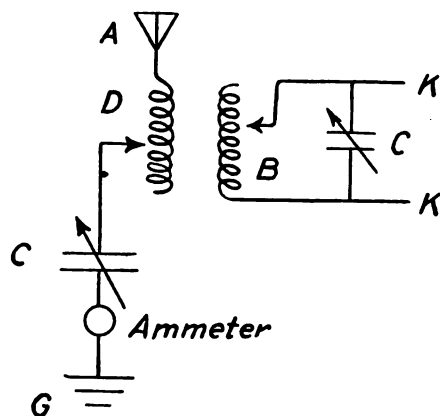
A 300-Mile Radio Control

To-day an operator at Valdez sends communications over 300 miles of wire lines to Fairbanks and thence by radio to Nome, about 540 miles. Actually he operates a radio arc at Fairbanks from his station 300 miles away, which is very "remote control."

In the event of a break in the Signal Corps cable which connects Alaska with the United States proper, the naval radio station at Cordova handles traffic to North Astoria, Oregon, completing the chain to the United States for the army.

Puzzling Problem of Tuning

By *Harold Day*



Schematic diagram of a simple circuit showing the tuning inductance and variable condenser.

TUNING is a puzzling matter for beginners. It is, however, very simple. It is stated that by varying the size of the coil B, and the condenser, the frequency of exchange of electrical energy between them—and, hence, the wave length—may be regulated. Study the circuit shown on this page.

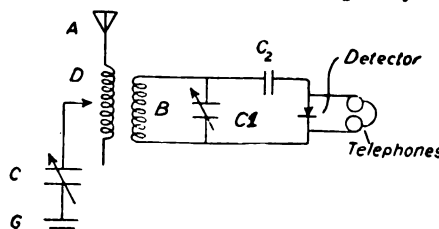
Assume that the wires, KK, are connected to a source of electrical energy, the frequency of which is varied by changing B and C. Vary C, leaving B fixed until a frequency of 1,000,000 cycles, or a wave length of 300 meters, is obtained. Then vary C and D, and it will be found that up to a certain point—and to that point only, the ammeter measuring the current gives a reading. This process is known as tuning and the point at which the ammeter gives reading is known as the

"resonant" point. All transmitting and receiving sets operate in the above manner. The difference in the sets being due to the methods used in varying B and C, and C and D.

Tuning applies to transmitting sets; the action being reversed; and then B and C are varied. High-frequency alternating current will be obtained from the wires KK, but the voltage and current will be in the order of millionths of a volt or ampere. A meter cannot be used. A special device, the detector, is employed, which, with telephone receivers, makes the currents audible.

Keep for Reference When Your Set Fails

IT should be noted that the scheme of connection in a receiving set is almost similar to that of a transmitting set with one exception: a detector and telephones have been added. The operation has already been explained in special articles published in RADIO WORLD. The various wave lengths are obtained by varying the frequency of



Schematic diagram showing complete crystal receiver. D and B are combined in loose coupler. This is so constructed as to permit of variations of D and B.

the circuits and the alternating current obtained from the distant transmitting station which is impressed on the detector.

The coils, D and B, are conveniently combined in the loose coupler. This instrument is so constructed as to permit of ready variation of D and B, and it also permits of the variation of the position of one coil with reference to the other. In the accompanying sketch a condenser, such as C or C₁, is shown.

These simple facts should be thoroughly understood by every amateur and fan. Keep this article and the accompanying diagram for reference.

Cells May Be Varied by Changes in Connections

By Horace Beers

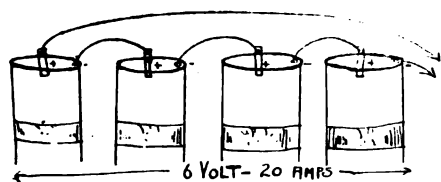


Figure 1. Method employed when connecting up dry cells in series. Drawn by Horace Beers.

A KNOWLEDGE of the methods of connecting up dry and storage batteries may prove useful where other sources of current are not available. Standard-size dry cells are used quite extensively for lighting vacuum tubes by amateurs who are not able or willing to hand out the sum of money necessary for a storage battery. The dry cell may be a fairly good substitute for the storage battery, but its use is not advised, except in emergencies, because these cells soon become exhausted and must be replaced by a new set of batteries. The cost of this continual replacement soon mounts up.

For the vacuum-tube B battery a number of flashlight batteries may be used as the plate potential for the vacuum tubes. Different uses of electricity require different values of voltage and amperage. An audio tube generally takes, approximately, one ampere of current to light at a pressure of six volts. The plate circuit requires a current that is measured in milliamperes, but at a pressure of twenty or more volts.

It must be remembered that a dry

cell has a voltage of $1\frac{1}{2}$ volts when new, and should show about 25 to 30 amperes. The storage cell, after being in use for a short time, registers about 2 volts, but their short-circuit ampere reading should never be considered, as it is ruinous to the cell in making the test. Such cells are rated in "ampere hours." This term may be taken literally, as an ampere hour means the flow of one ampere for a period of one hour. Usually about 8 amperes can be drawn, as a maximum amount, from a 60 ampere-hour storage battery.

For different uses cells may be connected in series, or parallel, or in combination of the two. When we connect in series we increase the voltage. When we connect in parallel we increase the amperage.

Suppose we have 4 dry cells and wish to operate some pieces of apparatus that require 6 volts without a large consumption of current. By connecting the cells in series the total voltage is the sum of the voltages of the individual cells. In this case the cells are $1\frac{1}{2}$ volts each; so 4 in series would give us 6 volts. By series we mean that the center post of one cell is connected to the side post of the other.

If a greater amount of current is needed we can connect our cells in what is known as series-parallel, as

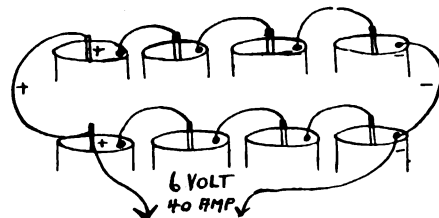


Figure 2. Method employed when connecting up two banks of dry cells in series parallel. Drawn by Horace Beers.

shown in Figure 2. This consists of connecting 2 series sets of four in parallel; that is, by connecting the 2 positives and, likewise, the 2 negative end-poles of the 2 series. Take the leads off as shown. This connection doubles the amperage, while the voltage remains the same. Further increase in amperage may be obtained by adding more banks of cells to the system.

This same rule applies to the storage battery; but, as the batteries register only 2 volts each—three when connected in series—it would give the necessary 6 volts.

These simple facts regarding batteries should be remembered by every radioist dabbling with batteries. A storage battery having 3 cells would register 6 volts; one with 2 cells, 4 volts, and so on. Never connect or short circuit a cell. By this we mean, never place a wire or other piece of metal across the negative or positive of a cell. It will completely ruin it and you will be wondering why the battery will not produce current.

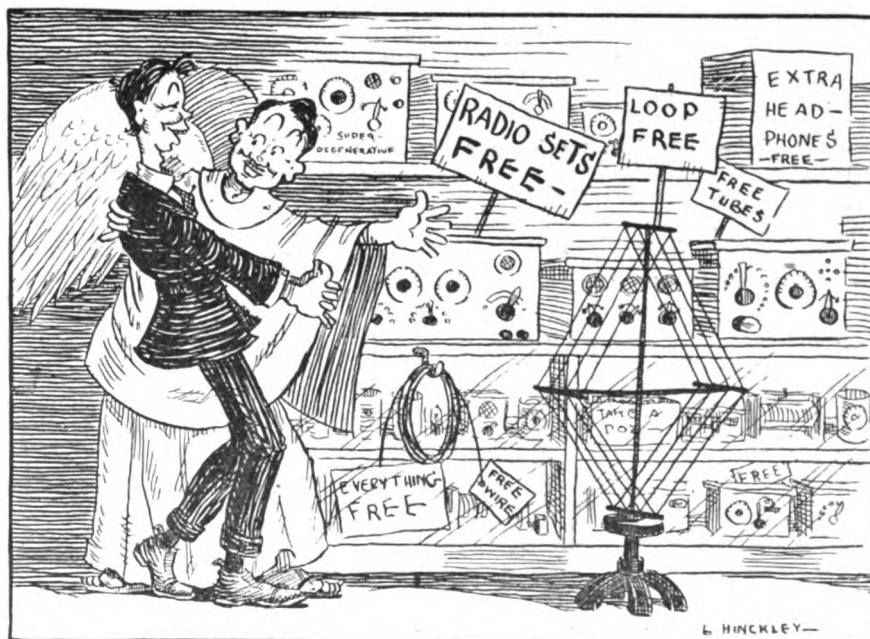
Erecting Aerial Masts

A SIMPLE way of raising aerial masts to any considerable height is to plant a short staff about one-third the length of the main mast, close to its base and raise the shorter mast by means of tackle. Guy ropes should be slung from the mast about two-thirds the way up, to permit guiding.

It is usual to make the aerial of more than two spans of wire, so that a greater conducting surface will be represented. For stations up to 1 kilowatt, size and aerials should have at least 6 wires spaced not less than 2 feet apart or more than 3 feet.

It has been found that nothing is gained by placing the separate spans closer than 2 feet. For fairly large aerials, 3 feet is very good spacing.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.



(Cartoon by Lawrence B. Hinckley)

A RADIO BUG'S IDEA OF PARADISE

Radio Angel: "Help yourself, son. If you don't find all you want this trip, come again!"

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

RADIO is playing an important part in the work of mapping Northwest Canada. By tuning in and getting time signals from a known distant point and comparing it with the time at a designated place the map-makers can easily ascertain distances and directions.

* * *

Scientists have discovered that the aurora has a decided effect upon radio. Apparatus affected by the aurora could receive, but not transmit, signals while the influence lasted.

* * *

SAM is the call of a new radio-compass station at Hallo on The Skagerrak, Sweden, which was opened for general service on November 1. The new station, which is operated through Goteborg, SAB, will determine the true bearing of vessels calling within 150 miles on a 600-meter wave length. The charge for a bearing is placed at five kronor, about \$1.34.

* * *

The Radio Corporation of America has announced a radio-letter service to London and Germany at a rate slightly higher than postage. The rate is six cents per word. Messages filed any day in the week up to Saturday marked "Radio-letter" are transmitted to London or Germany for delivery on the following Monday morning.

* * *

The United States Signal Corps at Washington, D. C., continues to save money through the transmission of official messages by radio instead of by land wires. In September a total of 239,826 words were handled, with a saving for the month of \$2,668 over the cost at commercial rates.

* * *

Radio wins a race! "Radio," ridden by L. McDermott, won the Latonia Cup at Louisville, Kentucky, with an added purse of \$7,500, over a distance of two miles and a quarter in 3:49 flat.

* * *

Recent modifications of the rigid laws governing the installation of radiotelephone and telegraph stations have made possible the installation of radio-broadcasting, according to Vice-Consul Edwin B. Montgomery, of Montevideo. Applications are now pending which, if granted, should mean the opening of a splendid market for radiotelephone receiving apparatus in Uruguay.

* * *

Fred Stone, president of the National Vaudeville Artists, was the guest of honor at a luncheon at the William Penn Hotel, Pittsburgh, given by prominent citizens. All the speeches made were sent out by radio. Among the speakers were: Harry Davis, Senator John P. Harris, president of the Theatre Managers' Association of Pittsburgh; Senator George Wharton Pepper, Senator David Aiken Reed and Mayor W. A. Magee.

* * *

Gambia, the British colony in West Africa, has installed radio telephone and telegraph stations at Bathurst and McCarthy Island, 176 miles apart. The new stations are in daily use, giving instantaneous communication between the two centers. The colony has no organized wire telegraph or telephone system, and the radio stations already have proven of great value.

* * *

Members of the United States Army, organized reserves and National Guard in San Francisco will have the opportunity to buy some of the 10,000 army receiving sets at \$7.50 each. These sets were declared surplus stock, and cost \$1,000,000. Buyers are limited to military men only.

* * *

The call letters for the station recently opened at Havana, Cuba, are PWX.

* * *

Great Britain has given the Wireless Society of Manchester permission to erect a special transmitting station for the purpose of attempting to bridge the Atlantic from the east to the west with one kilowatt of power. The extraordinary license issued for this station specifies that no more than this amount of power shall be used and that the apparatus shall utilize continuous waves. In Great Britain the restrictions which have always been maintained on amateur stations even specified what kind of aerial should be used, and placed limitations upon its size. In the license given to the Manchester society this rigid rule has also been modified, and permission granted for the erection of a more efficient type of aerial for the purpose in view.

* * *

The steamer "Matsonia," equipped with a 1,000-watt General Electric Company radio set, talked through its telephone every morning from September 12 until September 25, the day before she arrived in San Francisco from Honolulu, with the radio station

at Apia, Samoa. The last conversation was at 8:30 o'clock in the morning. At that time the "Matsonia" was 4,050 miles from Apia. On this voyage the "Matsonia" was in radiophone communication the entire trip with either the San Francisco office of the Radio Corporation of America, KTH, or the Hawaiian station, KHK. All the ship's radio work was done on a wave length of 550 meters.

* * *

Experiments are being made in Belgium for rapid reception of messages in script by a photographic process combined with radio.

* * *

Radio development in Czechoslovakia has not yet passed the stage of infancy, according to dispatches to the Department of Commence from Consul Winans, Prague. He states, however, that the government has already taken an active interest in radio development, and in view of a more extensive and popular acceptance of this form of communication at home has sent a special commission of experts to study the progress made in other countries. Whether a sending station for radio messages will be established in Czechoslovakia will depend upon the findings of this commission. Even when finally introduced, however, the local industry cannot be expected to attain the state of development reached in the United States. It is stated by the Ministry of Posts and Telegraphs that all messages sent by radio will be subject to strict control by the Government; not every person will be permitted to own a receiving or sending apparatus. High duty will be assessed on radio outfits and supplies of foreign make, and each radio set, whether of domestic or foreign manufacture, will have to be registered at the Ministry of Posts and Telegraphs. Many local factories are said to be interested in the future of radio telephony and to be awaiting a favorable moment for producing the necessary requirements of the industry.

* * *

Over 5,000 words on the election results in New York and other parts of the East were sent to California by radio on election night, the wire service having been seriously interrupted by a sleet storm in the Rocky Mountains. The station of the Radio Corporation of America at Rocky Point, which is ordinarily used for sending radio messages to Europe, sent returns to the radio station at Bolinas, near San Francisco, which is ordinarily used only for communication with the Far East. Western returns also were received by radio from Bolinas.

* * *

Beginning November 26, the radio audiences will hear the first of a series of thirteen Sunday afternoon popular concerts by the City Symphony Orchestra, which will be broadcast by the Westinghouse-Radio Corporation station, WJZ, at Newark. These concerts will be held at the Manhattan Opera House, New York City, and will be conveyed to WJZ by a special Western Union wire. The programs will consist of gems from the lighter classics, together with shorter symphonic poems. Young soloists of real talent and distinction will be heard at each performance. The City Symphony Orchestra, which is maintained by the Musical Society of the City of New York, consists of 83 players carefully selected for their musical talent and symphonic experience. The conductor, Mr. Dirk Foch, a native of Holland and a composer of distinction, has had a successful career as a conductor of symphony concerts and opera in Amsterdam, The Hague, Stockholm, Gothenburg, and other European cities.

* * *

"Aida," Verdi's great opera, was broadcast from the Kingsbridge Armory, New York City, on Saturday evening, November 11. The performance—which marked a new era in radio and made history for this wonderful science—was given by artists and the orchestra of the Metropolitan Opera House, New York City, undoubtedly the greatest organization of its kind in the world. Sent out by the powerful station, WEA, it was heard over a range of a thousand miles.

Send Radio World Your
Best Suggestions for
National Radio Week

Radio and the Woman

By
Crystal D. Tector

AMONG the many letters that I have received since the movement for National Radio Week started but one contains a negative note. Now, I wouldn't mention it—at least, first of all the communications that have come to me—if I did not believe that every objection contains some possible suggestion for good. I once belonged to a club, and one of the members seemed to take particular pains objecting to everything—everything! She called herself the "natural born objector." We other women almost hated to start anything new, knowing that this particular member would never agree. We have all encountered such a person. But they seldom do as much harm as good—and it is generally good business to have one on a committee.

* * *

Well, the correspondent I started out to write about is a Miss Jane Drophie of Chicago. Her objection is summed up in one sentence which I cull from her letter: "Won't the men take all the glory of National Week and won't they get on all the committees and have everything their own way?"

* * *

I imagine that Miss Drophie hasn't advanced much in up-to-date matters pertaining to women's place in the world—even if she does live in Chicago. My reply to her, and to any other woman who feels that we women are going to take a back seat during National Radio Week, is this: 'If such a thing comes to pass, it will be the fault of the women and the women only! And I think that I am sufficiently acquainted with my sex to make the statement that we will have just as much to say as the men—and, whisper, perhaps a little more!

* * *

Let me tell you a few of the preparations that the radio women of the charming suburban town—just a pleasant ride from New York—where Friend Husband and I have the dearest little home in all the world, are making for National Radio Week.

* * *

First we organized the Women's National Radio Week Executive Committee. We could have had fifty members, but at the first general meeting we all decided that a small workable committee with absolute powers would be the most satisfactory. So a committee of nine was decided on. The chairman of our first meeting appointed four, and the remaining five were chosen by ballot—that is, everyone at the meeting was asked to cast a ballot for her choice and the five polling the highest votes were declared elected.

* * *

This committee has the power to appoint subsidiary committees on publicity, dealers, shop-window decorations, entertainment, and any other phase of radio that may seem necessary. We consider that one of our most important committees is the Committee on Church Program and Entertainment, for no little interest in radio is centered in the churches in my town; and, this winter, we look to some wonderful evenings, as not a few of the churches have splendid sets. However, this particular committee will endeavor to have special radio nights and afternoons in as many churches as possible during National Radio Week—jolly entertainments and socials where people will meet and get acquainted, and, we all hope, become radio fans.

* * *

Another committee of importance will work among what we call "radio strangers." The members of this committee will visit those who have taken no interest in radio, and try to bring them to the church entertainments, the affairs at different homes, the radio stores where the general broadcasting may be heard, and to advise the most practical reading in order to learn radio. You may imagine that such a committee has a good deal to do; but from the reports I have received, our committee is doing wonders. I can safely say that, during the past ten days, we have made radio converts at the rate of a dozen a day. I do not mean people who promise to take an interest and then bid you a cheerless farewell; but people who have become so interested that they have not only thanked you but have asked you to come again.

* * *

We also find that one of our busiest committees is going to be the one that will advise shopmen how to decorate their windows and make their stores attractive. As we all know, the average radio dealer, or electrical merchant, is a pretty busy man in the first place, and, in the second, his wares do not make very attractive window and inside displays. Now here is where we women can do yoemen's service. I am certain

that as National Radio Week approaches few radio dealers will object if one or more polite, well-intentioned women approach them and ask if they may show Mr. Dealer or Mr. Shopkeeper how to present his goods in a way that will not only make them decorative but attractive to the prospective buyer.

* * *

Then, too, we women can do much to give the many social affairs that are bound to make National Radio Week sparkle the very *eclat* they will need. We will be of great service in getting up programs for the younger set—meetings and dances with radio as the foundation and the background. Why, already, I have had over a score of hidden requests for invitations to several affairs that I have announced—and I only wish that my home were larger—as large, indeed, as a barn or as the Pennsylvania railroad station in New York City—and I would just issue, right here, in the columns of *RADIO WORLD*, a general invitation to all to be present. "The more the merrier," say I.

* * *

I think that I have given my women readers a few hints here. One clever hustling woman in any town can easily start this movement going. It will be surprising how quickly it will take hold. For radio is new, and we Americans are ever on the alert for something new. It won't be long before the spirit of the thing will spread, and, I am bold enough to make the assertion, in any red-blooded American town, doing something for National Radio Week, or being on a National Radio Week committee, will be very much the vogue.

* * *

And, let me tell you in advance, there is to be some wonderful broadcasting this winter. We are to hear grand opera by the artists and the orchestras of the Metropolitan Opera House, New York, the very finest thing of its kind in all the world. We are to have the rendition of symphony orchestras that comprise the highest-paid musicians. We are to have the news of every great event. We are to hear eminent singers and instrumentalists—and we will have plays produced that, otherwise, we might never have a chance to see or hear. So, you see, radio is working for a wonderful future, and National Radio Week promises, more than anything else, to give us a glimpse of that future.

* * *

I can't help being so enthusiastic because I so fully believe in it. And I want to help you—all of you women who are interested in radio! And the editors of *RADIO WORLD* will help me to help you by devoting these columns to you every week.

Boys! This Tells You How to Use an Antenna with Your Kite

There are times when boys like to experiment with something more than the plain aerial. In the accompanying photograph, two of the younger radio enthusiasts are seen on the roof of their home in an attempt to raise a kite. It is their intention to utilize this kite by attaching a wire to it in order to experiment with altitudes higher than those of the average roof aerial. Their receiver is of the crystal type, and when the kite is aloft some thousand feet, unusual results may be obtained. This is an experiment to find out whether the height of an aerial has any more or less effect on the volume or distance of signals. Instead of flying the kite with a string, a light wire is used.

(C. Kadel & Herbert)



Another Busy Radio Week

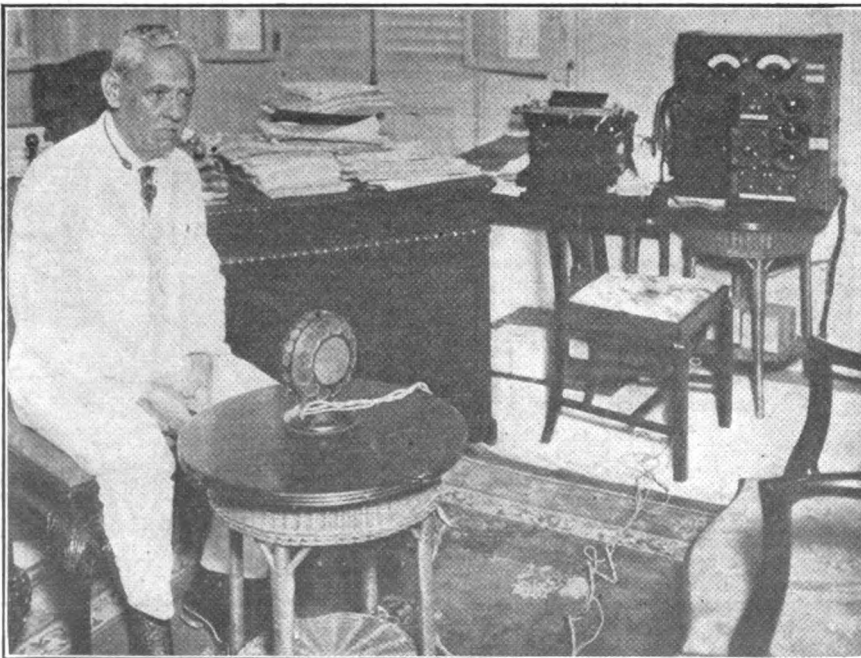


(C. International News Reel)

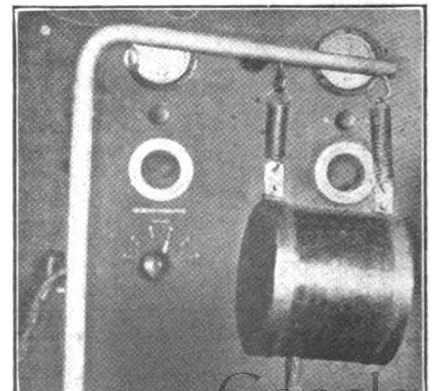
(Above) Every man his own aerial! This is a possibility, according to Collins Penz, a radio fan of Minneapolis, Minnesota. Mr. Penz has a small set in his home. One day, during a testing out while it was hooked up, he noticed that he could hear a broadcast concert while he kept his fingers on the slider of the tuning coil, as shown in the photograph; but when he removed his fingers, the music was not audible. His body served as a natural aerial. Mr. Penz made his coil by winding two coils of wire—one large and one small—around an ordinary megaphone. This gave him a primary and a secondary winding, making it a loose-coupler.



(Below) The pensive man in this photograph is Alfredo Zayas, President of the Republic of Cuba, in his private office just after talking into a microphone. It was the occasion of the broadcasting of the Cuban president's address to the American people, which proved that the span between the two republics may be covered by radio in the fraction of a second. Radio development in Cuba is having a great boom—particularly since the broadcasting of the World's Series baseball game was received there so clearly. Several new high-power stations are to be erected in Havana. General interest in radio matters is thoroughly active and amateurs are becoming more numerous every week. Cuba is a hearty market for American radio goods.



(C. Wide World Photos and International Telephone & Telegraph Corp.)



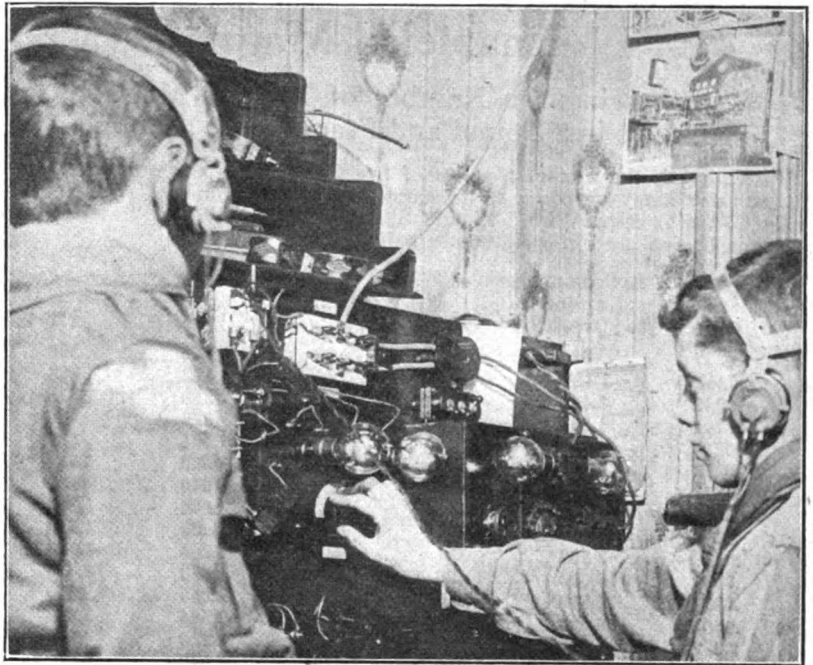
(C. Kadel & Herbert)

(Left) "close-up" crophon most in strumen casting this cy shaped speaker, directs is one sensitive mechani transmit to pick most st

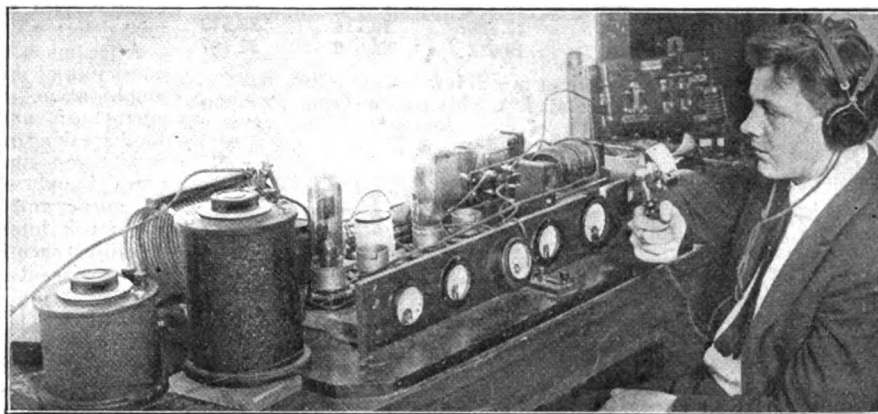
s Seen by the Camera Men



(Left) Miss Nellie D. Stevens is the first person to receive a photograph transmitted by Radio. Here is Miss Stevens decoding a "radio-photo" of Miss Virginia Valli, Universal Film star, which was sent from London to New York by radio. On the artist's drawing board are two portraits of Miss Virginia Valli. The picture on the left of the board is a copy of the portrait transmitted through the air; on the right is the result of Miss Stevens's decoding. She is now engaged in perfecting a method of transmitting finger-prints by radio, in the United States. To the left is a facsimile of a coded portrait as received by Carl Laemmle, president of the Universal Film Manufacturing Company. Sending photographs by radio is becoming a simple matter. It is possible to radio photographs over a great distance, one having been successfully sent from Italy to the United States.



(C. Wide World Photos)



(Above) This picture shows a remarkable radio set made by boys. To be sure, they had the guidance of a capable instructor. This particular set is for long-distance reception. Radio World would be pleased to see photographs of sets made or assembled by other boys, and invites them to send in such pictures with a view of having them published for the benefit of other boys.

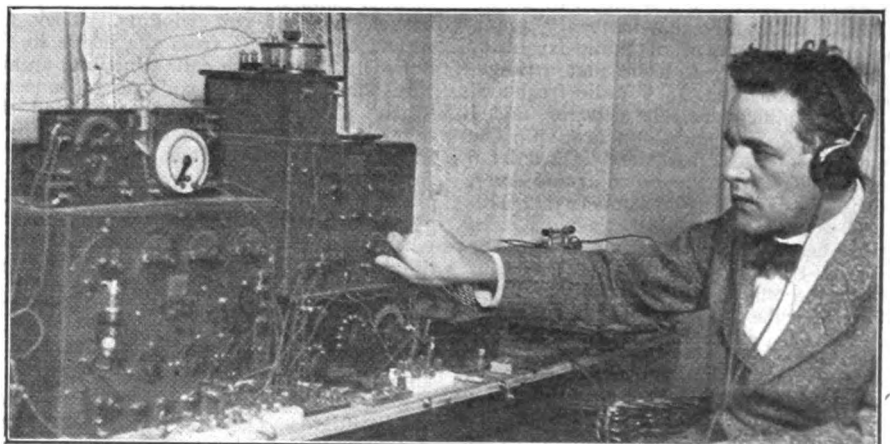
(C. Kadel & Herbert)

(Above) The football season has been considerably augmented by radio. Broadcasting the big games is very much in vogue. As in the case of the World's Series, these most interesting athletic events, so important to lovers of American sports, were received, play by play, in thousands of homes all over the country. The photograph illustrates the receiving and sending station at Fordham University, New York, designed primarily for the exchange of football scores and relay work between the various colleges. This station operates on 200 watts and uses from two to four U-V 203 tubes. Edward J. Hefele, one of the students of Fordham, is shown in the photograph broadcasting a football game taking place on the college grounds.



(C. Kadel & Herbert)

(Above) Mr. Shou S. Man, a graduate of the Hong Kong University, testing out the static characteristics of vacuum tubes at Columbia University, New York. Not a few young Chinese have come to the United States to learn the mysteries of radio. Few users of radio realize how much work is involved in the manufacture of vacuum tubes.



(C. Central News Photo Service)

(Above) Arthur Alexander, the American tenor, announces that his avocation is radio. This successful young singer is one of the most ardent fans in the country and says that he wouldn't care if he were a radio operator aboard an ocean liner.

(Left) The motorcycle is the latest thing to be radioized. And it works! Neil Cochran, of Oakland, California, is shown here tuning in on the radio station of "The Tribune" of that city. Mr. Cochran drove the radio-equipped motorcar which trapped the "bandit" in the recent "bandit chase" held in his State.

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Radio-Wire Tables

By Frederick J. Rumford, E.E., R.E.

No. 1—Enameled Magnet Wire

Showing the Number of Feet of Magnet Wire in a Pound and Fractions of a Pound

APPENDED is the first of a series of five tables which the radio amateur will find useful for many purposes. The succeeding tables—"Single Cotton-Covered Wire," "Double Cotton-Covered Wire," "Single Silk-Covered Wire" and "Double Silk-Covered Wire"—will be published in early numbers of RADIO WORLD.

No.	Diameter in mils.	Approximate turns per square inch	$\frac{1}{8}$ lb.	$\frac{1}{4}$ lb.	$\frac{1}{2}$ lb.	$\frac{3}{4}$ lb.	1 lb.
20	.0337	885	40	80	160	320	320
21	.0302	1,126	43	86	172	258	404
22	.0269	1,400	63	126	252	378	509
23	.0241	1,736	80	160	320	480	642
24	.0215	2,160	101	202	404	606	810
25	.0192	2,770	127	254	508	762	1,019
26	.0171	3,460	160	320	640	960	1,286
27	.0153	4,270	201	402	804	1,206	1,620
28	.0136	5,400	255	510	1,020	1,530	2,042
29	.0122	7,900	321	642	1,284	1,926	2,570
30	.0109	10,000	405	810	1,620	2,430	3,240
31	.0097	12,620	510	1,020	2,040	3,060	4,082
32	.0087	16,020	641	1,282	2,564	3,846	5,132
33	.0077	20,400	805	1,610	3,220	4,830	6,445
34	.0069	25,200	1,010	2,020	4,040	6,060	8,093
35	.0062	31,900	1,274	2,548	5,096	7,644	10,197
36	.0055	40,000	1,601	3,202	6,404	9,606	12,813
37	.0049	51,600	2,013	4,026	8,052	12,078	16,110
38	.0044	65,700	2,534	5,068	10,136	15,204	20,274
39	.0039	81,600	3,189	6,378	12,756	19,114	25,519
40	.0035	14,000	4,013	8,026	16,052	24,078	32,107

The figures for the $\frac{1}{8}$ -, $\frac{1}{4}$ -, $\frac{1}{2}$ - and $\frac{3}{4}$ -pound wires are a few fractions off, but not sufficient to cause any harm. The computations were made in this way in order to eliminate decimals.

Uncle Sam Turns Out Two New Amplifiers

One Is an Electron-Tube Amplifier Using 60-Cycle Alternating Current to Supply Power for Filaments and Plates. The Other a Radio-Frequency Device Using the Transformer Coupling Method

AN amplifier which has the advantages of low first-cost and cheapness of operation, besides doing away with the inconvenience of the storage battery and the B battery, was developed recently at the Bureau of Standards, Washington, D. C.

A crystal detector and 5 stages of amplification, 3 stages of radio-frequency amplification and 2 stages of audio-frequency amplification are used. The first arrangement tried consisted of 1 radio-frequency stage of amplification, tube detector, and 1 stage of audio-frequency amplification. The filaments of the 3 tubes were lighted by 6 volts supplied by a stepdown transformer, the primary of which was connected to 110-volt, 60-cycle power mains.

It has been found that either air-core, or iron-core, transformers may be used for coupling the output of one tube to the input of the next tube. The air-core transformer gives more amplification per stage, but is responsive to only a narrow band of frequencies owing to the low effective resistance of the windings. The iron-core type, while not giving as much per stage, allows amplification over a much broader band of frequencies.

A special type of air-core transformer which will respond to signals on wave lengths from 600 to 1,000 meters has also been developed. The coils of the transformer were wound in the form of a flat doughnut, the wire being wound in a manner similar to that of the open, or basket, type of coil winding. They are wound continuously from the inside to the outside. Two of the coils constitute an air-core transformer, one coil being connected in the plate circuit of one tube and the other being connected to the grid circuit of the succeeding tube. It is found that when the primary and secondary transformers are placed about $\frac{1}{2}$ inch apart the transformer gives best amplification at 600 meters, and when the coils are placed close together the amplifier operates best at 1,000 meters. This is due to the increase of the capacity between the coils when placed adjacent. An amplifier has three stages of radio-frequency, two stages of audio-frequency amplification, and a detector tube.

Scientific Paper No. 449 of the Bureau of Standards, Department of Commerce, describes the construction of a new radio-frequency amplifier which uses the trans-

former coupling method. Radio-frequency amplification consists in the amplification of the received radio-frequency current before it is detected. By the use of radio-frequency amplification and a coil antenna a signal which is very feeble can be made loud enough to be heard throughout a large room.

Three methods are described by which the electron tubes may be coupled together so as to give radio-frequency amplification—resistance coupling, tuned-plate coupling, and transformer coupling—the latter having been found most satisfactory.

In order to operate well the radio-frequency amplifier should have a transformer designed so that it will have small capacities in the windings as well as between the windings, and in connecting the transformer in the amplifier circuit care must be taken to have all connecting leads as short as possible.

The alternating current was rectified by means of a gas-filled, two-element rectifier tube, called a "Tungar" tube; but it was found that the residual hum was greater than when the alternating current was not rectified.

When an electron tube is used as a detector there is impressed on both the plate and filament a 60-cycle alternating current voltage, which, although small, becomes objectionable when amplified by one or two stages of audio-frequency amplification. When, however, a crystal detector is used instead of an electron tube detector it has been found that the 60-cycle hum is practically eliminated and that the crystal gives as good rectification as the tube detector.

After much experimental work a circuit consisting of three stages of radio-frequency amplification, galena crystal detector, two stages of audio-frequency amplification, loud-speaking reproducer, and the necessary power transformer and rectification circuits were found which allowed the reception of music and telegraphic signals without too much interference from the humming noise just mentioned.

Mr. Miller's Circuit from Another Angle

EDITOR, RADIO WORLD: In reference to your request for information relative to the new circuit for experimentors in RADIO WORLD, No. 30, dated October 21, the writer notes that Mr. W. Miller, Southern Methodist University, Dallas, Texas, claims to have worked out this circuit. Possibly he did. However, the writer, also Mr. J. Fisher, of this city, have been using this circuit for about one year, not as Mr. Miller describes it, however, which in the writer's estimation, is a very cloudy method. In the place of the D-L 50-coil, a variometer should be used. This gives tuning over the entire wave length unless one is looking for Japanese or Chinese stations on the Atlantic Coast. In addition to this, a .00025 mfd., should be discarded for a variable condenser. Then by using one stage of audio frequency in connection with this circuit, one is able to tune in sharply and receive stations anywhere from 600 to 1,000 miles.—F. D. Tyndall, 836 Kingston avenue, Oakland, California.

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Help to Squelch QRM

Suggestion that "The Rochester Plan" Be Put in General Force to Prevent Conflict Between the Novice Listener and the Radio Amateur

AS a result of experience through the past year of broadcasting, we have a definite program to recommend for amateur consideration. There have been many unjustified complaints against amateur QRM; and, of course, where amateurs in cities have hogged the air all evening there have been justifiable complaints. Most of us have realized, says Kenneth B. Warner, editor of "QST," November, that broadcasting was capable of becoming a powerful force for good in our country, of tremendous social, economic and educational value, and have known that meant the passing of the old days when we could pound brass from supper-time on and the ushering in of a new era when the air had to be shared. As we have pointed out previously, many of us have gone so far in the business of sharing that we have almost been afraid to operate at any time, and amateur radio has suffered for the lack of a definite plan. On the other hand there are uniformed novice listeners who object to amateur transmission at any hour of night, and again the need for a recognized scheme has been shown. This we now offer.

Broadcasting is admittedly an institution of the early evening hours. That is the time that quiet air should prevail, when the greatest good can be done for the greatest number. When should we open up our stations for transmission? Our board has considered that question and has decided upon 10.30 p. m. as the proper time. We're regretfully obliged to conclude, fellows, that the time is here when we should voluntarily keep our transmitters silent during the early evening hours if their operation interferes with listening. This means that in all congested communities amateur stations should be quiet between the hours of 7 p. m. and 10.30 p. m. This is no new thing for most of us—we've been doing it already—but it makes it a recognized principle of amateur work.

We urge our members and clubs to get together with the listening-in element in their community and have an understanding on the subject. Acceptance of this plan on the part of the amateurs means that they recognize the rights of the listeners to hear their concerts undisturbed, and that they will keep quiet between these hours. Acceptance of this plan by the novice listeners means that they recognize the rights of us amateurs to transmit and carry on our useful work and that they will not complain against the "meaningless buzzes" when the lid goes off at 10.30. This plan was proposed at a meeting of all radio people in Rochester, recently, and was adopted as a solution of the local difficulty. We may well call it "the Rochester Plan."

Whenever a community gets together and agrees upon such a plan, we feel that it should become as law and that the mere possession of a transmitting license should not entitle an amateur to go contrary to the sentiment of all his fellows. It is our view that such operation, unless justified by an emergency or official tests, would constitute deliberate and malicious interference within the meaning of the federal radio law, and we believe the Department of Commerce will agree with us. On the other hand, in localities where this plan is adopted and quiet air is maintained between 7 and 10.30 p. m., we will expect amateur transmission to proceed without complaint after 10.30, and the A.R.R.L. will protect with every

resource at its command the right of any of its members to so transmit if unjustly accused while legally operating in such a community.

Now we have a working plan. Let us adopt it, fellow amateurs. This puts an important duty of self-policing on the shoulders of our affiliated clubs and we are depending upon them to handle the job. When this plan is adopted it must be respected, religiously, and this means that unlicensed and improperly adjusted stations must be hunted down and turned in. In bygone days such a station bothered no one but its neighborhood amateurs, and if they could put up with it there was no harm done; but today such a station will bring discredit upon all of amateur radio and must not be permitted to exist. We would suggest that clubs establish committees to help local amateurs and render assistance when needed to get a station properly adjusted, but if the operator persists in operating illegally after being warned he should be turned in to the inspector without mercy—we have too much at stake. Other folks are watching us too; and while we think about it, we want to tip off everybody to get their station and operator licenses renewed promptly upon expiration.

What about local work, which used to occur in the early hours of the evening? Honestly, we don't know, and it will be up to the amateurs of each club to decide for themselves how they will divide their hours. The time after 10.30 is going to be very precious and, solely because it is not as important as DX work, we are afraid local work will have to be got over with by the time 7 o'clock rolls around. Low-powered battery-operated CW sets of course can be used for local work all evening long and not cause a particle of QRM for the broadcasting fan next door, but most of the lads who do local work have a far different kind of equipment!

Our transmitters must improve. There will be too many of us with traffic to move at 10.30 and too many listeners with dumb-bell tuners for us to continue much longer with the cycle-consuming spark of pre-war days. For the very efficiency of our traffic moving the selfish spark will have to yield to the valve set. We hasten to say, though, that there are selfish CW sets too, and we are just as much agin a bum CW without rectifiers and filters as we are against the ordinary spark, and for exactly the same reason—it takes up too big a place in the air, its wave is too broad. We cannot be pushed into an adoption of CW versus spark against our will, but left to our own devices we believe it is evident to any thinking amateur that the quiet efficiency of the little bottles is just the thing we need—filtered DC, CW transmitters.

Now let's get busy on our self-imposed 10.30 lid. Remember that the League does not feel that it can back a member who runs loco in a congested locality and smears a whole county with QRM from the minute his supper is down, but that it will safe-guard the interests of its law-abiding members in communities where the Rochester Plan is adopted and respected.

One thing more. Noise this about a bit. Let it be known that we amateurs have decided among ourselves to preserve some quiet hours, out of consideration for the broadcast listeners. Spread a little honest propaganda in your local newspapers.

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Latest Radio Patents

Dr. Alfred N. Goldsmith Invents Device to Improve Tone Transmission

No. 1,432,456. Patented, October 17, 1922. Patentee: Alfred Norton Goldsmith, New York, N. Y.

DR. ALFRED N. GOLDSMITH, secretary of the Institute of Radio Engineers and chief of radio activities at the College of the City of New York, has been granted letters patent on an apparatus to improve the tone transmission from a sustained wave-generator.

Since sustained wave-transmitters produce signals consisting of constant-amplitude radio-frequency current, such signals are inaudible, or practically so in a receiving system having the usual rectifying detector, such as a crystal or vacuum tube. Notwithstanding this fact, transmitters on ship board which may be called upon for distress signals, are compelled by law to be capable of radiating a signal wave of such character that it is possible of reception and detection in a simple detector of a receiving set.

It is accordingly highly desirable, and even necessary, to provide a method of controlling and modifying the sustained wave-radiation of an arc, alternator, oscillating vacuum tube, or other sustained wave-transmitter so

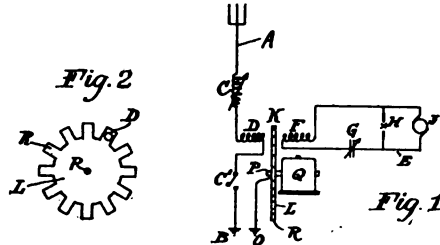


Figure 1 is a diagrammatic representation of circuits and apparatus for carrying out the invention of Dr. Alfred N. Goldsmith. Figure 2 is a detail side view of the rotator of the modulator.

that periodically modulated radiation is capable of being produced; that is, the amplitude of the radiation should be periodically varied at audio-frequency.

This method of modulation may be advantageously applied to apparatus for transmitting from a sustained wave generator, in the belief of Dr. Goldsmith.

on a map, or chart carried by a moving body, the movements of that body and give its location at any time.

This is one of the most important radio inventions of the day.

Spark-Gap Improvement
No. 1,428,856. Patented, September 12, 1922. Patentee: Leslie O. Parker, Swissvillia, Pennsylvania.

MY invention," says Mr. Parker in his patent papers, "relates to wireless apparatus and, particularly, to that class of apparatus which employs two relatively movable electrodes, one of which is stationary and the other a rotatable toothed disk, the teeth of the latter moving past the tip of the stationary electrode to make and break a circuit across a gap located between.

"In order that the make and break shall occur at the peak of the voltage

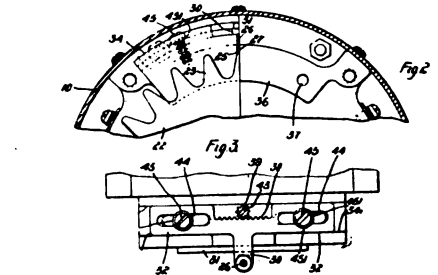
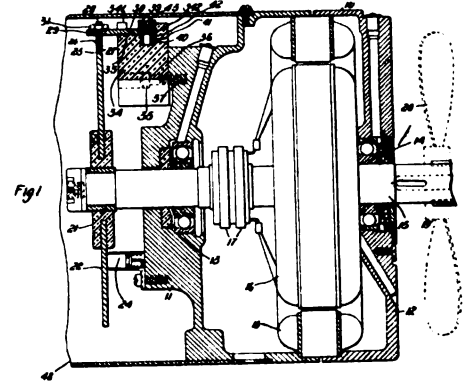


Figure 1 is a longitudinal sectional view of a high-frequency wireless generator equipped with a spark-gap structure embodying this invention, and Figure 2 is detailed view of parts of the generator and the mounting for the stationary electrode.

wave, it is necessary that the electrodes shall be relatively adjustable to permit them to be correctly positioned with relation to each other. This adjustment is usually effected by moving the normally stationary electrode circumferentially of the rotatable electrode.

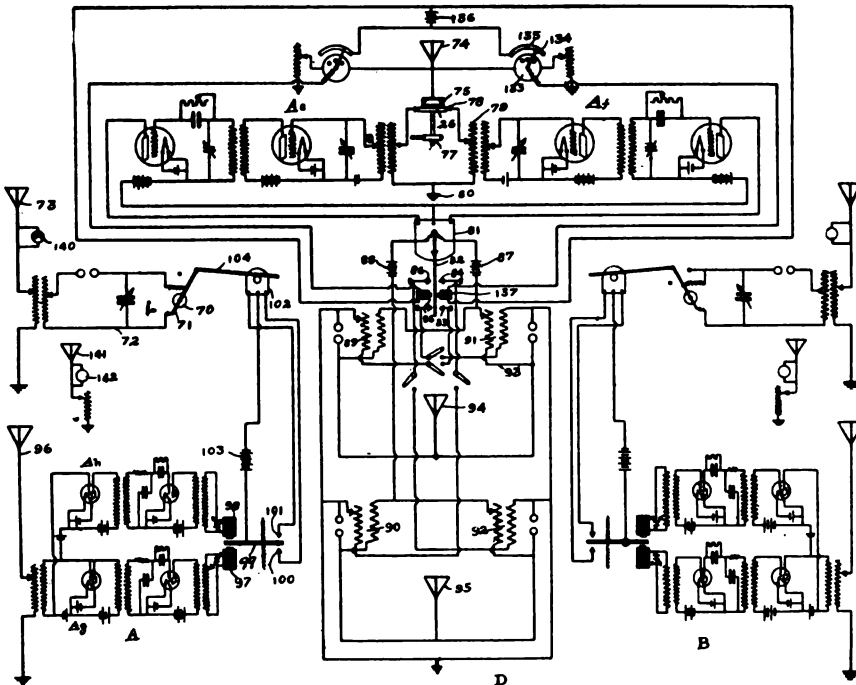
"My invention is to provide a spark-gap structure in which the normally stationary electrode shall be supported by, and insulated from, the end bracket of an alternator in a simple and inexpensive manner, and so arranged that it is readily adjustable on its support and accessible for inspection and repairs.

East Harlem Radio Club Elects Officers

THE Radio Club of East Harlem, New York City, organized September 20, 1922, has elected the following officers: Harold Itzel, president; John N. Itzel, secretary, and John D. McEvily, treasurer. The club meets every Wednesday at the Federation Settlement, 127 East 106th Street, New York City, at 8 o'clock. Any radio fan who desires to become affiliated with this organization may do so by writing to the Radio Club of East Harlem, Harold Itzel, president, 175 East 111th Street, New York City, for particulars.

WE NEED RADIO WORLD, dated April 22 and August 5. If you have copies you don't require, mail to this office and current issues will be sent you for them. RADIO WORLD, 1493 Broadway, New York.

Will Locate Moving Bodies by Radio



Wiring diagram showing the arrangements of the circuits of Mr. Connors's invention at two transmitting stations and a control station.

No. 1,433,979. Patented, October 24, 1922. Patentee: Walter W. Connors, Elizabeth, New Jersey

THE invention of Walter W. Connors is an apparatus for determining the actual location and actual movement of bodies. It will find, also, the actual location of a transmitting or a receiving station. The altitude of a receiving station may be ascer-

tained and represented in miniature. The location and movement of anything movable equipped with a receiving station may be indicated.

The distance of a receiving station from a transmitting station, as well as its geographical location, may be ascertained by this invention. It will indicate and trace

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Radio to Decrease News Costs

Far East and Pacific Island Tolls Now Too Costly for Commercial Relations

THE scheduled agendum of the Commercial Congress of the Pan-Pacific Union, opened with consideration of "Trans-Pacific Communication," introduced by a comprehensive report by V. S. McClatchy, publisher of the Sacramento "Bee," regarding cable and radio service and suggestions for improvements. Particular attention was paid to news communication as foundation for knowledge and understanding necessary for promotion of peace and enduring commercial relations among the nations of the Pacific.

There are two cables across the Pacific—one from San Francisco to Shanghai via Hawaii, Guam and Manila (Cavite); the other from Vancouver to Hong Kong via Australia, both controlled by British interests. One carries news from Canada to Australia for 5 cents per word; the other, from San Francisco to Manila for 27 cents per word.

The British government encourages news interchange with its dominions by forcing the cable companies to give a low rate for the service; for instance, 7½ pence from London to Melbourne. The United States has sought to secure similar results by using its Navy radio for transmitting news between San Francisco and Manila for 6 cents per word; between San Francisco and Honolulu for 3 cents.

The report declared that radio rather than cable must be looked to for the immediate future for increased transmission facilities on the Pacific.

It was pointed out that a request from China would secure the use of the United States radio station at Pekin for news interchange with the United States through relay at Manila, pending the time when the Federal Telegraph Company of California will have considered its great station at Shanghai for direct communication with California; that Japan can now use her stations in cooperation with the United States Navy station at Honolulu for news intercourse with Uncle Sam without violating her exclusive contract with the Radio Corporation of America as to commercial messages between the two countries; that in this way news rates with China and Japan could be reduced at once from 32 and 27 cents per word, respectively, to a maximum of 9 cents; that Australia can reach Honolulu now by cable to Suva and wireless through Tutuila, and later by wireless direct through her proposed great station; that the Dutch East Indies and French Indo-China have already contracts with the United States navy for radio communication for commercial messages with the United States through Manila, and that the Navy Department will cooperate in establishing a low news rate with these countries.

Reducing Antenna Resistance

IT is the antenna charging-current at the transmitter that produces the signals at the receiver, and in order to get a large antenna current with tube sets, resistance of antenna systems must be reduced to a minimum. In addition to the usual metallic earth plate a counterpoise, consisting of a number of wires spread on the ground underneath the antenna, will materially reduce the total antenna-resistance. The antenna should be constructed and supported so that its electrical period will not vary through swinging. As will be seen, most of the tube circuits shown in this bulletin use the antenna as the capacity element of the oscillating system.

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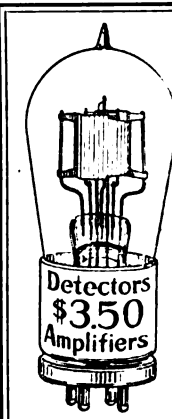
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charges your "A" or "B" battery over night. Silent and clean in operation—requires no watching—may be used right in your living room.
Connects to any lamp socket. Self-polarizing—fully automatic—cannot overcharge or injure the battery.
Entirely enclosed—approved by Underwriters. Unconditionally GUARANTEED. Lasts a lifetime.
Beautifully finished in Mahogany and Gold—the most efficient and handsome rectifier ever produced. Bulletin 637 proves it—send for your copy today—IT'S FREE. Sold by all good dealers or shipped prepaid for \$18.00, complete.

Dealers—Jobbers: The HOMCHARGER Merchandising Plan offers the best proposition in the entire radio field—send for details.
THE AUTOMATIC ELECTRICAL DEVICES CO.
185 West Third Street
Cincinnati, Ohio

Over 50,000 HOMCHARGERS in Use

NOVO "B" BATTERIES FOR RADIO

22½-45 & 105 VOLTS



NOISELESS DEPENDABLE GUARANTEED

ASK YOUR DEALER

NOVO MANUFACTURING CO.
424-438 W. 33rd ST.
NEW YORK

531 SO. DEARBORN ST. CHICAGO.

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796



Let Radio World Test Your Goods

A Chemical Liquid

Manufactured by Krystal-Kleer Co., 2378
Third Avenue, New York City

KRYSTAL-KLEER is a recent chemical discovery used in cleaning crystals when they become covered with oil from handling. It is a combination of chemicals and is very powerful, acting immediately when applied to surface of the crystal. It also makes it sensitive to the slightest touch of the catswhisker. All else needed is an ordinary nail-file. File the surface of the crystal a little, then with a drop of this chemical on a small piece of absorbent cotton, rub the surface thirty seconds.

Completely Connected

Manufactured by W. J. Radio & Mfg. Co.,
3020 Fourth Avenue, South Minneapolis, Minn.

A SHORT-WAVE coupler completely connected. Tested out and found to give wonderful results on the broadcast wave-lengths in conjunction with vacuum tubes. All one has to do is mount and connect in circuit. There are no taps to solder; no extra switch at side; no electrical connection to any shaft. Compact and rotor always in center of field. Primary is wound with green silk wire. Of good construction and neat design.

Heard at the Radio Counter

A Conversation Between Customer and Radio Clerk

(Part V)

"CAN you tell me if I may use radio frequency with my set?"

"What type set have you?"

"I have a two-stage regenerative set of the audio-frequency type."

"Not very well. When using radio-frequency, it must be understood that you will have to remodel your whole set. I would advise you to keep the regenerative set you have on hand and start in building a radio-frequency receiver."

"Do you think a radio-frequency receiver is better than an audio-frequency regenerative receiver?"

"For the radiophone broadcast listener, I would suggest building a radio-frequency receiver, for these reasons: In the first place, radio-frequency transformers are made to cover a wave-length range from three hundred to five hundred meters, limiting the power amplification between those wave lengths. Secondly, a loop aerial must be used with this type receiver, due to the high power of amplification which would allow the remarkable advantage of eliminating interference not possible with the outdoor aerial."

"Well, that sounds good. Better get me started on this receiver right away!"

"Very well. Here is your diagram and make-up of the set; also, three radio-frequency amplifying transformers, three tubes, and three sockets."

(To be continued)

Sidbenel Enlarges Plant

THE Sidbenel Radio Equipment Manufacturing Company, Inc., New York and New Jersey, manufacturers of the famous Sidbenel A and B Battery, which proved so successful that they are compelled to increase their production facilities and enlarge their plant in order to catch up with the demand for their batteries and various other products.

This firm has acquired the services of Sidney Isaacson, a prominent battery engineer. He has been appointed general sales manager for Greater New York, with offices at 1663 Jerome Avenue, Bronx, New York City.

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Automotive & Radio Manufacturing Corp., Wilmington, \$1,000,000. (Corporation Trust Co. of America.)

H. W. Wolcott & Co., Buffalo, electrical and auto works, \$30,000; H. W. Wolcott, A. G. Wickman. (Attorney, G. G. Smith, Buffalo.)

Multiple Battery Sales Corp., Manhattan, \$10,000; J. F. Russell, Jr., N. D. Sturges, J. W. Smith. (Attorneys, Lowther & Smith, 35 Nassau St., New York, N. Y.)

Rieger Research Corp., Manhattan, physics, electrical and chemical research, \$20,000; J. T. MacEvoy, F. L. Judd, H. S. Michaels. (Attorney, F. Klein, 277 Broadway, New York, N. Y.)

Radio Advertising Co., advertising, \$60,000; Philadelphia, Pa. (Corporation Guarantee and Trust Co.)

Weinig-Urban Electric Co., Buffalo, \$10,000; R. G. Urban, R. F. Bagley, F. Truscott, Jr. (Attorneys, Messrs. Angrot, Buffalo.)

Sturges Battery Corp., Wilmington, electric machinery, \$3,000,000. (Corporation Trust Co. of America.)

Burrows Electric Co., Buffalo, \$15,000; E. S. Burrows, F. A. Gannah. (Attorney, C. J. Kennedy, Buffalo.)

Recording Instrument Corp., Roselle, N. J., manufacture speed and distance instruments, \$700,000; Horace H. Smith, New York; Anthony F. Wallbillich, Newark; Martin Czaring, Roselle, N. J.

North Park Electric Shop, Buffalo, \$6,000; H. J. Terschliesen, R. W. H. Campbell, H. C. Schuhr. (Attorneys, Sullivan, Bagley & Wechter, Buffalo.)

American Radio Products Corp., Wilmington, \$250,000. (Delaware Registration Trust Co.)

Change of Name

Triangle Radio Equipment Co. has changed its name to Educational Radio Corporation, New York.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31. Colwell & Korbell, Fisk Building, New York City, directors of publicity.

INTERNATIONAL RADIO SHOW, Madison Square Garden, New York City, November 20 to 25, inclusive. E. C. Buchignani, director of publicity.

SOUTHEASTERN RADIO EXPOSITION, Auditorium Armory, Atlanta, Georgia, December 4 to 9, inclusive. Co-operative Radio Sales Assn., 205 Peachtree St.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

GREAT ADVERTISING MEDIUM
RADIO WORLD's special issue, "Holiday Radio Gifts Number," issued on December 9. Copy received up to November 29.
RADIO WORLD, 1493 Broadway, New York.

What One Advertiser Writes About Radio World Results

CHAS. FRESHMAN COMPANY

Incorporated
97 Beekman Street
New York City

November 7th, 1922.

Radio World,
1493 Broadway, New York, N. Y.

Gentlemen:—We wish to thank you for your successful effort in getting additional advertising copy on our Variable Grid Leak and Micon Condenser in your publication to appear in the issue of Saturday, November 11th, 1922.

The reason that we sent you the copy at such a late date was that it has been our policy to advertise only one of our various products in each magazine, and we had an advertisement running on our Noiseless Tested Micon Condenser for your coming issue.

The results that we obtained from our first advertisement of the Variable Grid Leak and Micon Condenser combined were so great that we did not want to miss the opportunity of having it re-appear in the current issue.

It might interest you to know that outside of the general publicity that our Variable Grid Leak and Micon Condenser combined received from the first advertisement in your publication that we have received hundreds of direct orders from individuals and payments enclosed mentioning the fact that they saw the advertisement in RADIO WORLD. These inquiries came from all sections of the country.

We wish to congratulate you on the exceptional distribution of your publication.

Yours very truly,

CHAS. FRESHMAN COMPANY, INC.

(Signed) Myron Goldsoll

Vice-President in Charge of Sales

MG:JJ

"Decrease" in Broadcasting Not Bothering Department of Commerce

THE question whether or not broadcasting will die out may be bothering some people, but not the United States Department of Commerce. During October, 56 stations were licensed to broadcast, and 22 dropped out. This indicates that the industry is increasing by about 24 stations a month.

On November 3, there were 553 broadcasting stations operating, 19 of them on 400 meters under Class B, and the balance on the old 360-meter wave. During the week ending November 4, eleven new stations were licensed to broadcast.

With the cessation of the Corinth Radio Supply Company's station WHAU, Mississippi comes off the broadcasting map, there now being no broadcasting station in that State. It is the only State, today, without a station. States with single stations are Delaware, Wyoming, New Hampshire, and Vermont—all others having two or more. California is still in the lead. The new broadcasting stations licensed and those discontinued follow:

Supplemental List of Limited Commercial Stations on 300 Meters

- KFFE—Eastern Oregon Radio Co., Pendleton, Oregon, 100 watt.
 WMAZ—Mercer University, Macon, Georgia, 750 watt.
 WPAF—Peterson's Radio Co., Council Bluffs, Iowa, 10 watt.
 WSAS—State of Nebraska, Lincoln, 250 watt.
 WNAS—Texas Radio Corporation and Austin Statesman, Austin, Texas, 100 watt.
 WRAR—Thomas, Jacob Carl, David City, Nebraska, 20 watt.
 KFCE—Moore, Frank A., Walla Walla, Washington, 50 watt.
 KYO—Electric Shop, Honolulu, Territory Hawaii, 40 watt.
 WPAB—Pennsylvania State College, 1 watt.
 WWAC—Sanger Bros., Waco, Texas, 50 watt.

New Class B Station on 400 Meters

- WBZ—Westinghouse Electric & Manufacturing Company, Springfield, Massachusetts, 600 watt.

List of 22 Broadcasting Stations Deleted During the Month of October

- WGAU—B. H. Radio Co., Savannah, Georgia.
 WHAJ—"Daily Telegraph" and E. K. Kitts, Bluefield, West Virginia.
 WHAU—Corinth Radio Supply Co., Corinth, Mississippi.
 WDAT—Delta Electric Co., Worcester, Massachusetts.
 WHU—The Wm. B. Duck Co., Toledo, Ohio.
 WJT—Electric Equipment Co., Erie, Pennsylvania.
 KQT—Electric Power & Appliance Co., Yakima, Washington.
 WPL—Fergus Electric Co., Zanesville, Ohio.
 WLAB—Grossman, George F., Carrollton, Missouri.
 WDAD—Harrison, Wm. Louis, Central Kansas Radio Supply, Lindsborg, Kansas.
 KYG—Willard P. Hawley, Jr., Portland, Oregon.
 WHAX—Holyoke St. Ry. Co., Holyoke, Massachusetts.
 WWT—McCarthy Bros. & Ford, Buffalo, New York.
 WIAP—Radio Development Corp., Springfield, Massachusetts.

WBAM—I. B. Rennysen, New Orleans, La.

WHQ—Times Union, Inc., Rochester, New York.

KFBF—F. H. Smith, Butte, Montana.

WCAN—Southeastern Radio Telephone, West Forsyth St., Jacksonville, Florida.

KOE—"Spokane Chronicle," Spokane, Washington.

WIAL—Standard Radio Service Co., Norwood, Ohio.

WDAB—H. C. Summer & Son, Portsmouth, Ohio.

WBAZ—Times Despatch Publishing Co., Richmond, Virginia.

Entrants for the "Receiving Record"

EDITOR RADIO WORLD:—I am a reader of RADIO WORLD and am deeply interested in radio. I have noticed from time to time, different articles on reception of broadcasting stations and articles by some one who claims records for receiving.

I am now driving at the article in RADIO WORLD, No. 31, dated October 28, where Mr. J. A. Merklein claims a record and says that on October 16, 1922, he happened to tune out WJZ and get WDAP of Chicago, and WSB of Atlanta, Georgia, on detector tube and 110 volts and two variometers.

I am not claiming any record, as there

are others who may have done better; but I have him snowed in. Kindly ask him to take notice that I use only the detector tube and one coil 4 inches in diameter and 2 inches wide, two variable condensers and only 69 volts.

The following are stations heard clearly any night they are on and the weather clear: WOC, Davenport, Iowa; WSB, Atlanta; WDAP, Chicago; WWJ, Detroit; WLK, Indianapolis; KDKA, Pittsburgh; WGY, Schenectady, New York; WGI, Medford Hillside, Massachusetts; WBAD, Minneapolis, Minn.; WOZ, Richmond, Ind.; WIP, Philadelphia; 4CL, Commerce, Georgia; WJAR, Providence, Rhode Island; WOO, Philadelphia; WGR, Buffalo.

This does not include stations in and around New York City. And also, these stations have been verified. And cold weather has not set in yet for good results.

I am also able to tune out the stations around New York and Newark, if not wanted. That is, if I want WJZ I can tune out WFAF or the opposite, or both, and get WOR.—Walter George McKinley, 47 West 37th Street, Bayonne, New Jersey.

* * *

EDITOR, RADIO WORLD:—We do not claim to beat the receiving record of Mr. Merklein, but think that we are getting excellent results with the outfit we are using: 4-wire L-type aerial, 40 feet long, 25 feet high. 3-coil tuner with two condensers. Receive, Boston, Springfield, Detroit, St. Louis, Davenport, Pittsburgh, and Atlanta—all on the detector alone. Using 3-tube set, we receive Atlanta loud enough to be heard all over the room with Baldwin phones. Chicago, KYW, we are unable to receive with less than three tubes.—Emmett L. Miller, Chappaqua, New York.

Remember "This Is a Radio Christmas"

and that millions of dollars will be spent during the holiday time for radio gifts.

Why not get your share of this business by advertising in the issue of RADIO WORLD of December 9, which will be a

HOLIDAY RADIO GIFT NUMBER?

Thru this medium you can reach thousands of readers, who are not only interested in radio themselves, and want new equipment, but who also will give presents to others whom they wish to make radio fans.

ADVERTISING RATES:

Regular advertising rates in force for RADIO WORLD'S HOLIDAY RADIO GIFT NUMBER, as follows:

\$150 a page, \$5 an inch. Discount, 10% four times, 15% thirteen times. Forms close Wednesday. Published following Wednesday. Classified ads. five cents a word.

Take advantage not only of RADIO WORLD'S circulation, but also its cash-thru-the-mail pulling power.

Be represented in RADIO WORLD'S Holiday Radio Gift Number, and reach the many thousands who actually want your goods and are ready and willing to pay for them.

Preferred Positions Must Be Booked Immediately.

Copy for run-of-paper positions will be received up to November 29.

RADIO WORLD, 1493 Broadway, New York

VARIOCOUPERS

READY FOR WIRING

Genuine Bakelite Tube, 4 in. x 3 in., Rotor Ball; All Necessary Brass Hardware, Base Brackets, etc.

\$1.50 Complete Set—10c. extra for postage.

ARROW WIRE & RADIO COMPANY
163 7th Ave. New York City, N. Y.**VARIOMETERS**

READY FOR WIRING

2 Mahogany Stators, 4 1/4 in. x 1 1/4 in.; Mahogany Rotor Ball; All Necessary Brass Hardware and a Winding Form included.

\$1.50 Complete Set—10c. extra for postage.

ARROW WIRE & RADIO COMPANY
163 7th Ave. New York City, N. Y.**R-C CABINETS**

Mahogany Phonograph Quality Finish. No Drilling of panels for attaching required. Hinged top.

RETAIL PRICES

7x6\$2.50 7x14\$3.00
7x10\$2.75 7x18\$3.00
7x21\$4.00

If your dealer cannot supply you, order direct.

THE R-C MILLSExecutive Offices, 30 E. 23d St., New York, N. Y.
(Mention RADIO WORLD)**"BECO"****RADIO FREQUENCY SET**

175 to 500 Meters

2 Radio Frequency
2 Audio Frequency and Detector
All on 3 Tubes.**Bissell Engineering Company**
161-167 W. 64th STREET, NEW YORK**THE GOODMAN**

PATENT PENDING

The Niftiest Short Wave Tuner on the Market
Only \$6.00 & PP on 1 lb. Send for pamphlet.**L. W. GOODMAN**
DREXEL HILL, PA.

Major _____, Halifax, N. S., writes: Delighted. Received Shenectady clearly on one tube first time I tried the GOODMAN. Would have saved money by buying sooner.

3000 Ohm Sets \$3.98PLUS 20 CTS. POSTAGE AND PACKING
Satisfaction Guaranteed or Money Back.

We mail phones the day your order arrives. Every pair tested, matched and guaranteed as sensitive as \$8 to \$10 Sets. Circular Free.

Tower Mfg. Company
113 STATION ST BROOKLINE, MASS.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

Answers to Readers

WILL you furnish me with directions to make a loose coupler for the following receiving sets: Two audio-frequency transformers, 3 6-ohm rheostats for filaments, .0005 mfd., variable condenser, grid condenser and leak, lightning arrester, one pair of 3,000-ohm phones. I have 2 tubes, 8 inches long. The diameter of primary is 4 inches and the diameter of the secondary is 3 inches. How many turns to a tap are necessary on the secondary coil?—Morris Siegel, Tacoma, Wash.

For the primary, wind 110 turns on the 4-inch coil, using No. 26 double-cotton covered wire. Use 10 taps of 10 turns each, and 10 taps of 1 turn each. For the secondary, wind on the 3-inch coil, 100 turns of No. 30 double cotton-covered wire, tapped with 10 taps of 10 turns each. Use your .0005 variable condenser across the secondary coil. These coils should give you a tuning range up to 1,000 meters.

I have just finished building a standard short-wave regenerative set, using a vario-coupler of some 60 turns on a primary 4 inches in diameter; and 50 turns on a 3-inch secondary. I am using No. 24 wire on the secondary and No. 22 wire on the primary. My aerial is of the outdoor type, 20 feet long with a 15-foot lead-in consisting of 5 wires. This gives a 100-foot length. There are times when I hear code, but I seldom hear broadcasting. Possibly this is because my aerial runs over a tin roof. What is my approximate wave length? Why can't I hear the broadcasting stations.—Paul Roelser, Baldwin, Pennsylvania.

The inductance of your coupler primary is, approximately, 450 microhenries; and of the secondary, 220 microhenries. To just what wave lengths the primary will tune, is merely guess work. Your antenna, undoubtedly is very poor. Doubling the wire back and forth makes the inductance low, neither can the capacity be very large. The best way is to run the aerial, in one stretch, about 100 feet and keep it clear from the tin roof. Then you may tune to 600 meters. We recommend a .0005 variable condenser across the secondary. With this, you should be able to hear broadcasting.

Let me know the wave length I can tune up to with the following equipment: Vario-coupler, crystal detector, primary with 13 taps of 10 turns each on a 4-inch tube, 23-plate condenser shunted across secondary. My aerial is 150 feet long, 8 feet above the roof of a 4-story house. The lead-in is 10 feet. The fixed condenser is shunted across phones?—Michael McCarthy, New York City.

With such a receiver, you should be able to tune up to approximately 800 meters.

I have just completed a crystal set but can hear nothing in the way of music—only noise. My antenna is of seven-strand copper wire, about 80 feet long. The lead-in is of No. 14 copper, as short as possible. My ground is bell wire and is run over the kitchen floor connecting with the water pipe. Is this O. K.? Is the ground connection the right size of wire?—Francis Molaka, Rome, New York.

There is nothing wrong with your hook-up. It is another case of poor location for reception with a crystal set. Probably you are too far from any of the broadcasting sta-

tions. Improvements on your set might help you. Go over all your connections. According to the Fire Underwriters' rulings, your ground lead must be, at least, No. 14 copper wire. The length of your lead-in should be made shorter.

Is there a broadcasting station in Porto Rico?—Hans Mulinos, Tampa Florida.

We know of one station, WGAD, operated by the Spanish-American Radio School.

Can I use honeycomb coils to load up my aerial circuit to receive Fort Wood? Where should these coils be placed?—Anxious.

You can load up to this wave length, which is 1,450 meters, by inserting a honeycomb coil in the aerial circuit. If you are using a vario-coupler, you will also have to load up the secondary coil. This is, of course, for the plain type receiving set. It cannot be done with your type receiver, as yours is of the variometer make.

I have a two-stage amplifier with a regenerative set. I hear music and speeches at a distance of 50 to 75 feet on clear nights. I

(Continued on following page)

"WEB" CRYSTALS

Best Crystal Yet. Single Mountings of Galena, Silicon & Iron Pyrites

Sold under a replacement guarantee; at all dealers or by mail direct on receipt of

PRICE, 25c

Distributed by

WALTER E. BATHGATEROOM 42, 9 CHURCH ST., NEW YORK CITY
Manufacturers, Jobbers, Dealers write for prices.**Triple Mounted****SHAMROCK CRYSTALS**

Triple mounting of the three crystals—Galena, Silicon and Iron Pyrites.

Sold under a replacement guarantee; at all dealers or by mail direct on receipt of

PRICE, 50c

Distributed by

WALTER E. BATHGATEROOM 42, 9 CHURCH ST., NEW YORK CITY
Manufacturers, Jobbers, Dealers write for prices.**RHEOSTATS—SOCKETS****POTENTIOMETERS****SWITCH LEVERS****ROYHELE MFG. COMPANY**

Mfrs. of quality products

169 Mercer Street New York City

Write for prices—Representatives wanted

PHANTOM-CIRCUIT

BUILD YOUR OWN. This marvel of mystery, using no aerial, no loop, no ground, brings in music instead of static showers. We consistently hear concerts on Magnavox, even stations 550 miles distant, audible 100 feet from horn. The simplicity of this set will surprise you. No radio frequency. Complete instructions with photo of circuit sent prepaid for 60c.

VESCO RADIO SHOP, Box W-704, Vanville, Calif.

That Armstrong Circuit

So much interest has been displayed in the special article, "TESTED INVENTION OF MAJOR ARMSTRONG AMPLIFIES SET 100,000 TIMES," by John Kent, that appeared in RADIO WORLD No. 13, dated June 24, 1922, the publisher decided to put aside a number of copies for those who were not able to get this issue when published. Copies will be sent, prepaid, on receipt of 15c. or send in your subscription, \$6.00 for one year (12 issues), \$3.00 six months, or \$1.50 three months, and subscription will be started with the issue containing the article about Major Armstrong's Amplifier.—RADIO WORLD, 1493 Broadway

RADIO WORLD IN THE PUBLIC LIBRARIES

Many public libraries throughout the country are sending in their subscription orders for RADIO WORLD.

Librarians evidently have made up their minds that the visitors to their libraries are anxious to read articles about and see pictures of the latest developments in radio when they are news.

If your library has not placed RADIO WORLD on file, tell your local librarian how interesting and important is this once-every-seven-day radio paper.

Address: RADIO WORLD, 1493 Broadway, New York, N. Y.

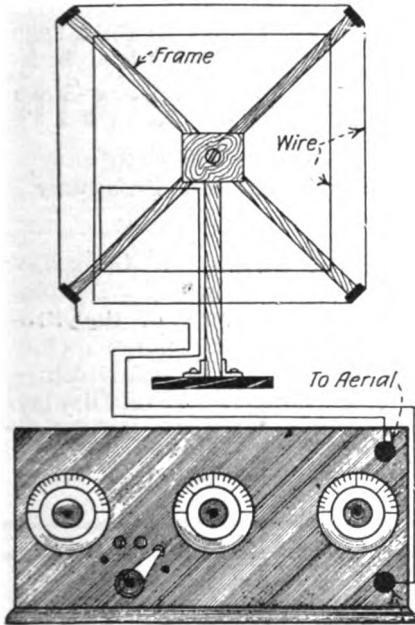
Answers to Readers
(Continued from preceding page)

wish to add a third step. I have heard that a power tube (U-V 202) will increase the volume of sound better than with an ordinary U-V 201 amplifying tube. Which would you advise? Which is the lowest voltage necessary to operate the plate of the U-V 202 tube? Will an Acme transformer be suitable? Will Western Electric phones stand the strain of the diaphragm? What are the advantages of using a power tube in the last step?—George Siebert, East Orange, New Jersey.

The power tube would give you greater amplification than would the ordinary U-V 201, as it allows much more current to flow through the plate circuit. The 202 tubes operate best with a plate voltage of 350 volts. By lowering this voltage, the results are lowered considerably. The transformer you mention is all right. The phone may not be strained, but why waste such power in a pair of phones when a loud-speaker will give you just as much volume?

* * *

In my circuit of a "super," how should the loop aerial be connected to the set? Is there any special connections from the loop? How can it be used?—George Moering, Glens Falls, N. Y.



Design to show windings, also connections from loop, as requested by Mr. George Moering.

The accompanying illustration shows how the connections are placed on the set you describe, utilizing the loop aerial.

* * *

Where is the broadcasting station with call letters OKYX.—Fred Edwards, Lostine, Oregon.

There is no such call letter assigned to any station as yet.

* * *

In making up the Armstrong superregenerative receiver, I have experienced a "peanut whistle." This sometimes develops into a sound like a hiss or a water fall. My tickler coil, or ball, is 4 inches in diameter wound with No. 24 enamel wire and has about 90 turns. The filter condenser is not affected; neither is the potentiometer which feeds the coupler.—Vincent Galloway, Omaha, Nebraska.

The "peanut whistle" you describe is the correct whistle to obtain. It should not be very strong, but it proves that your oscillating tube is O K; or as we say "She notes." The connections are correct. We suggest that you get the switches on the primary of the vario-coupler at the exact adjustment for 360 meters, otherwise you will get nothing but the whistle. If there is a very great

difference even the whistle will be blotted out. The final tuning will be done by means of the loop condenser and the feed-back coil, which, of course, is the rotor of your vario-coupler. Try changing the connections around on the rotor. It may be that the winding of the secondary is opposed to that of the primary.

CRYSTAL SET \$4
"THE LITTLE WONDER"
\$2.50 UNMOUNTED

Wonder in name and a wonder in performance. Cannot be equalled for the price. Catches distinctly everything broadcasted within 30 miles.

Send for FREE catalog, describing our "Little Wonder" set and listing radio supplies.

GUARANTEED, TESTED CRYSTALS
Galena and 20c.
Radiocite..

Radi-O-Plate Panels. All sizes cut to order.
Holloway Electric Supply Co., Inc.
238 Third Avenue New York City

VARIO COUPLERS



GEM
\$1.25
List

We also make 6 other styles

That List \$2.50 up

Jobbers—Dealers—Agents

Write for Discounts

Jewell Radio Sales Co.

90 West St. New York City
Phone Rector 1835



I Want a Radio Worker In Each Community To Work For Me

My work fits in nicely for those men and women who have spare hours or full time at home and wish to earn from \$5.00 to \$40.00 weekly, depending on time you devote to it. It is not radio work, but I believe anyone energetic enough to interest themselves in Radio will make an excellent "TANGLEY BRANCH MANAGER," to operate a branch for us in their home. Pleasant, easy work, no canvassing, immediate profits. No experience or special talents necessary. We furnish complete outfit, train you for the work, and assist you in building up a business you will be proud of. Don't wait until another grasps this offer, write today for literature, and make your spare hours earn.

TANGLEY CO., 187 Main, Muscatine, Iowa

No Experience Necessary

Full or Spare Time at Home

"TUNING IN"

TO THE RIGHT TUNE IS VERY SIMPLE WHEN YOUR CONNECTIONS ARE SOLDERED WITH THE NEW

"POST SOLDERING IRON"

(The Iron with the Platinum Heating Unit). Removable Soldering Tip



1/2 Actual Size
LIST \$4.00

Designed especially to cover every requirement for delicate work. The smallest practical, efficient instrument on the market. Attaches to any socket. Universal current. Fully guaranteed. From your dealer, jobber or write

POST ELECTRIC COMPANY

30 EAST 42ND STREET, Div. 500

NEW YORK

FILL OUT AND MAIL NOW

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD

1493 Broadway, New York City.

Please send me RADIO WORLD for months, for which

Please find enclosed \$

SUBSCRIPTION RATES:

Single Copy\$.15

Three Months1.50

Six Months3.00

One Year (32 Issues)..... 6.00

Add \$1.00 a Year for Foreign and Canadian Postage.

During the Month of December

22½ Volt "B" Battery

FREE

with \$15.00 purchases

SPECIAL XMAS CRYSTAL SETS

- Complete with phone, newest type.....\$12.50
- Complete with head set, Volta make..... 15.00
- Federal, with head set..... 17.50
- Aeriphone, with head set..... 12.50
- You are going to be well pleased with any or the above sets, they are all tested before leaving our place, Aerial when buying set.....2.50

SPECIAL XMAS TUBE SETS

- Complete with head set and tube, Volta make..... \$27.00
- Westinghouse R. C. with tubes.....100.00
- Acnephone, three tube set, and loud speaker, with tubes 75.00

SPECIAL XMAS KEY AND BUZZER SETS

- You will be well pleased with what we offer for \$0.90
- You are sure to like the Blinker type, with bulb 1.25

PHONOGRAPH ATTACHMENTS

- For single phone, fits any Phonograph or phone \$0.75
- For Double Phone, fits any Phone or Phonograph 2.00
- For just one phone to attach on Horn (state what make phone) 1.50

COMPLETE RADIO SETS

in Upright Phonograph Cabinet

Beautiful mahogany cabinet encloses the Tuner—3 stage Amplifier, Storage Battery—"B" Batteries, G. E. Battery Charger, loud talker, 4 vacuum tubes. All accessories required for installing the outfit are supplied. These outfits, when shipped within 20 miles of New York City, are installed free of charge. With one year service guarantee.

Above Prices Are Good Until Christmas

TRIPLE COIL MOUNTINGS

- Complete with Flexible Leads \$2.50

HEAD SETS

- Western Electric, brand new in sealed boxes. \$0.00
- Federal, 2200 ohm, brand new in original boxes 5.00
- Seibt, imported set, adjustable..... 8.00
- Kellogg, lightest head set made and perfect throughout 8.00

LOUD SPEAKERS

- MAGNAOX, type R3.....\$33.00
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Broadcast Bill's Radiolays

By William E. Douglass

FOOTBALL never used to make much of a hit with me; I liked baseball an' shinny, but what I could never see wuz why those fellows had to go out on the field to fight. Why couldn't they put the gloves on, then stand up an' do it right? But last year when I bought this set an' started in to listen to football games sent play by play I saw what I'd been missin'. Now I can tell you every game them college fellers play—you never ketch me very far from my set Saturday. The "Demons" here in Brussels Sprouts are playin' every week; we've trimmed the "Canton Warriors" an' the team from Quivver Creek. The "Tigers" down at Goose Grease Creek were all we had to fear until we played 'em Saturday, the big game of the year. On Fri-



day night I strung some wires right near the home town bleachers to use as an antenna an' pick up the football features as they were bein' broadcasted by Station XYZ, an' that way keep the crowd informed on games they couldn't see. The game between the "Tigers" and the "Demons" wuz the one to tell which team, this year, would be the county champion. So you see it meant a lot for Brussels Sprouts to win an' keep on bein' Champions like we have always been.

Before our game had started I tuned in a sending station to show 'em how my set would work when gettin' information. An' then our boys come on the field, the game wuz 'bout to start so I left Min to mind the set because you know my part whenever there's a big game is to lead 'em in the cheers. I guess that's why our team has never lost in all these years. I led a snake dance on the field between the halves while Min wuz gettin' all the college scores as fast as they come in. She give a kid a dollar so's to telegraph that station to broadcast out our football scores all over this here nation an' tell 'em we were winnin'—had the "Tigers" on the run. Well, sure enuf, they did it fore the second half begun.

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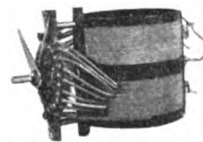
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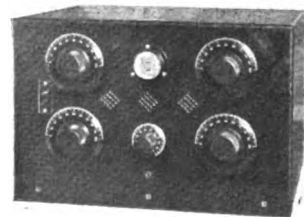
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Show Rooms, 131 W. 37th St., N. Y.

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 FROM PUBLICATION OFFICE,
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While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patent, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

The New Wireless

I BOUGHT a brand new wireless for the kid,
 And started in to rig it up with vim;
 I stretched the copper wire two hundred feet,
 And bought receivers made to listen in!
 I got a tuner and a finder thing,
 And read a lot about galena point;
 I jabbed the needle and I whirled the knob,
 But couldn't get the outfit into joint!

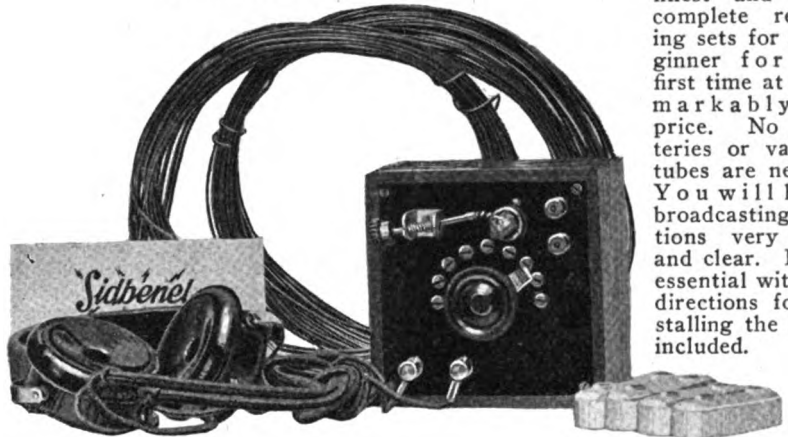
Then twice I got new batteries and worked,
 And once I caught a faint KDKA;
 It sounded like an SOS from Mars,
 And seemed to be a million miles away!
 I bought a new galena point and monkeyed
 With wires and grounders fastened to a pipe;
 I got a two-way switch to stop the lighting,
 But couldn't get the thing to work just right!

I got a longer wire stretched for receiving,
 And painted the arm-piece with paraffine;
 I got some lead and soldered on the ground wire,
 And licked up wireless dope complete and clean!
 And every night at eight we worked and listened—
 The kid would laugh and I would fume and fret;
 I hate to call myself a wretched quitter,
 But I haven't got that wireless working yet!

—LOUISE HOLLINGSWORTH BOWMAN,
 in "The Times," New York.

\$25.00 Radio Set for \$8.25

FOR TWO WEEKS ONLY



The famous Sidbenel Company offers one of the finest and most complete receiving sets for a beginner for the first time at a remarkably low price. No batteries or vacuum tubes are needed. You will hear broadcasting stations very loud and clear. Every essential with full directions for installing the set is included.

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The Sidbenel "B" is shipped to you partly assembled—all you need to do is connect the plates together, and this takes but ten minutes and is most simple, as instructions are furnished with each battery.

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For recharging we furnish a rectifier for AC which costs \$0.25 extra. DC current requires none. Complete with directions:

One Unit, 22 volts.....	\$ 3.25
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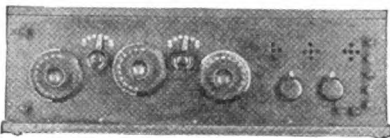
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 A \$126 Radio for.....

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409-D East Fort St. Detroit, Mich.

The Plot Thickens!

Another Radioist Picks Up Phone Call and Seeks Aid in Solving Mystery

EDITOR, RADIO WORLD:—I am using a detector and tuner made from the blue prints furnished by the Experimenters' Information Service of your city, and have secured wonderful results. Using only one step of amplification I have been able to hear a 'phone station (10 watts), WBAA, a distance of about 475 miles. I have heard 'phone stations in 27 different States and Canada; but there is one thing on which I would like information: Almost every night, between the hours of 10 and 12, I am able to hear telephone conversation between the exchanges of Muskogee, Oklahoma, and Little Rock, Arkansas. The nearest is over a hundred miles distant.

I can hear the operator put her party up and also hear them ring, several times each evening. There is only one point in tuning where I am able to hear this. The first time that this was picked up, I thought it was a broadcasting station, but heard central say, "Number 455 is busy." Every night, for several days, I listened to find out where it was coming from as the telephone company here did not ring this number. Later, I could hear the girl say, "This is the Muskogee operator."

Can you offer an answer to this? I am sending a copy of this letter to the Bell Telephone Company and the Western Electric Company. I would like to know if there is anyone else who has picked up distant telephone talk—not radio.—Howard Fowler, Rogers, Arkansas.

Prize Freak Set

Denver Lad Uses Clothes Line for Aerial and Corncob Pipe for Receiver

ORVILLE GARDINER, seventeen-year-old Dener lad, seems to have developed a freak radio receiving-set that deserves the blue ribbon.

"It consists of a small two-cent corncob pipe, with 40 turns of No. 27 cotton-covered wire wound around the stem. He uses a small pencil-clip for a slider, and has scraped bare the wire where the sliding touches.

He drilled a small hole in the side of the pipe bowl, put a drop of metal in, then inserted a chip of galena, and fastened a piece of copper wire by means of a brad half an inch down from the galena for the catwhisker.

All it cost was two cents for the pipe—the

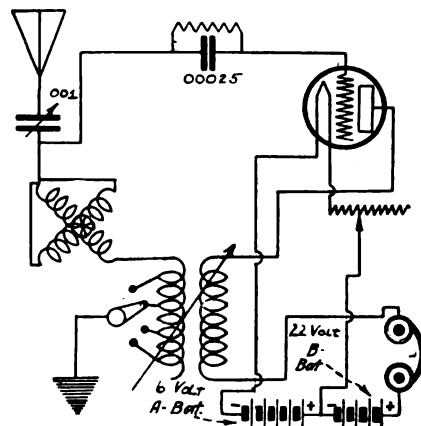
rest of the set was made from pieces lying around the house.

Using a clothesline for an aerial, he received Denver stations with his corncob set.

* * *

His Home-Made Circuit Brings in Wide Range

EDITOR, RADIO WORLD: I have a radio receiver that I constructed. I am using a hook-up that is original, so far as I am able to ascertain. With this hook-up, using a variometer and varicoupler that I made myself—I picked up, in one night, fifteen different sta-



One-tube hook-up as described by Mr. Wallis in his letter.

tions. I have heard Schenectady, WGY; Denver, Havana, Cuba, Minneapolis, WEAY, WDAP, WOR, WEA, 9XO, KSD, WOC, WMAK, and others—about forty in all.

These stations were heard on one tube only. When I use two stages, I cannot wear my phones with comfort. Using the phones without a loud-speaker, music, at times, can be heard all over the house, on two steps. I am using a radiation U-V 200 with 22 volts on the plate. My set is mounted on old battery-jars cut up into sheets. This makes a good panel. Accompanying this is the diagram for the detector. I would be glad to give further information to any one wishing to try out this diagram.—Joe L. Wallis, East street, Talladega, Alabama.

To Be a Radio Engineer

NOW the real designer of radio apparatus is the radio engineer, says Arthur R. Nilson, educational director, East Side Y. M. C. A., New York City, in "The Globe." He is an electrical engineer specializing in radio work just as the turbine engineer is a mechanical engineer specializing on turbines. Radio engineering requires a very high-grade of school training. To be a success—and being a success means more than just getting away with it—the radio engineer must be able to tackle any kind of a radio engineering job, from the making of a simple receiver, scientifically designed, to the complete laying out of a high-power arc, spark, or vacuum tube, trans-oceanic or continental transmitter. Not only must he be an electrical engineer of high calibre, but he must be of a high type of individual intellectually. Many of the so-called radio engineers are out of jobs for the reason that they are unable to make an approach good enough to land them a job or because they are unable to write an ordinary business letter in ordinary English.

NO FREE LIST!

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Radio Amplifiers for the Deaf

THE amplification of sound by means of the triode vacuum tube has now passed on from its application to wired and wireless telephony to a means of aiding those of deficient hearing, writes Roswell H. Johnson in Science. Its effectiveness is so great that it promises to be to the partially deaf as great a boon as glasses to those optically defective. The use of the amplifier is sure to expand rapidly in this field, although it will be somewhat impeded by its expense.

The purpose of this, however, is to call attention to the application or applicability of a sound magnifier in various fields of scientific work and industry:

1. For detecting distant underground operations as in mine rescue or military work.
 2. Detecting the approach of a boat, train or automobile before it comes in sight.
 3. Detecting the approach of a storm.
 4. As a parallel instrument of the binocular prism glasses of the ornithologist, to detect bird songs too far to be heard distinctly or at all. It is particularly useful in detecting the higher notes that do not carry far and in observing nocturnal migration.
 5. To aid the hunter in detecting sounds of distant game.
 6. In conversation from vessel to vessel or station to station at shouting distance and a little further.
 7. In directing men aboard or on shore.
 8. To extend the possibilities of the dictograph in detecting evidence of crime.
 9. To make possible addressing larger audiences and distant audiences.
 10. To make it possible for some women with weak voices to nevertheless speak to large audiences.
 11. In accoustical research for the study of subliminal sounds.
 12. The detecting of subliminal sounds from animals not now known to make sounds.
 13. To make more audible the whispers or weak sounds of the sick or injured.
 14. To make communication by weak or injured less fatiguing.
- That commercial equipment of good efficiency is now readily available may not be known to some of those who might make good use of the apparatus.

Claim Flaw in World's Biggest Broadcaster

THERE have been a number of complaints that the world's biggest broadcasting station, WBAY, operated by the American Telephone and Telegraph Company, 24 Walker street, New York City, could not be distinctly heard in the northern part of the city. W. E. Harkness, manager of the station, told a reporter for "The World," New York, that it is impossible to tell just why the broadcasting should prove deficient in this particular spot.

"It may be the fault of this antenna, or it may be the location of the persons who complain," said Mr. Harkness. "There is a theory—radio is so new it is difficult to speak with certainty about any phase of it—that an antenna amid steel frame buildings does not work so well as in the open.

"However, whatever the fault may be, it is a small matter. The plant itself, under the roof of the Walker street building, is a complete success. Recently we have been experimenting with remote control by microphoning to the West street station. This is done without loss of time, clarity, volume or anything else.

"We are still using the antenna on the Walker street building roof at times. Last Friday, we broadcast through it with good results. However, the roof structure is a small part of the plant itself. The actual broadcasting is done under the roof. We could easily put up another antenna, or remove it to some other roof. What difference does it make what roof we use? The plant itself is in this building."

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Detectors and Amplifiers repaired for \$3.50.

The repaired tubes, we warrant, will give you the same absolute satisfaction that you would expect to receive from new tubes.

We are now in a position to give guarantee for prompt deliveries with satisfactory results. A reasonable trial will confirm our reliability.

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\$3.25

Amateurs: We Pay Postage

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THIS WEEK WE HAVE

"B" BATTERIES

22-1/2 V-small \$0.65
 22-1/2 V-large 1.85
 45 V-medium 2.25

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Mr. Dealer:—If you are a progressive merchant, you may display the Sorsinc sign. Let us tell you how.

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This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5¢. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office ten days before publication, RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4794.)

VERY INTERESTING printed matter on detectors and crystals. Sent on request. Midland Electric Mfg. Co., Indianapolis, Ind.

Manufacturers of Rogers Radio Receivers and Rogers Receiving Radiometers. Rogers Radio Company, 5133 Woodworth Street, Pittsburgh, Pa.

BROADCASTING MAP of the United States appeared in RADIO WORLD No. 8. Sent on receipt of 15¢ coin or stamps, or start your subscription from that number (\$6.00 for 52 issues). RADIO WORLD, 1493 Broadway, New York.

PATENTS—Electrical cases a specialty. Pre-war charges. B. P. Fishburne, Registered Patent Lawyer, 386 McGill Bldg., Washington, D. C.

HELP WANTED—MALE

EARN \$118 to \$250 Monthly, expenses paid, as Railway Traffic Inspector. Position guaranteed after 3 months' spare time study or money refunded. Excellent opportunities. Write for Free Booklet G-151. Stand. Business Training Inst., Buffalo, N. Y.

ISSUES OF RADIO WORLD from April 1 to Oct. 7 (27 numbers) for 15¢ a copy, or the whole lot for \$3.15. Or send us \$6.00 for one year and start with the first number. RADIO WORLD, 1493 Broadway, New York.

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Dept. E, 874 Columbus Ave., New York City

3.50 23-Plate Var. Condensers, .0005.....	\$1.75
4.50 43-Plate Var. Condensers, .001.....	2.25
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.0005 and .001 Fixed Mica Bakelite Cond.....	.20
Tub. Grid Leaks, 1/4, 1, 1 1/2, 2, 2 1/2, 3 Megohms	.45
Arrow Variometer	2.25
B. R. P. Variometer (to 800 Meters).....	3.00
180 Degree Vario Coupler (wound Green Wire)	1.65
B. R. P. Vario Coupler (Panel & Lab. Type)	3.50

Send Money Order, but do not add postage for mailing. Pkg. will come Parcel Post Collect.

RADIO HOSPITAL. Radio sets repaired by practical radiotician, and experiments under customer's supervision. Mail orders filled MELCO RADIO, 37-A Bedford Street, New York City.

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FREE APPARATUS FOR SECURING SUBSCRIPTIONS FOR "RADIO." Write today for complete list of premiums and our special subscription offer. "RADIO," Pacific Bldg., San Francisco, Cal.

FRENCH TUBES, genuine (no bootleg with French name), most sensitive and economic. (Good for detectors, amplifiers, and especially for radio frequency. Will work very good on two dry cells.) Price \$3.25. ATLANTIC & PACIFIC RADIO CO., 131 W. 37th St., near Bway., New York.

ASTONISHING results Rokay Regenerative Hook-up without use of Variometers—variocouplers, switches, taps, etc. ONE SINGLE CONDENSER CONTROL ONLY. The coming receiver. Simpler than a non-regenerative—better than any regenerative we have tested. Hook-up. \$1.00. Money Orders only. Saves you \$10.00 in building your own. With properly wound coils. \$3.50 post paid. Complete receiver parts on wood base with Vacuum Tube, \$8.00. Head set and "B" Battery, \$21.35. Express paid. Rokay Electric Co., Ingomar, Ohio.

AERONAUTICAL MOTORS, 50 H. P., New \$175.00. Weighs 138 Lbs. Complete. Rogers Aircraft, Route 1, Box 8, Ft. Worth, Texas.

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WE NEED RADIO WORLD, dated April 22 and August 5. If you have copies you don't require, mail to this office and current issues will be sent you for them. RADIO WORLD, 1493 Broadway, New York.

INTERESTED IN JOURNALISM? The Star Reporter is for Journalists. 50¢ annually. 5¢ sample. Box 55, Times Square Station, New York.

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BROADCASTING MAP

of the United States appeared in RADIO WORLD No. 8. Sent on receipt of 15¢ coin or stamps; or start your subscription from that number (\$6.00 for 52 issues).

RADIO WORLD, 1493 Broadway, New York

RADIO MAN, eleven years' experience in all sides of the game, capable of constructing, installing, operating broadcasting station of any power, desires permanent connection. Go anywhere. What can you offer? Evans, Momus Pier 48, N. R., N. Y. C.

Are you familiar with all the radio symbols used in the various book-ups published in Radio World? If not, secure a copy of Radio World No. 26, dated Sept. 23. In this issue was a complete table of all important symbols used in radio construction and testing. Send 15 cents for a copy, or \$6.00 per year, and have subscription start with that issue. RADIO WORLD, 1493 Broadway, New York City, N. Y.

September Electrical Exports Showed Upward Trend

PRELIMINARY figures of the Department of Commerce showing United States exports of electrical goods for September reflect the improved conditions which are noticeable throughout the

industry, the total, \$5,238,753 worth, being an increase over the preceding month in the amount of \$487,583. The month's total also compares favorably with that for September, 1921.

Important shipments of power transformers and power switchboards were made during September, the totals, \$499,755 and \$365,348 worth, respectively, exceeding by substantial amounts the heavy export shipments of these classes for August. Motors and motor driven devices also increased over the preceding month, and in general an average improvement of about 10 per cent. is seen in the September electrical export figures.

in Germany, that a law was passed in Britain prohibiting radio amateurs from using instruments and apparatus of other than British manufacture. The regulations went still further and provided that no license would be issued for receiving or sending if even one unit in the installation were of foreign manufacture. This example was closely followed by France, although that country followed a more liberal policy and only recommended the purchase of apparatus of home manufacture for purely patriotic reasons.

It would be interesting, however, to compare the product of German ingenuity and engineering skill with our own American products. For many years that country has been ahead, so far as works of precision are concerned.

Foreign Radio Factories at Work

GERMAN manufacturers and industrialists have not overlooked the great market created in this country by popular radio broadcasting, says Lloyd Jacquet in "The Mail," New York. Accordingly, they have put their engineers to work and have started their factories and begun placing a complete line of radio apparatus for foreign consumption, with the old time "Made in Germany" label.

In fact, the German manufacturers have been able to undersell any other competitor because of the cheapness of labor and of raw products in Germany today. This competition so alarmed English firms, who foresaw the danger of a flooding of British markets with goods made

The Difference

A RADIO transmitter consists of apparatus which can generate alternating current at very high frequencies (from 20,000 to several million cycles per second) in a conductor which, at the transmitting station, is called the transmitting antenna. A radio receiver consists essentially of an antenna which is cut by the field propagated by the radio transmitter, and of detecting an amplifying apparatus whereby the minute currents generated in receiving antenna are detected and made audible.

Subscribe for RADIO WORLD. \$6.00 a year, \$3.00 six months, \$1.50 three months.

"Suneco" Tube Adapter

Eliminates
the
Storage Battery
Price \$1.50 Each

Sun Equipment Company

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Hutchinson Radio Co.
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Zeta Radio Frequency Transformers
Amertran Transformers

Write to-day for our price list

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IS YOUR TELEPHONE HEAD SET WEAK?

Let me remagnetize it. Guaranteed, in one day good as new. **\$1.50** Per Set

1 rewind for higher ohmage. All radio telephone repairing at moderate prices. Mail orders attended to. Dealers write.

ROYS, 101 West 42nd St., N. Y.

PRICES SMASHED

Each sale has created new friends and customers with the result that we now announce drastic reductions in our quality lines. All goods prepaid. Send card for complete price list. You'll be surprised. You'll tell your friends. A sample saving follows:

COMPLETE REGENERATIVE VACUUM TUBE SET	Our Price	Others
Panel—Bakelite—7x12" drilled.	\$1.65	\$2.40
Cabinet of 3-ply wood to fit panel.	1.50	2.50
Two dials—each 35c.	.70	1.40
Sixteen switch points with nut.		
Each 1c.	.16	.48
Four switch stops with nut.		
Each 1c.	.04	.12
Eight binding posts. Nickel plated		
@ 3c.	.24	.48
Two switch levers @ 25c.	.50	.90
1 filament rheostat. Highest grade.	.65	1.10
1 vario coupler. Fourteen taps.	2.25	4.00
1 22 plate variable condenser.	1.95	3.50
1 tube socket—Moulded.	.45	.85
1 grid condenser and leak.	.10	.25
1 phone condenser.	.10	.25
1 tube socket support.	.15	.25
12 feet spaghetti tubing @ 4c.	.48	.84
15 feet tinned copper connecting wire.	.30	.45
Blueprints showing details to assemble.	.10	.25
	\$11.32	\$20.02

Other articles taken at random from our late price list are:

Detector tubes—Cunningham—NOT rebuilt	\$3.95	\$5.00
Crystal detector of closed type	.60	1.00
Transformer—Audio frequency	2.95	4.50
Double slide tuner—knocked down.		
Coil wound	2.50	....
Loose coupler—knocked down. Coils wound	3.75	
Loose coupler—Assembled	7.50	12.50
Variometer—Hardwood stators 4 1/2%.		
Assembled	2.25	4.00
Frost Fone—2000 ohms.	3.95	5.00
Kallogos—2400 ohms.	8.75	12.00
Western Electric 2200 ohms.	9.25	12.00
Blueprints giving detail of 2 step amplifier	.10	.25
Two step amplifier—knocked down		
Panel drilled	12.95	23.50
Two step amplifier assembled. In cabinet	18.95	35.00
Vacuum tube set in cabinet 7"x12". Wired	17.95	35.00

Send for list today or order direct from above. Goods sold subject to return for rebate or exchange. **YOU MUST BE PLEASED.**

Radio Parts Manufacturing Co.
16 Park Place West Detroit, Mich.

Union College to Invade New Radio Field

THE Union College radio station, WRL, Troy, N. Y., will make an earnest endeavor to become a pioneer in a new field. It is the intention of the club to become the first amateur station able to carry on regular communication across the Atlantic. In preparation for the work, which will be started in December, the organization is now completing a new apparatus. There will be two G-E tubes of 250 watts each, with the current supplied by a 240-cycle alternator. Since the circuit has no filters, but is self-rectifying, the tone will be the same as a 240-cycle modulated C-W equipment. With the completion of the changes, there will be four or five experienced operators ready to make the tests. Long-distance continuous-wave transmission is the new field in radio work. It is the field which will be explored by the college radiomen in the tests they will make under the auspices of the American Radio Relay League.

Union is famed as the introducer of the wireless baby-carriage two years ago. That novelty received a world-wide broadcast, through motion pictures. The station is remembered also as one of the first in the country to broadcast entertainments. As that field of endeavor is supplied with powerful stations employing factory-built installations, not only far-reaching but expensive in original cost and maintenance, the college radioist will return to experimental work.

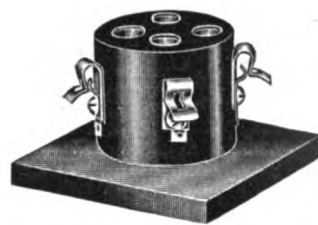
Beating the Record!

EDITOR, Radio World: While some of your readers pat themselves on the back and brag about their so-called long-distance records for radiophone-broadcast reception, we would like to give them some real long-distance records to shoot at.

With a 70-foot aerial and a Westinghouse RC set we have received clearly and distinctly the following stations, all strong enough to put on a Magnavox:

WBAR, Fort Worth, Texas; CFAC, Calgary, Canada; KFCB, Phoenix, Arizona; WDAF, Kansas City, Missouri; WWJ, Detroit, Michigan; St. Louis, Missouri, and Chicago.

We have a reliable range here of 1,500 miles and have no trouble in picking up any station of any power on the Coast and as far east as Denver. We have a very good location and a good aerial, so, of course, that has a good deal to do with it.—E. S. Morrison, Ashland, Oregon.



The **Newest Product On the Market**

Our WD-11 Tube Socket. Made of first grade Formica. Can also be used with French Tubes.

75c. each

We also carry the new Spider Web inductances designed Specially for Rheinhartz Tuner.

Price \$2.50 each

V. T. Sockets made with a Formica base German silver shell. Phosphor Bronze contacts formerly retailed for \$1.75. Now

50c. each

We also offer a limited number of Porcelain base Rheostats, former price \$1.50, made by a well-known manufacturer, for

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Also Variometers completely assembled.

\$1.00 each



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The Popular Radio Insulation. Cut, Grained, Drilled and Engraved according to your Specifications.

\$2.00 a pound

American Electro Technical Appliance Co.

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Spirola

HIGH GRADE CABINET LOUD SPEAKERS

TRADE MARK

Do not be deceived by our low prices. SPIROLAS are not cheap instruments made to sell at a low price. They are rather a remarkable development made possible by the invention of the SPIRAL tone chamber (patent pending), which not only allows us to market a cabinet instrument of the highest grade in every respect at an almost sensational price, but gives many exclusive advantages over the common cabinet type speaker, which is nothing but an ordinary horn enclosed in a cabinet—great competitors for full-sized tone chamber and a really complete elimination of metallic, "horn" noises. SPIROLAS are especially recommended to music lovers who can appreciate an absolutely pure, natural tone.

We make a complete line—of equally high-class construction throughout, with fine hand-rubbed finishes. **ALL SPIROLAS ARE SOLD UNDER ABSOLUTE MONEYBACK GUARANTEE—ten days to see and try them for yourself.**

SPIROLA CONCERT—Complete with special, powerful built-in cord ready to hook up in place of phones, beautiful mahogany or oak **\$12.50**

Satin black finish, nickel-plated fittings, otherwise same as DELUXE **\$3.85**

SPIROLA DELUXE—New, improved duplex type for use with your headset, two complete speakers in one, eliminating the usual interference between phones, same finish as above. **\$4.85**

We also make the DELUXE and black finish type for use with a single loud speaker unit. In ordering state whether for use with headset or unit. At dealers or postpaid (C. O. D. if preferred).

L. H. DONNELL MFG. CO.

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The Latest and Most Essential
Part of an Efficient Tube Set

FRESHMAN

Variable Grid Leak and
Micon Condenser (combined)



Price
Only
\$ 1.00
Complete

A Positive Necessity

The Freshman Variable Grid Leak enables a variation in an unbroken range from zero to 5 megohms, and all intermediate points. The Condenser embodied in this wonderful device is the famous Micon—constant fixed capacity of .00025 m.f.

*Improves Your Set
Wonderfully by*

- CLARIFYING SIGNALS
- LOWERING FILAMENT CURRENT
- ELIMINATING HISSING
- INCREASING BATTERY LIFE

At your dealers—otherwise send us purchase price and you will be supplied without further charge.

CHAS. FRESHMAN CO., Inc.

Manufacturers of the

Highest Class Mica Condenser Products in the World

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No Antenna or Aerial Needed



- Forms perfect receiving aerial.
- No outside wires necessary.
- Plugs into any light socket.
- Consumes no current.
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- Receives in any room of the house.
- Gives sharper tuning than an outside antenna.

Price \$2.00

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Micon TESTED MICA CONDENSERS



Assure Absolute Noiseless-ness
Clarity of Tone
Accuracy
Constant Fixed Capacity
Micon Condensers are especially adapted for use with Radio - Frequency, Super - Regenerative and other circuits, where an accurate fixed condenser is required.

Size	Price
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.0005	.35
.001	.40
.002	.40
.0025	.50
.005	.75
.01	1.50

For protection against damage to the filament and the consequential short life of filaments, Micon Condensers are invaluable.

At your dealers—otherwise send purchase price and the desired Micons will be sent without further charge.

CHAS. FRESHMAN CO., Inc.

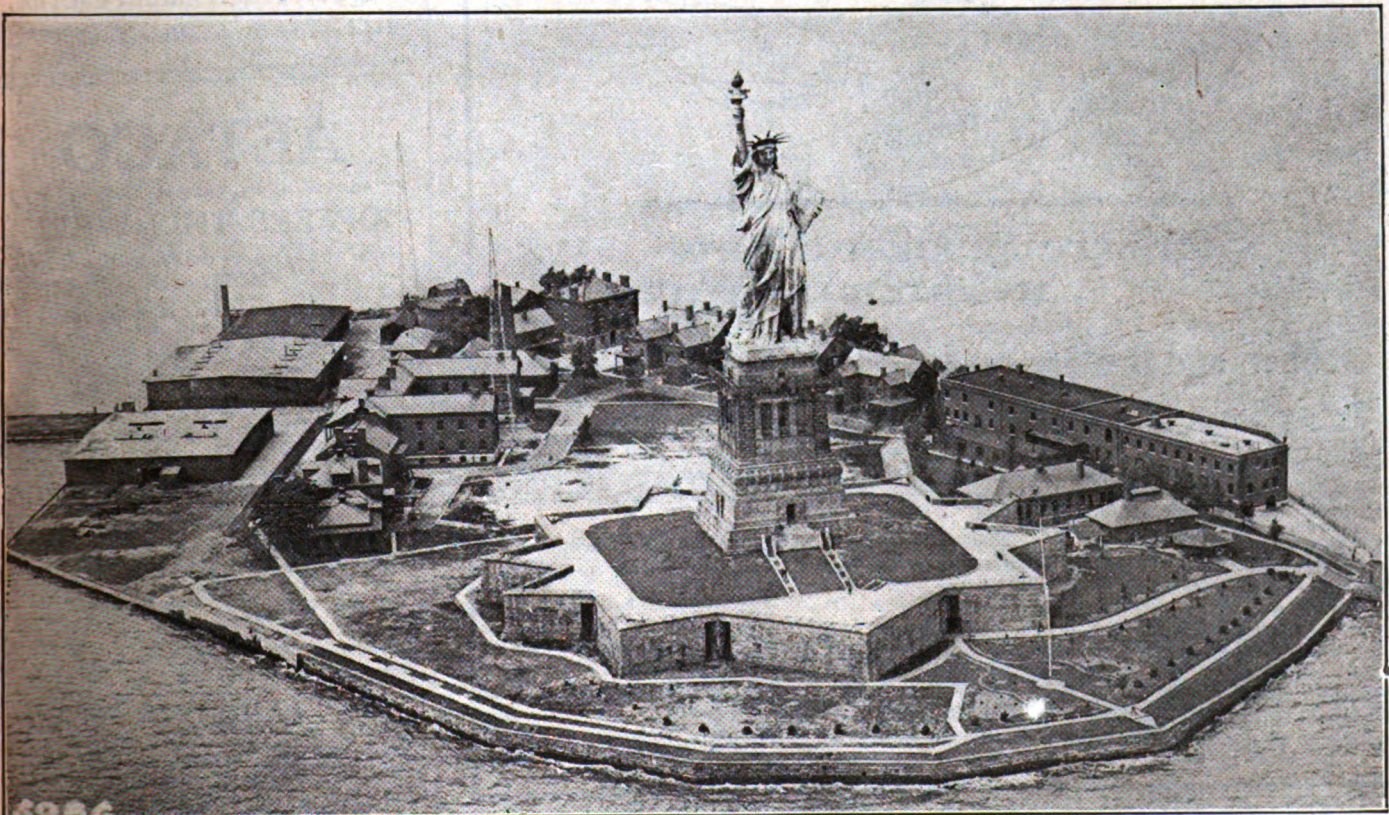
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RADIO WORLD

(Trade Mark)

ILLUSTRATED. WEEKLY

WVP, Where Uncle Sam Broadcasts



(C. Underwood & Underwood, N. Y.)

An Airplane View of the Statue of Liberty and Bedloe's Island, New York Harbor, showing at the left the lofty aerial of WVP, the Fort Wood Radio Station operated by the United States Government.

Wessco

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All Merchandise offered are Standard, Guaranteed, and are of perfect workmanship. Mail orders must include postage. Terms—Money orders with orders—Checks are not accepted.

FREE With Every \$10.00 and Over Purchase a \$1.75 22½ volt Variable B Battery **FREE**

AERIAL—A, Vacuum Tube Detector Set—"THE SET THAT MADE GOOD IN A NIGHT." "BETTER THAN THE BEST." Complete with Radiotron Tube, A and B Batteries, Phones, Aerial and Lightning Arrestor.....\$35.00

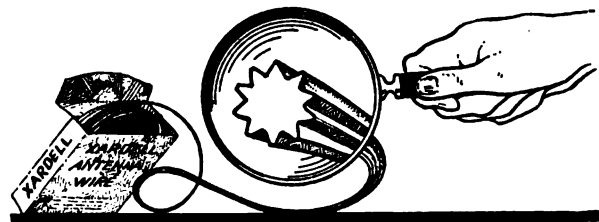
\$45.00 MAGNAVOX.....	\$32.50	\$4.50 Thordarson Transformers.....	2.35
\$24.00 A Battery, 100 amp., 6 V.....	16.75	Thordarson Grid Condensers.....	.15
\$19.00 A Battery, 80 amp., 6 V.....	11.45	\$1.50 Thordarson Vernier Rheostat.....	1.10
\$14.50 A Battery, 60 amp., 6 V.....	8.75	\$5.50 Fort Wood Tuning Coil.....	3.94
\$1.00 Rheostat.....	.32	\$3.00 Knockdown 2-cilide Tuning Coils.....	1.50
Switch Arm.....	.10	4-in. Composition Red Fibre Tube.....	.45
75c High Quality Dial.....	.20	3½-in. Composition Red Fibre Tube.....	.42
\$5.00 23-pl. Variable Cond.....	1.65	3-in. Composition Red Fibre Tube.....	.39
\$5.50 43-pl. Variable Cond.....	1.95	Johas-Manville Bk. Comp. Tubes, 4-in.....	.35
\$4.50 Variometer, guaranteed, high quality.....	2.40	Johas-Manville Bk. Comp. Tubes, 3-in.....	.25
\$4.25 Variocoupler, guaranteed, high quality.....	2.25	\$1.10 Crystal Detector.....	.45
Unassembled Variocoupler, complete.....	1.00	\$1.50 Multi Jack.....	1.15
Unassembled Variometer, complete.....	1.25	\$1.50 Wire Adapter.....	1.15
Insulators.....	.08	\$1.25 Universal Plug.....	.95
Contact Points, dozen.....	.04	\$18.00 WESTINGHOUSE BATTERY	
Brass Bus Bar, Unused, ft.....	.02	CHARGERS.....	13.75
75c Sockets.....	.23	70c Open Circuit Jack.....	.50
\$5.00 B BATTERY, 22½ V, VARIABLE,		85c Closed Circuit.....	.65
BEST QUALITY, GUARANTEED, LARGE		\$1.00 2 Circuit Jack.....	.80
SIZE.....	1.45	Knobs.....	.07
\$1.75 B BATTERY, 22½ V, VARIABLE,		125 ft. Coils No. 14 Phosphor Bronze Tinned	
HIGHEST QUALITY, GUARANTEED,		Wire.....	.40
SMALL SIZE.....	.75	40c K. D. Crystal Detector.....	.10
3-Plate Vernier Variable Condenser.....	.70	Magnet Wire.....20 per cent. discount off list	
Guaranteed Genuine Bakelite Panels—7x10,		Retars.....	.15
\$1.25; 7x18, \$1.65; 9x10, \$1.45; 5x5,		\$3.00 Radio Frequency Transformers.....	1.95
.47; 6x9, .95; 6x12, \$1.25; 7x9, \$1.15;		\$1.00 Berlinham Radiophone Plug.....	.75
12x14, \$3.00; 7x24.....	3.00	75c Battery Hydrometer.....	.35
50c Mic. Condensers.....	.25	\$1.85 Amuse Improved Potentiometers.....	1.10
\$1.00 All Moulded V. T. Sockets.....	.25	Knife Switch, S. P. S. T.....	.14
\$1.50 MICROSTATS.....	.95	Knife Switch, S. P. D. T.....	.22
Spaghetti, per length.....	.07½	Knife Switch, D. P. D. T.....	.35
\$2.00 Chilton Lightning Arrestor.....	1.25	\$6.50 Wessco Audio Transformers, highest	
HOMCHARGER.....	1.95	quality guaranteed.....	3.25
HOMCHARGER DE LUXE.....	15.25	\$8.75 Westinghouse Storage Battery.....	5.05



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Here is an Antenna Wire that will at once appeal to the radio enthusiast. It has a real selling argument in that it is different and better than any makeshifts to date.

This new wire, hard drawn from the finest copper, has a corrugated surface with 10 collecting points on its circumference. This gives a greater collective surface and the points give a greater gathering surface.

The result is extreme sensitiveness, and an increase in the range and clearness of any set, from the simplest crystal type to the finest V. T. Receiver.

Packed in neat cartons of 100 feet, 200 feet and 500 feet.

Price \$2.00 per hundred prepaid
Order direct or from your dealer



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(American Electro Technical Appliance Co.)
OFFERS THIS WEEK

Solder Web Inductance Coil for Rhoishartz Tuner,
\$2.50, each

Large Stock of Well-Known Manufacturer's
.0005 Condensers, Special,
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Queen's Variometers,
\$3.50, each

Queen's Variocouplers,
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Jefferson Audio-Amplifying Transformers,
Regular Price \$7.00, Special,
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Special Formica Panels cut, \$2.00 a pound.
Grained, drilled and engraved to order.

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VOLUME TWO

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the act of March 3, 1879.]

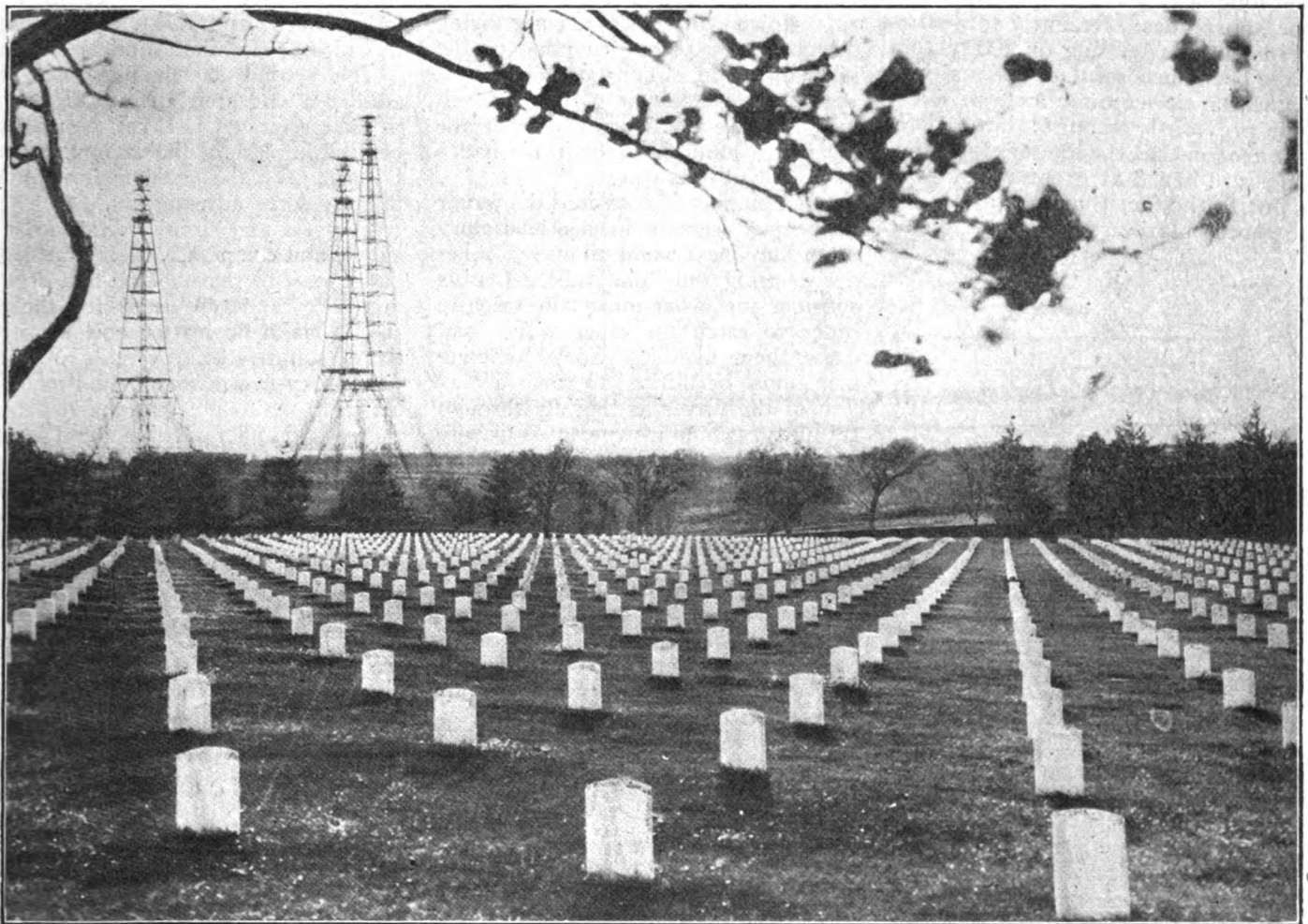
A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. II, No. 9, Whole No. 35

November 25, 1922

15c. per copy, \$6.00 a year

Where Radio Kept Vigil Armistice Day



(C. Underwood & Underwood, N. Y.)

Washington, the nation's capital, city of "magnificent distances," always athrill with the echoes of the men who made American history, has no more appealing place in all its vast area than Arlington Cemetery, where rest forever the brave men who gave their lives in the cause of liberty—not only for their own native land, but that the rest of the world also might be free. Perhaps there is no more beautiful, peaceful spot on earth than these hallowed acres where sleep the dead of the United States Army and Navy. The rows and rows of modest milestones of the privates and the massive memorials of their officers are, today, a foreground for the gigantic towers that support the aeriels of NAA, the government's radio station at Arlington. Nothing is more silent than these high-pointing towers, nothing marks more specifically the grandeur of science and the mystery of life. So one may be pardoned, if in their steadfast position as transmitters and receivers of all that is wonderful and new in the world, they should be described as the watchers of our soldier dead, particularly as, year by year, Armistice Day becomes a day of reverence. For all time, the President of the United States will be expected to place a wreath on the grave of the Unknown Soldier, on this occasion. Arlington Cemetery with its verdant slopes and sleeping dead on one side, the silent-flowing Potomac River and the busy farms on the other, the great City of Washington to the south, and radio's lofty masts towering over all is a picture no American who loves his country should fail to appreciate.

Using Jacks with Vacuum Tubes

THE use of telephone jacks in a receiving set has become a standard practice. They provide a convenient and rapid means of shifting the receiver from one stage to another. They can be connected so as to cause the insertion of the plug in any stage to light only those filaments required for that stage of

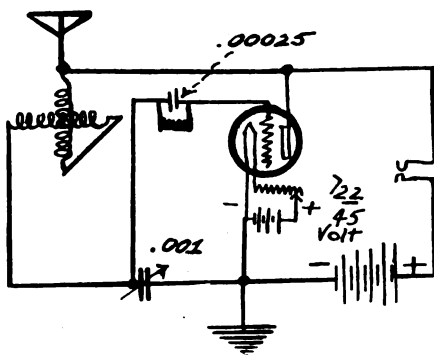
amplification. Removal of the telephone plug can extinguish all filaments and permit their relighting by the mere insertion of the plug without readjustment of the filament rheostats. Because of this completely automatic lighting and extinguishing of the filaments through the use of proper filament-control

jacks, the life of the vacuum tubes is greatly increased and the drain on the filament batteries is reduced to a minimum. It is always a safe proposition when employing vacuum tubes—whether a 6-volt tube, a "peanut," or 1½-volt tube—to use the filament jack. In the long run, it is the best with a receiver.

DX Hook-ups for the Radio Novice

By George W. May, R. E.

MANY believe that stations sending out the longer waves may be heard at great distances because of the greater wave-length used. It seems to be fairly well established by experiment that long waves do travel with somewhat less attenuation than short ones, but there is no experimental evidence to show how much better the long waves are propagated than the short ones. Recently low-powered stations sending on 200 meters have been successful, occasionally in transatlantic communication, a result previously thought impossible. The reason that the longer wave stations are heard at greater distances is due to the fact that they are high-powered stations. It is difficult



Schematic Diagram of a simple, compact receiving outfit. A variometer is used as a means of inductance. The plate-battery voltage is 22 volts. Drawn by George W. May.

to send out large amounts of power at the shorter wave-lengths because of the necessarily small antennas used at the short waves.

There is apparently much difference in signal strength at different parts of the season. Sometimes signals—between a pair of stations with the apparatus the same in either station—show the variation in strength as much as four to one, the stronger signals being received in the winter time. It has been suggested that summer foliage absorbs a considerable amount of energy from traveling waves.

There is also a pronounced difference between night and day transmission. Signals generally travel much farther at night than during the day; but transmission at night is likely to be more variable than it is during the day.

It seems that, during the winter months, there is not much static, or disturbance, in the receiver, so that comparatively weak signals should be received. If a broadcasting station is sending out one kilowatt of power a

tube detector, such as is shown in the accompanying sketches, should give readable signals at a distance of several hundred miles. This distance will naturally depend largely on how good an antenna is used at the receiving station and how well the set is grounded.

It will be noted that distances greatly in excess of this are reported, but generally a tube receiver is not used, as shown in the accompanying sketches. By proper coupling of the plate and grid circuits of the tube a regenerative action is obtained which may increase the sensitiveness of the receiver a hundred times in the hands of a skillful operator.

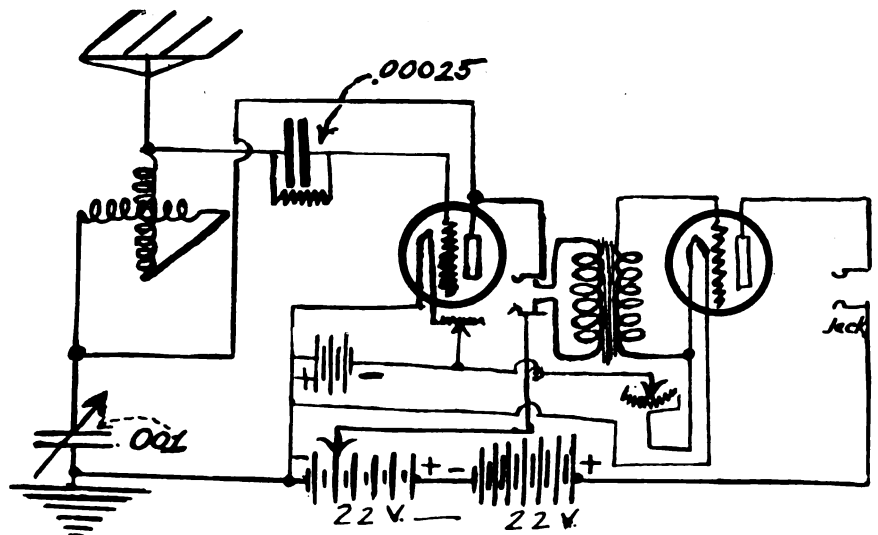
On a number of occasions the writer has copied signals in his laboratory from stations several thousand miles away, using only one tube. Let us consider just what must take place in order to catch the ether waves and make them audible. Some arrangement must be utilized to catch a portion of the waves as they fly through the air. Such an instrument is usually in the form of what we know as an aerial or antenna. As radio waves have definite frequency, or wave length, some means must be employed to tune the receiving set to the incoming waves, or adjust it so the waves in the receiving instruments will oscillate in synchrony, or harmony, with the waves of the transmitter. The instrument of synchronization takes the form of a tuning coil, loose-coupler, variometer, vario-coupler,

variable condenser, or, sometimes, a combination of several of these instruments.

I intend to utilize the variometer as a means of inductance for the 360-meter stations. The circuit is simple enough for any novice to work out. If connected up according to the diagram wonderful results should be obtained. From New York City I may say that I have heard WGY, Schenectady; WSB, and KHJ, also stations in Chicago, Cleveland and Detroit.

The second sketch illustrates the adding a one step of amplification to the circuit. A D-L coil No. 50 can be used in place of the variometer, but I recommend the variometer in order to have some adjustments.

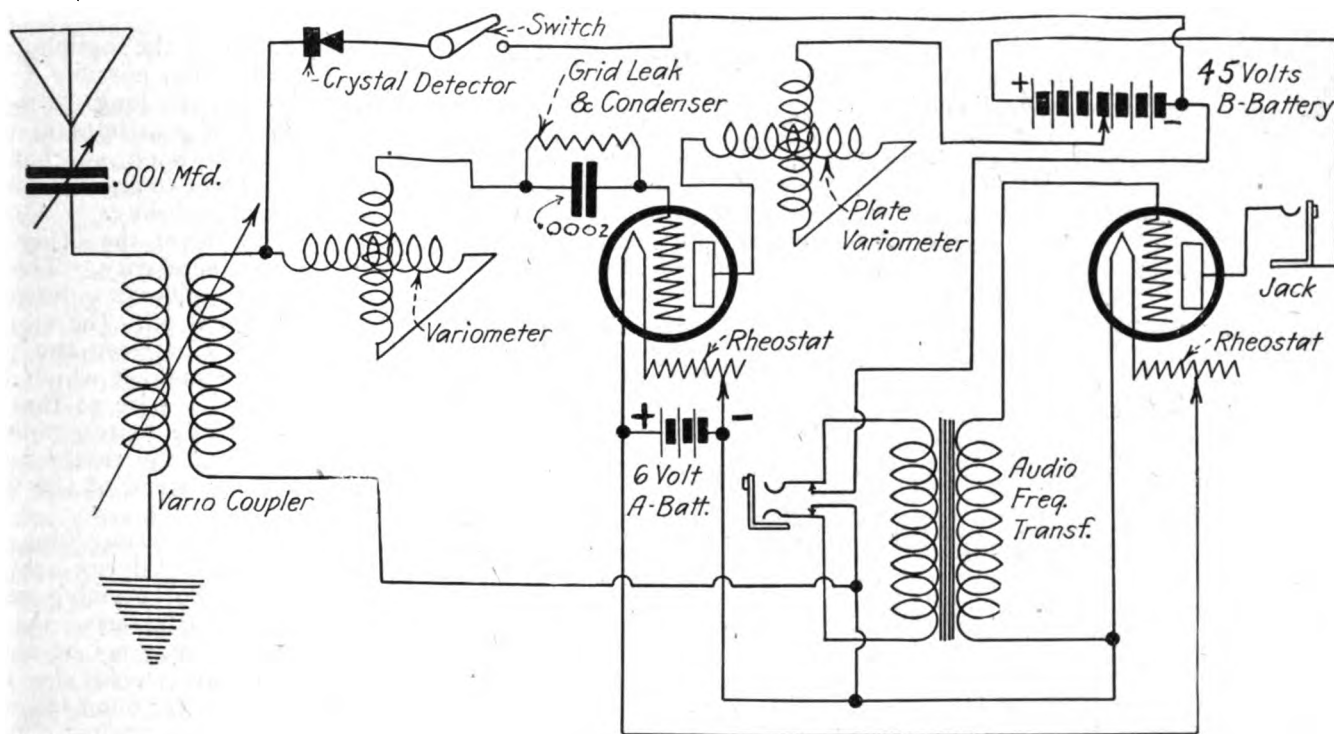
The sets and circuits described are simple and comparatively inexpensive; but it must be remembered that crystal detectors cannot be used for the results I claim no matter how sensitive the crystal may be. Crystals are good for twenty-five miles on the broadcast material, although greater distances can be had under favorable conditions. Code messages may be received over hundreds of miles with crystals. In using this circuit I would recommend using the W-D-11 vacuum tube, known as the dry-cell tube, operating on one dry cell. Believe me, these are the tubes for receiving! They are new on the market. If connections are made properly there is no reason why signals cannot be copied for some distance, provided the aerial is at least 100 feet long.



The amateur wishing to try out the circuit described by Mr. May in the accompanying article will secure satisfactory results by following the above hook-up. Note that a one-stage amplifier is used, which adds to the audibility of loud signals. The instrument of synchronization takes the form of a tuning coil, variometer, loose-coupler, variable condenser or, sometimes, a combination of several of these instruments. Any novice can easily work out this circuit, as it is very simple. Connect it up carefully according to the diagram. A duolateral coil may be used in place of the variometer, but Mr. May recommends the variometer because of the adjustments. Drawn by George W. May.

Combination Hook-up of Detectors

By Fred. Chas. Ehlert



Complete schematic diagram of a vacuum-tube detector outfit with one-step amplification as described by Fred. Chas. Ehlert in the accompanying article.

ONE of the most important parts of a receiving set is the detector. It is important in this respect: The human ear cannot receive signals above 10,000 cycles of frequency. In radio work the frequency sometimes runs as high as a million cycles, so means must be provided for making such high-frequency signals audible to the human ear. The detector does this. Therefore it is necessary to get the best results from detectors.

There are a number of detectors in use at the present time. They are the crystal, the magnetic, the Fleming valve, and the audion- or vacuum-tube. Crystal detectors are of different types: they are manufactured of various minerals. Galena is one of the minerals used mostly by amateurs. The

operation and assembly of a galena detector is simple. Crystals must be kept clean in order to retain their sensitiveness. Washing with a little alcohol greatly improves them if they have been left standing, or have been handled, for a long time.

The accompanying diagram illustrates the complete schematic diagram of a vacuum-tube detector outfit with a one step of amplification. A crystal detector is included also in the circuit. The amateur should try out both detectors separately. The hook-up shows both detectors in the circuit. When using the vacuum tube as a detector, care must be taken that the switch in line with the crystal detector is open. If the crystal is to be used, merely close the switch, shut off the rheostat on the

detector tube and adjust the crystal. With the aid of the one-stage amplifier, it will make possible the amplification of signals. Many amateurs would rather use a crystal detector than a vacuum tube because there is less battery noise and distortion. Others, however, prefer the vacuum tube as a detector; so, for these amateurs, the vacuum tube may be placed in action and the detector crystal eliminated. With the aid of an extra stage of amplification, signals will be amplified to a certain degree of sensitivity.

A novel effect would result if both detectors were lined and each one tested out separately. This would give an idea as to what both detectors do. It is an interesting experiment for amateurs.

Over 600,000 Hear "Aida" by Radio

Verdi's Great Work Is Broadcast Successfully With Metropolitan Singers and Orchestra

By Patrick Nichols

"AIDA," Verdi's grand opera, was heard by radio, on Armistice Day, it is estimated, by over 600,000 people within a radius of a thousand miles. The performance was given by members of the Metropolitan Opera Company and the Metropolitan Opera House orchestra, in oratorio form, in the Kingsbridge Armory, New York, the largest armory in the world, where over 15,000 persons

assembled to hear the performance. While the rendition marked a high spot as the program of the Armistice Day Festival in the Bronx, New York City, it will go down in history as one of the most important radio events of the year. Those who tuned their receivers on the 450-meter wave-length of WEAf, the huge broadcasting station of the American Telephone and Telegraph Company, will be proud, in years to come, to tell about this first "radio performance" of one of the most popular grand operas ever written. Voices and instruments were heard with remarkable beauty and clearness.

No effort was spared by the broadcasters to ensure reproduction of the opera by wireless without distortion.

Engineers of the American Telephone and Telegraph Company spent a week in the armory making tests. They were handicapped by their inability to hold a rehearsal, but, as an alternative they personally sang in different parts of the huge armory to assure themselves that the average human voice could be reproduced with fidelity. They also experimented with a half dozen canaries to make sure that the amplifiers would catch even the finest phrasing of the Metropolitan singers.

Commenting on this remarkable achievement, "The American," New York, says: "Such glorious broadcasting successfully accomplished, it looks as if popular musical pleasure and general musical culture were really 'in sight.'"

With the Ossiphone Even the Very Deaf May Hear Radio

RADIO is wonderful to all who can hear, but what about the poor fellow who is deaf and can't hear a sound of the concerts which flood our ears? Does he think radio so fascinating? Ordinarily not; but with a little instrument, the "ossiphone," even the totally deaf who have not heard a sound for scores of years, may listen in at the radiophone. The ossiphone may be the means of bringing a chest of gold to those who formerly had not even a penny.

It is a simple instrument, in-

By Ortherus Gordon

vented by Mr. S. G. Brown, of London. It is not a means of amplifying sound so as to overcome all degrees up to total deafness; nor does it translate sound into some other medium of communication, like motion or color. It conveys sound to the brain without the aid of ears, eyes, tongue, or touch; but it does enlist the aid of the bones. It is just what the word says—a bonaphone; "ossi" is Latin for bone.

In appearance, the ossiphone is a small ebony box, possibly 1 inch high and 4 inches long. From a slot in one end protrudes a metal vibrator with a knob, so that the entire instrument looks like an enclosed telegraph-key. Double wires leading from the other end heighten the similarity. The resemblance disappears, however, when the cover is off. The vibrator is seen to pass between the poles of a horseshoe magnet which have been wound with wire so that the ossiphone is made to resemble the inside of a telephone receiver with a bar vibrator instead of the usual diaphragm.

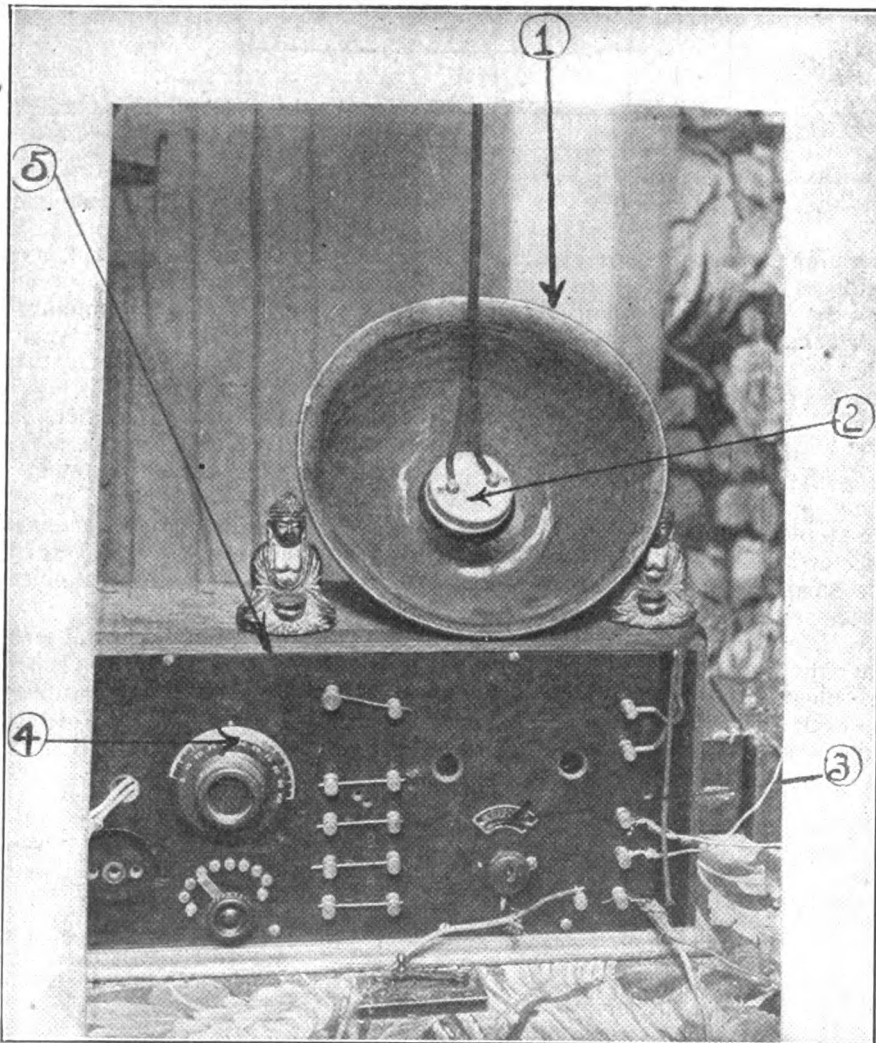
For use with a radiophone, the wires of this useful device are connected to a radio receiving set in place of the headphones. A deaf person, perhaps, may not be able to operate a radio set, for he must hold his ossiphone in one hand while he presses its knob against a finger knuckle of the other. Strange as it may seem, he hears exactly the same sounds as a listener-in, who can hear, with a headset. The difference is this: he hears through his bones; the other hears with his ears.

Remarkable tests made in London demonstrate that a person with normal hearing can actually hear better over the radiophone by use of the ossiphone than by use of the ordinary headset. It is claimed that the bones make better ears than the ears themselves!

In explanation of this, it seems that sound is not a product of the ear alone but the effect of the ear's vibrations on the brain. The aural nerves are the ones that do the trick. If vibrations could be transmitted to these aural nerves by any means whatever, hearing would result. In an event of this kind, the ears would be merely passive appendages.

This strange condition has actually been brought about by the ossiphone. That instrument utilizes the bone as a medium through which to transmit sound vibrations to the aural nerves and thence to the brain. The use of the ossiphone is neither nerve racking nor unpleasant. The bones themselves do not tingle—the vibrations of the ossiphone are too delicate for that. The only sensation to a deaf person is the joyous one of perfect hearing.

Plain Dish as Loud-Speaker Distributor



The lowly china, or earthenware, dish, such as may be found in any home kitchen, makes a surprisingly good distributor for a loud-speaker. Take one earpiece from your headset and suspend it in front of and facing the dish after it has been put end upwards on wood or some resonant material. By careful testing you can find the exact spot where the sound is the loudest, then the phone may be permanently suspended or fastened, as is shown in the photograph. Surprising mellowness will result. The experiment is well worth trying when you are picking up loud stations. In the photograph, 1 shows the disc, or plate, in position; 2 is the telephone earpiece; 3 is the rheostat to increase the brilliancy of the vacuum tubes; 4 is the dial that governs the tuning qualities; 5 is the receiver complete.

Merchant-Marine Officers of Future Must Know Radio

By S. S. Smith

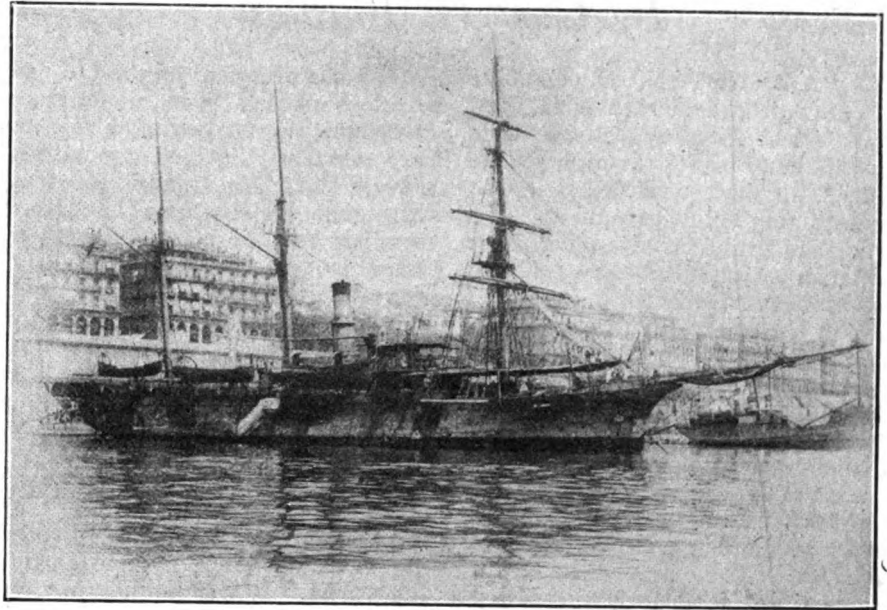
IT has been decreed by the State of Massachusetts that the education of a merchant-marine officer is not complete without a knowledge of radio. Accordingly, the Massachusetts' State Nautical School, the steamship "Nantucket," is offering to cadets, this winter, a complete course in radio operating and engineering. This is a departure from the ordinary curriculum; for during past winters, at North End Park, Boston, the education of prospective merchant-marine officers has been limited to navigation by the sextant, the log, lead, and compass, fair winds and the grace of heaven.

Now, for the first time, merchant officers in the making are being fortified against storms, currents, and fogs at sea by timely instruction in the use and operation of all kinds of radio apparatus. The importance of this instruction may be judged by the fact that there are at present only two training ships supplying our merchant ships with officers of American parentage: the "Nantucket" of Massachusetts, and the "Newport" of New York.

There is a special instructor on the "Nantucket" whose duty is to teach the cadets the Continental Code and to explain radio navigating. Fascinated youngsters are learning that there are other ways of obtaining a position at sea than those given in the nautical lore and navigational tables of Bowditch. Study of the radio compass is stressed, as that instrument is of greater value to the seafarer than any other.

During the winter lay-up at the dock, the theory of the science will be taught. In the summer, when the "Nantucket" goes on her annual cruise halfway around the world, the cadets will get actual practice in the radio room of the ship. In this period, they will have demonstrated to them the possibilities of radio navigating—not as it is practiced now but as it may be practiced in the future.

This is the first step ever taken to weld the deck and the radio department of merchant ships. Heretofore, there has been jealousy and ill-feeling—old-timers have felt that radio is an encroachment on their methods. They have balked at using radio. The Navy long ago



The Massachusetts State Nautical Schoolship "Nantucket," photographed at Algiers, aboard which students are given a complete course in radio operating and engineering.

brought radio within the control of the navigator; but then radio, as a means of battle signaling, was far more important on war vessels than on cargo and passenger carriers. Some time may pass before radio as

taught aboard the Massachusetts' school ship will have a visible effect on merchant marine, but the fact remains that future officers are being prepared for radio dominance on the sea.

Radio-Wire Tables

By Frederick J. Rumford, E.E., R.E.

No. 2 — Single Cotton-Covered Wire

Showing the Number of Feet in a Pound and Fractions of a Pound

APPENDED is the second of a series of five tables which the radio amateur will find useful for many purposes. The succeeding tables—"Double Cotton-Covered Wire," "Single Silk-Covered Wire" and "Double Silk-Covered Wire"—will be published in early numbers of RADIO WORLD.

Size	¼ lb.	½ lb.	¾ lb.	1 lb.	1 lb.
20	38	76	152	228	311
21	48	96	192	288	390
22	61	122	244	366	491
23	78	156	312	468	624
24	97	194	388	582	778
25	119	238	476	714	958
26	148	296	592	888	1188
27	191	382	764	1146	1533
28	247	494	988	1482	1993
29	307	614	1228	1842	2461
30	361	722	1444	2166	2893
31	435	870	1740	2610	3483
32	551	1102	2204	3306	4414
33	711	1422	2844	4266	5688
34	800	1600	3200	4800	6400
35	1049	2098	4196	6294	8393
36	1230	2460	4920	7380	9846
37	1454	2908	5816	8724	11636
38	1731	3462	6924	10396	13848
39	2258	4576	9140	13710	18286
46	3047	6094	12188	18282	24381

This table can be used for a variety of purposes.

Radio Waves Penetrate Earth

Experiments in Mine Indicate That Radio May Be Used for Communication

By Carl H. Butman

WASHINGTON, D. C.—The well-known signals KDKA, East Pittsburgh, have been heard in many places throughout the country, but it is doubtful if it was heard 100 feet below ground and at a distance of eighteen miles from the station, until the Bureau of Mines experts heard it recently in a test made in a mine at Bruceton, Pennsylvania.

Although the tests were hurried, only short continuous waves being used and no attempt made to modify the apparatus so as to try out longer waves, the experimenters found evidence that electromagnetic waves may be made to travel through solid earth.

Reporting to the Bureau of Mines, C. L. Colburn, C. M. Bouton, and H. B. Freeman, jr., say that, in response to many requests for a device permitting the use of radio in mines in the interest of safety, especially following disasters which frequently break mine telephone systems, they recently undertook an unusual experiment, in co-operation with three engineers of the Westinghouse Electric Company.

In their official conclusions they state:

"The present preliminary experiments, while unsuccessful in indi-

cating any practical method of using wireless waves for underground communications, nevertheless indicate clearly that electromagnetic waves may be made to travel through solid strata. The 'absorption,' or loss, of intensity with distance is very great for the short wave-lengths used in these experiments. Longer wave-lengths are known to suffer less absorption and may possibly be found practically effective under certain conditions."

The preliminary experiments consisted, first, in receiving signals from without the mine at Bruceton by means of a receiver located inside; and, second, both sending and receiving messages underground through the strata. It was found that with a receiving instrument set at a point 100 feet underground, signals from KDKA could be heard distinctly. About fifty feet from the receiving station used in this test was a six-inch bore-hole from the surface, lined with iron pipe and containing electric light wires which extended therefrom throughout the mine. The presence of these wires evidently assisted greatly in the reception, they report, for, when the receiving set was carried to another point removed from wires and tracks, the signals were barely audible through

fifty feet of cover. "The fact that signals were detected, however, even though faintly, is sufficient evidence of transmission through the ground to encourage further experimenting," they state.

In sending waves underground, the Westinghouse 20-watt vacuum-tube transmitter was used in such a manner as to send out continuous waves from 200 to 300 meters length; but they say that additional experiments with waves of increased length are much to be desired. It was found that although signals could be heard distinctly through fifty feet of coal strata, the audibility fell off rapidly as this distance was increased.

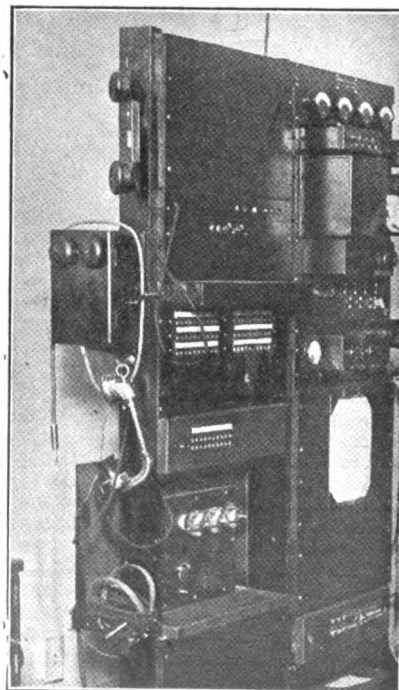
In all experiments, the vertical antennae was found to give the better results, the horizontal antennae giving practically no reception. A loop of a single turn was used, however, with fair results. All these experiments were tried with a wave-length from 200 to 300 meters, except the reception from KDKA which was 360 meters. The strata at the experimental mine lie almost horizontal, and may have had some influence on the transmission of radio waves; but the present experiments gave no conclusive evidence on this point. They seem to agree that the degree of wetness of the strata influenced the transmission of radio waves. The mine was a comparatively dry mine, but the overburden of soil and soft shale is damp, and a small stream of water is continually flowing from the mine. The underground workings of the Experimental mine follow a horizontal five-foot vein of bituminous coal, and the transmission and reception inside the mine followed the course of this vein.

In order to gain a quantitative idea of the transmission of the radiated energy, a milliammeter was inserted in the plate circuit of the receiving apparatus. This normally read 1.6 milliamperes, but the flow of radiant energy from the receiving antenna produced more or less depression of the current according to the intensity of the signals. This then made possible a comparison of the intensity of the reception at different points. The milliammeter was graduated in tenths of a milliampere, and tenths of a division could be estimated by eye. Signals could be clearly heard when the inflowing energy was too low to be indicated by the meter; that is, the clearly distinguished words from KDKA gave no appreciable depression of the plate current.

New Voice Amplifier at WEA F

New York's newest radio-broadcasting station, WEA F, operated by the American Telephone and Telegraph Company, uses a "voice amplifier," as shown in the photograph at the right. This is necessary because the music studio and the broadcasting station are a quarter of a mile apart. The new amplifier is a masterpiece of delicate mechanism that will pick up the notes of a bird and start them on their journey over the air without losing the most intricate trill. WEA F was the station through which the opera, "Aida," was broadcast on Armistice Day—a radio event that marked a new era in science and music, for it proved to the world that, because of price or distance, the masterpieces of music may now be given to everyone by voices accompanied by an orchestra that only a few have had the great pleasure of hearing. Without the voice amplifier, the success of such an undertaking would be questionable; but this new device is able to convey, without losing even the fraction of a sound, music and the human voice—from any place where they may be produced—to the broadcasting apparatus. Every week records some startling new addition to radio's remarkable equipment that makes it more and more of a great service to all the people.

(C. Kadel & Herbert)



Why Radio Transmission Is Superior to Wire Transmission

By *B. R. Cummings*

Radio Engineer. General Electric Company

RADIO may be defined as: "A system of communication whereby intelligence is transmitted with the speed of light in all directions, for any desired distance, without the aid of any artificial medium, by the propagation and detection of electrical disturbances in space."

An analysis of this definition will indicate the unique inherent characteristics of radio which make it serviceable where other systems of communication cannot be applied.

While the speed of transmission in radio is no greater than that of wire-communication systems, it is equal to it. A radio message travels at the rate of 186,000 miles per second—more than one million times the speed of sound. A radio message, for example, which is transmitted in New York is received at San Francisco in *less than two one-hundredths of a second!*

A radio transmitter will radiate its message in all directions, a characteristic which has made broadcasting possible. A broadcast message can be heard by airplanes, by ships at sea, by submarines submerged in the sea, and in mines or other points under the surface of the earth.

So far as we know radio communication can be effected over any desired distance. Radio stations have already transmitted completely around the world, and, since the medium which transmits light to us from stars and planets is the same medium which transmits radio communications, it is reasonable to believe that a radio message may be propagated through space for a distance depending only on the amount of power which is put behind it.

The third inherent characteristic of radio—that is, its ability to transmit intelligence without the aid of any artificial medium—places it in a field absolutely its own. Not only does this permit communication with points otherwise inaccessible, such as, for example, aircraft, with ships, and to inaccessible spots on land, but it eliminates the need of securing rights of way for transmission lines and their construction and maintenance. A radio system is therefore rendered more positive than wired systems in that it is not subject to the failures which frequently occur during the winter months in wire lines.

While the means utilized in radio differ entirely from those used in other forms of communication, it is possible to connect a radio system to a wire system so that a telephone subscriber, sitting in his home, may talk by a wire line to a radio station, where his voice is transferred to a radio transmitter, transmitted by radio and again transferred to a wire system. This fact makes it possible to extend the range of wire-telephone systems over areas which were heretofore considered impassable by including in the wire-telephone line a radio link which bridges the previously impassable section.

While a radio communication is broadcast in all directions, it would be desirable for some classes of work to be able to transmit only in one direction.

Senatore Marconi, during his recent visit to the United States, made a plea for further investigation into the possibilities of directive radio-transmission whereby the message would be transmitted in one direction only. He pointed out that, in his early experiments, he had succeeded in transmitting directly over short distances by using a reflector at the transmitting station whereby the propagated waves were reflected and concentrated in one direction similar to a beam of light from a searchlight.

It should be remembered that it is

not intended that radio communication shall replace the wire-telephone system. Its use will be restricted to communication between points where wire communication is not possible or applicable. This is due primarily to the fact that the number of radio communications which can be carried on simultaneously in a given area is limited, whereas in wire telephony the number of simultaneous communications which can be carried on is unlimited.

While directional radio-communication is needed in commercial radio work in order that radio may be made to approximate more nearly the directiveness of a wired system, such development will be intended not to replace wired systems, but to eliminate unnecessary interference in areas not lying between transmitting and receiving stations and to effect power economies in the transmitter itself. It should be remembered that, while broadcasting by radio is serviceable in communicating with moving stations and for broadcasting work, commercial radio traffic is usually handled between fixed stations—that it would be desirable to be able to transmit from one to the other without having the message broadcast.

The foregoing has referred briefly to the characteristics of radio-communication without touching upon the functioning of the apparatus itself. Many people witnessing for the first time a radio transmitter in operation are disappointed, for there is no visible motion in any of its parts. It is noiseless, and there is no evidence whatever of the phenomena occurring in its various circuits.

Its operation, however, includes a consideration of both the infinite and the infinitesimal; infinitesimal units of electricity so small that they cannot reflect light, and, therefore, can never be seen, moving under perfect and complete control of the operator; amplifying the human voice millions of times without distortion and transmitting it through space with almost infinite speed. In analyzing the phenomena involved and the almost unbelievable future for this method of communication we may probably be forgiven for modifying Morse's memorable message: "What Hath God Wrought?" to "What Hath God Not Wrought?"

Eleven New Broadcasters

ADDITIONAL broadcasters licensed during the week ending November 11, as limited commercial broadcasting stations, on 360 meters, are as follows:

KFED—Billings Polytechnic Institute, Polytechnic, Montana.

WNAQ—Charleston Radio Elect. Co., Charleston, S. C.

KFCK—Colorado Springs Radio Co., Colorado Springs, Colo.

WNAX—Dakota Radio Apparatus Co., Yankton, S. D.

WOAJ—Ervin's Electrical Co., Parsons, Kansas.

WNAW—Henry Kunzmann, Fortress Monroe, Va.

WBAQ—Lyradion Mfg. Co., Mishawaka, Indiana.

WNAV—People's Tel. & Tel. Co., Knoxville, Tenn.

WRAY—Radio Sales Corporation, Scranton, Pa.

WPAL—Superior Radio & Tel. Equipt. Co., Columbus, Ohio.

WOAF—Tyler Commercial College, Tyler, Texas.

The Radio Primer

*For Thousands of Beginners Who
Are Coming into Radio Circles*

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

DOES everything, or certain things only, contain electricity?

Everything contains electricity. And everything means just everything—your shirt, your pencil, your shoes, your hat, yourself! This is similar to the fact that most everything contains water. Take apples and peaches, for instance. If the water is evaporated we have dried apples or dried peaches. If we could withdraw the electricity from an object there is no doubt that the object would change in some way.

* * *

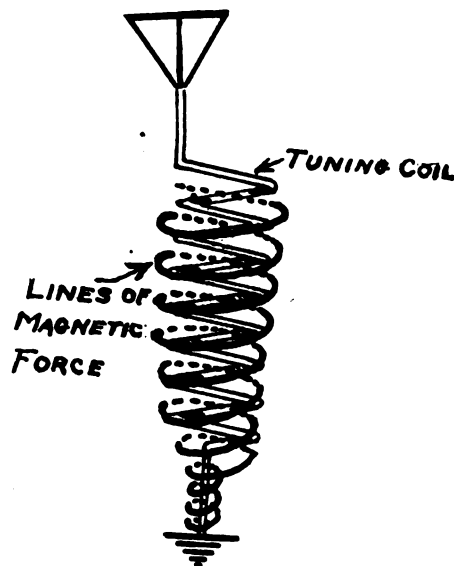
How about the movement of electricity?

Electricity makes itself known only when it is in motion, or when there is more than usual, or less than usual, of it in an object. This is exactly what air does. If air moves we have wind. We speak of electricity in motion as a current of electricity just as we speak of a current of air or a current of water.

* * *

Are there any polarities to electricity?

In order to answer this question let us consider what happens when we comb our hair and hear a crackling sound, or the fact that the hair is attracted toward the comb when it is near it but not touching it. This is due to the presence of more than the usual amount, or less than the usual amount, of electricity. In order to more clearly understand this try the following experiment: Take a piece of cork about the size and shape of a pea and cover it with a layer of tin-foil. It will then be shaped like a ball. Fasten this to the end of a silk thread about eight inches long and hang it up. Take a piece of hard rubber—a rod is best, but a comb will do—and a piece of cat's fur, or flannel, and rub the rod with the fur. This should be done in a room containing dry air, as damp air lets the electricity leak away. Any room that is heated will answer. The rod now contains more than the usual amount of electricity. It is electrified. You electrified it when you rubbed it with the fur. When a body contains more than its usual amount of electricity it is said to have a negative, or minus (—), charge. The fur, which had a



When a current is passed through a coil of wire, millions of lines of magnetism radiate from each wire, winding and twisting about the coil.

less amount, is positive, or plus (+).

* * *

What can be said of the positive and negative charges in regard to attraction?

Positive electricity repels positive electricity; negative electricity repels negative electricity; positive attracts negative electricity. In other words, like poles repel; unlike poles attract.

* * *

Will electricity flow through any material?

Charge a large ball with positive electricity and another large ball with negative electricity. Take a silk thread and extend it from one ball to the other. Then test the two balls to see if they are charged. You will find that there is no change in them. Both still have their charges. Instead of using the silk thread use copper wire. Test the two balls and you will find that neither is charged. When we used the silk nothing happened.

* * *

What is the explanation of this?

What happened is this: The excess electricity on the negatively charged body went through the wire to the positively charged ball, which, you must remember, had less than the usual amount. In other words, we had the electricity moving along the wire, forming an electric current. The wire permitted electricity, but the silk

How to Put Up Your Aerial

A SIMPLE way to raise an aerial mast of a considerable height is to plant a shorter staff about one-third of the length of the main aerial-mast close to the base of it, and raise the larger mast by means of block and tackle. Guy ropes should be slung from the mast about two-thirds the way up, to permit of guiding.

It is customary to make the aerial of more than two spans of wire so that a greater conducting-surface will be presented. For stations up to one kilowatt in size, an aerial should have at least six wires spaced not less than two feet apart nor more than three feet apart. It has been found that nothing is gained by placing the separate spans closer together than two feet; for fairly large aerials, three feet is good spacing.

Other things being equal, the greater the height of the aerial the greater its range either in transmission or receiving; but the range is largely influenced by the number of strands in the aerials. Where the height is limited, the aerial may be extended so that it covers a considerable area.

It must be kept in mind that as more wires are connected parallel to the aerial, it will tend to give it greater activity. The capacity inherent in it is also directly increased. The aerial must not be made too large for the transmitting set or there will be a decrease instead of an increase in the range.

thread did not. Then the wire is a conductor of electricity and the silk a non-conductor. An object that will not conduct electricity is known as: 1—non-conductor (not a conductor), 2—di-electric (not electric), 3—insulator (to shut off).

* * *

Are conductors needed for electricity?

A conductor is absolutely needed for a current of electricity; so is the object to which it is connected. In order to explain further my example of an electric current: We rubbed the hard rubber rod with the fur, and this rubbed some of the electricity of the fur into the rod. The electricity that we rubbed on the rod is not something new or unknown. It is electricity that simply moved from the fur to the rod in very small parts, called electrons. These electrons have been measured, weighed, and are able to show themselves. It is these moving electrons which makes a current. Of course, to have a continuous current we must keep them moving.

No Interference Between 360 and 400 Meters

By *Washington R. Service*

FOR some time the Department of Commerce Radio Section has insisted that there was no actual interference between the broadcasting stations using a 360-meter and a 400-meter wave, if good sets were used and properly tuned, and this contention recently has been proven. The radio inspector at San Francisco has submitted a report to the Radio Section of the Department of Commerce, which, it is believed, will be of interest to the radio public. Because of numerous complaints in California that serious interference was experienced by listeners-in while two neighboring stations were transmitting simultaneously, one on 360 meters and one on 400 meters, the radio inspector conducted a personal test which he describes as follows:

"I arranged a test with a single-coil tuner and also two inductive tuners located at a point midway between both transmitting stations. These stations, which were about a mile apart, were then requested to transmit at exactly the same time. It was found that with the single-coil tuner it was impracticable to separate the two waves. However,

by using an inductive tuner, a charge of six degrees either way, would tune out either one of the stations. This corresponded to a change of about six meters on either side of the transmitting wave.

As the receiving station was located on almost a direct line between the two stations mentioned, it seemed to demonstrate, beyond any possible doubt, that, with a selective tuner, it would be entirely feasible to receive from either station at will without interference from the other.

No doubt there will be much complaint from single-coil receivers and from other stations having very large aerials; but it is thought the interference will result in the ultimate improvement of receiving apparatus throughout the district. A campaign of education is being instituted by the Broadcasters Association; and it is intended that an inexpensive form of resonance trap is to be placed upon the market, for installation in conjunction with single-coil receiving stations, which will enable operators to reject unwanted signals, within the range of 300 to 600 meters.

Radio from Two Important New Angles

By *Arthur G. Shirt*

THERE is danger to the politician in radio—a danger that, apparently, he does not see. It loses votes faster than it gains them.

The correspondent of a New York paper, during the recent gubernatorial campaign, struck the idea right when he wrote:

When a voter can sit at his home without the influence of the crowd, and calmly analyze the speech of a political candidate as it is delivered, I am inclined to believe that it is very disadvantageous to the speaker. Candidate _____'s talk, as it came in over the radio, was a fine example of pure, unadulterated "bunk," and when I heard the band play and the crowd cheer, I then realized how easily the average voter is beguiled into believing that he has heard some concrete important statement that means something, when he is really only being

influenced by the general effect of the meeting.

Radio is extremely impersonal—it is neither coerced nor influenced by any personality, good or bad. It strips everybody and everything to the same level—forces them to substitute real genius and honest arguments for fake cleverness and "hot air." With this analytical coldness in its favor, it is a wonder that radio has not been used in courts of justice where the emotions of juries are too frequently played on by designing lawyers to gain ends not always coincident with the ends of justice.

Of course, it sometimes happens that the human element in the case before the jury for trial must temper the decision and alleviate the

National Radio Week
Dec. 23 to 30, Inclusive

CANADA is anxious to join the United States in celebrating National Radio Week. Harry Lewis, editor of "Radio News," Toronto, has written to Major J. Andrew White, chairman of the Executive Committee, 328, Broadway, New York, that his country is willing and ready to affiliate. He believes that the concerted action of both countries would have a good effect on radio in general. Every effort will be made to bring the Canadian fans and amateurs in line.

Dr. Alfred N. Goldsmith, eminent radioist, inventor, and chief of the radio department of the College of the City of New York, has been appointed chairman of the Committee on Radio Engineers.

"The Evening Mail," New York, says editorially:

MOVEMENT is on foot to organize a "National Radio Week." This is good and commendable and deserves the support of everyone interested in or connected with the radio industry. If the idea develops into more than a threat and is actually carried out it will do much toward stimulating business.

Incidentally The Evening Mail suggested a similar plan in these very columns last August that should show The Mail's attitude pretty closely.

If the sponsors of the present movement can show some interesting action, they can rest assured that the columns of this paper are at their disposal.

There is another movement on foot to raise \$50,000 among the manufacturers to advertise radio on a national scale. All these movements are good, but they should have been planned months ago. Instead manufacturers sat and waited until the last minute for something to happen, confidently expecting that radio was so good that it would sell itself to the public with practically no effort on their part. This theory has been exploded and now we have desperate last minute methods, which are always more or less haphazard, to revive the industry.

The best thing in the world needs selling power behind it and radio is no exception. We have a market before us as big as all outdoors.

If the manufacturers do raise \$50,000 for an advertising campaign, let us hope that it will be spent wisely. If half of this sum was expended on programs and the other half on advertising the programs, no doubt the radio industry would receive a much needed impetus.

punishment. More often, however, is it necessary to administer stern and impartial judgment. If the jury does not see the prisoner or the lawyers, but hears testimony and arguments by means of a radiophone, will it have a better chance of rendering a fairer decision than otherwise possible? Here is a question that may puzzle the minds of economists, thinkers, jurists, and criminologists for some time to come.

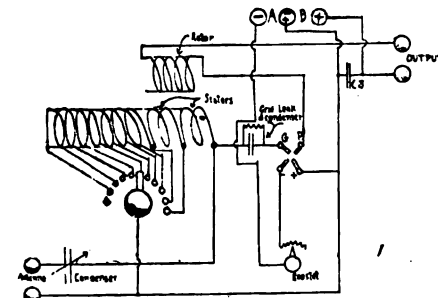
Whatever value this suggestion may have, the use of radio as a relentless mirror will warn politicians and others who use it for their own ends that the radiophone is a dangerous toy for them to play with.

How to Make an Intermediate-Wave Regenerative Receiver with a Wave Length from 150 to 3,000 Meters

By Joseph Schuck

THE panel is 18 inches long and 6½ inches high. It may be bakelite or hard rubber. The shielding in front of the condenser and inductance may be copper or aluminum. It is connected to the ground terminal of the set. Care must be taken in shielding the panel as the plates must not touch the shaft of the variometer or any metal parts of variometer or condenser.

The condenser is a 43-plate .001 mfd. and is inserted in the antenna. The variometer must have a rotor ball measuring 3½ inches over all. A cardboard tube is used measuring 4 inches inside and 4 inches long. It should be given a number of coats of shellac to prevent it from shrinking after it is wound. The winding is bank wound, 3 layers, 87 turns to a layer started ¼



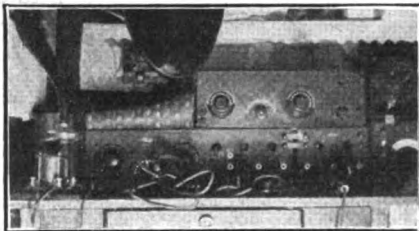
Hook-up for the regenerative receiver, 150 to 3,000 meters, as described in the accompanying article.

inch from the end and 11 taps taken off the first tap at 3, the second tap at 5 and 8 thereafter. Two taps are taken off the variometer at the stators as seen

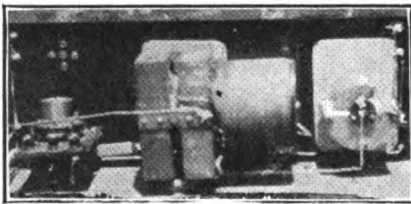
by the drawing. The inductance is then mounted on the variometer by means of two small V brackets. Care should be taken when mounting. The winding of the inductance must run in the same direction as the variometer winding. The rotor of the variometer must also be able to pass freely when turning at the inductance.

The audion socket is to be mounted on a shelf by means of set of V brackets. The shelf is of hard rubber, or bakelite, 4½ inches long and 3 inches wide. Three battery posts are also mounted on this shelf. The rheostat is mounted directly under the socket shelf, thus saving space and giving the set a better appearance.

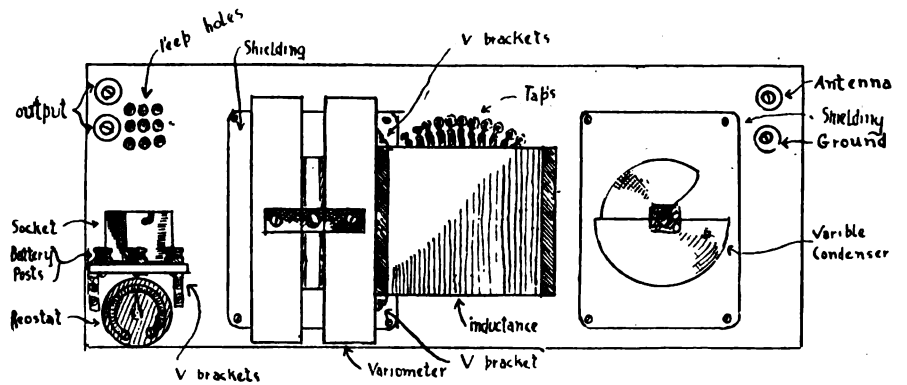
The phone condenser, C 3, is an .0025 mfd. The grid leak and condenser is combination type, .0005 mfd.



Front view of set showing wave-meter at right



Rear view of set, explained in diagram at the right.



Schematic design of the rear view of Mr. Schuck's circuit, as shown in the lower photograph at left. The bank-winding system, Mr. Schuck believes, should be welcome to all amateurs. This receiving set has a true wave-length from 150 to 3000 meters. In a test of its range bringing in broadcasting stations, the results were as follows: WJZ, WGI, WGY, WOR, WEAF, WVP, and KDKA—quite a string. In code stations, Mr. Schuck claims, there is no limit to its distance. It has brought in eight district stations, clear as a bell. Its furthest distances, so far, are Station's NAO and NAP, located in Florida. Mr. Schuck's station is in New York City.

The Meaning of Potential

By Harold Day

THE word "voltage" has been used to indicate electrical pressure. Other terms are used, and it will help us in our understanding of electricity and in reading scientific books if we have some knowledge of these terms. We speak of an "electrical potential" and "difference of potential." "Difference of potential" is the same as "voltage." Potential is the voltage (difference of potential) between any body and the earth.

The earth is such a large body that its electrical condition is always con-

stant. It is a fairly good conductor, and any loss, or excess, of electrons on its surface is quickly equalized. Thus we can use it as a reference point from which to make measurements. Its potential is always zero. "Potential" is to electricity what "level" is to water. The zero point for measuring water is, of course, the sea level. If one tank of water is 180 feet above sea level, and another tank 160 feet above sea level, their difference would be 20 feet.

In other words, there would be a

20-foot head of water in order to make the water flow from one tank to the other. In this same way we speak of an object as having a potential of 180 volts compared with the earth. Another object may have a potential of 160 volts compared with the earth. Their difference in potential would be, as stated, 180 minus 160, or 20 volts. There would be 20 volts pressure to make the electrons flow from one object to the other. This difference in potential, or voltage, is known as electromotive force—Emf.

GREAT ADVERTISING MEDIUM
 RADIO WORLD's special issue, "Holiday Radio Gifts Number," issued on December 9. Copy received up to November 29. RADIO WORLD, 1493 Broadway, New York.

The Vacuum Tube

Its Action and Proper Use. Correct Method of Caring For It

By Donald Van Wyck

TO understand the action of a vacuum tube it is necessary to know the following facts:

A current of electricity is simply a flow of electrons. The electrons flow in one direction, forming a current which is said to flow in the opposite direction.

Electrons are small charges of negative electricity.

All materials contain electricity—positive and negative.

It has been discovered that metals, if heated, will throw off into space some of the electrons which the metals contain; that the hotter the metal up to a certain degree of heat the more electrons it discharges. Electrons travel at a high rate of speed. If air or any other gas is present in the space around the metal the electrons strike the minute particles of the air, or gas, and are soon stopped.

The above facts are applied to the vacuum tube. The air is pumped from the tube—hence the name "vacuum"—so that the passage of the electrons will not be stopped. The filament marked F in a tube is heated so that it becomes red or white hot. This is usually done by an electric current furnished by a storage battery. G represents the grid, and P the plate.

The vacuum tube is the only part of the more common radio receiving-set which requires replacement. It is therefore important that the amateur have a correct understanding regarding its use. A detector, or amplifying tube, is nothing more than a highly evacuated incandescent lamp containing a plate, grid, and filament. Thomas A. Edison made his first tube by inserting a wire in the top of an ordinary electric-lamp. The principles which apply to the care of lighting lamps apply equally as well to the tubes.

Only after scrapping a tube or two does the amateur realize that he has a delicate instrument with which to contend. It is certainly a delicate instrument, for a very slight increase in filament current may prove fatal. The difficulty is introduced by the necessity of operating the tube so near its danger point. Very few people realize this.

By a slight turn of the filament knob the fine tungsten-wire is brought to a glow, or, as we say, a brilliancy. The melting point of tungsten is 3350 degrees centigrade. This is higher than any other substance except carbon. Iron melts at 1550 degrees centi-

grade. Melting of the filament occurs when the battery is fully charged. When six or more volts are impressed across the terminals of the filament of the tube a rush of current passes to the filament, taking the chance of burning it out. To eliminate this some type of resistance is used in series with the filament and battery. Some of the more common type of vacuum tubes are designed and made to take less voltage.

There are several types of rheostats which may be used with the vacuum tube. One of these types is the wire-wound rheostat. This has been widely used, but has many defects. Few amateurs understand its proper use. Sometimes when the broadcast doesn't seem to come in just loud enough he will force the rheostat up a peg or two. He does not realize that a very slight increase in current decreases the life of the tube, and the chances are that it will burn out.

Another defect of the wire-wound rheostat is the method of bringing the filament to its proper operating-temperature. This is done by gradually increasing the current until it reaches the required luminosity. Contrary to popular conception, this is not the proper method of turning on a vacuum tube or any other tungsten-lamp. A tungsten-lamp should be turned on so

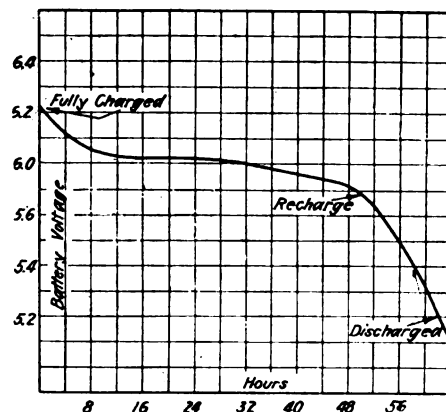
How Mica Is Mined

MICA for diaphragms comes almost exclusively from the Far East. India contributes the most of it, but some is mined in Africa. It is found far under the ground, frequently enclosed by granite or other hard rocks.

When a mica rock is discovered, natives build a fire on it and continue it until the rock is thoroughly heated. Water is then thrown on the heated mass and the sudden temperature change opens up cracks along the "grain" of the rock. Crude wedges are then driven into these cracks and the rocks split apart. The pieces are loaded into native baskets and hauled and dragged to the surface.

Only a small proportion of the mined mica is satisfactory for diaphragms. Sometimes less than one-tenth of one per cent. can be used. To be a success in reproducing sound waves the mica sheets must pass laboratory tests for elasticity, toughness, resistance to heat, high electric strength and transparency.

Mica in itself is not magnetic, in fact its insulating properties are of a high order. To be successful as a diaphragm the mica must be aided by a flat disc of soft iron fastened firmly to the mica at the exact center spot over the magnets.



Schematic chart showing the graph of a battery after the tube has been in operation. Note the difference of the battery voltage as compared to the hours of power consumption. Suggested by Donald Van Wyck. Drawn by S. Newman.

that it instantly flashes to its operating temperature—but not above it! Burning the lamp below this temperature causes the filament to crystallize and break when subjected to slight vibration.

Tungsten, if examined under a microscope, would appear to the eye as a structure similar to a bundle of wires. Tungsten must have that structure in order to make it ductile and strong.

Regarding the amplifier. If you will study investigations you will find page after page about the structure of tungsten and the intricate method of obtaining that ductile structure. You will learn also how the proper structure is lost if the filament is used improperly. Heating the filament to a temperature of 200 degrees centigrade below the proper operating temperature changes the fiber structure of the metal to a block structure. The filament, if examined under a high microscope, will look as if it contained a small train of cubes. The comparison is like the old story of the strength of a bundle of twigs compared to a single stick.

Fortunately we need not worry about all of these changes in the tungsten in our ordinary lamps every time we turn on the light. The question is asked: "Could we use this same idea for lighting the vacuum tubes?"

The problem is a little different. The device used in the power-house is expensive and bulky. But a more simple device is made which bids fair to fulfill the requirements of the radio novice, especially for radio work. The automatic current adjuster dampens the current when it tends to increase, and vice versa. It also permits flashing of the tubes to their proper operating temperature, thus causing the prevailing crystallization of the filament. In other words, it is designed to operate the tubes under proper conditions, irrespective of the condition of the battery or tubes.

With the DX Night Owls

From a Non-Radio-Frequency User

EDITOR, RADIO WORLD: In **RADIO WORLD**, No. 31, dated October 28, I noticed a letter concerning an evening record of reception, by Mr. J. A. Merklein, 7513 Third avenue, Brooklyn, New York, in which his greatest distance was about 800 miles.

I beg to submit for favorable comparison the following record for one evening, most of which was made over an Aeriola Senior set, using an aerial 196 feet, including lead-in, single wire, hung 50 feet in the air, ground on water pipe. Part of this was made on a double circuit, regenerative tickler, using one-stage amplification. A home-made set.

PWX, Havana, Cuba, 820 miles; then followed, in order, WLAG, Minneapolis, 825 miles; WGY, Schenectady, N. Y., 1,026 miles; WGI, Medford Hillside, Mass., 1,090 miles; and at 10.10 p. m., Central Time, I closed with station KDYS, located at Great Falls, Montana, 1,667 miles. I have logged 54 stations, all over 250 miles from Birmingham, and would be glad to compare this record with any other amateur, who is *not* using radio-frequency.

Come on you amateurs, step up and get your feet wet.—Kenneth F. Smith, 133 Francis St., Birmingham, Alabama.

* * *

16 Stations on 80 Degrees of Dial

EDITOR RADIO WORLD: The records I have made in receiving no doubt have been equaled by others with half the radio or audio-amplification; but I doubt if many can equal what I am doing with one detector-tube without any amplification. I built my apparatus, and although I have two steps of audio-amplification which I use with a loud-speaker when I wish to entertain friends, I have been experimenting for some time to see just what can be accomplished with one tube only. Many fans refuse to believe the results of my work, but I have proved it to others who have visited me.

While experimenting on my home-made receiver, I have heard, in the past few months, concerts from over a hundred different stations located in 30 different States of the Union, also Canada and Cuba, 2,250 miles air-line to California, 1,350 miles air-line to Denver, where I get two stations quite regularly. I have heard three stations in Texas—Dallas, Houston and Fort Worth—also WBPA regularly, about 1,150 miles air-line. I get PWX, Havana, Cuba, most every Wednesday and Saturday night, about 1,250 miles air-line. I get all southern and western stations regularly.

All of this has been accomplished on a detector tube without amplification. I have even listened to WOC, Davenport, Iowa—about 575 miles air-line—without amplification or antenna. My apparatus is so finely adjusted that, on a test, (with others present) when weather conditions were good, I made the following record:

In about 20 minutes time, I tuned 5 different stations at 400 meters, 5 different stations at 360 meters and 6 stations between 360 and 400 meters, clean and clear, without any interference. One would hardly think that stations supposed to be at 400 and 360 would vary

that much; but they do according to how I check them up. I got 400 meters at from 20 to 22 degrees, and 360 meters at 14 to 16 degrees, on the wave-length dial of my receiver. It is almost impossible to turn the dial sufficiently by hand, so I use the rubber at the end of a lead pencil to lower the edge of the dial, by twisting the pencil. By this method, I can turn the dial to a hair.

In this 16-station test, after the receiver was adjusted and set for reception of first station, all I had to change for the stations following was the wave-length dial or secondary condenser. Result: 16 stations on 80 degrees of dial.

The foundation of my apparatus is the 3-circuit honeycomb-coil design with some important changes in various places. However, I get results.

At present, I am the official eastern outpost testing station for WSB, Atlanta, Georgia, and we have been of mutual benefit to each other. WSB is one of the best on the air and about the correct distance—550 miles air-line—for good testing. I have used their broadcasting for a standard to build a machine of which I am very proud.—H. S. Rahrer, Box 43, Crafton Station, Pittsburgh, Pa.

* * *

Something to Brag About

EDITOR, RADIO WORLD: The following is of no small moment, and will be of interest to other radio fans, especially those who have broadcast their success through your columns:

I have an MR-6 De Forest, two stages of amplification, a Magnavox, 2-strand antenna 75 feet long and about 25 feet high. Thursday morning, November 9, I received a letter from Harry Davis, playing at the Lyric Theatre, Atlanta, Georgia, asking me to tune in at 400 meters for WBS, Atlanta "Journal," Thursday night November 9, at 11.55, when there would be broadcast a message to me at my home in Hollis, Long Island, and that he would also warble a song for me. If I succeeded in tuning in for WBS the Atlanta "Journal" wanted me to take down the program and immediately telegraph them of my reception. After playing around an hour with local high-powered stations and many long-distance stations, among which were Louisville, St. Louis, Chicago, Detroit, Cincinnati, Indianapolis, Davenport, Milwaukee, Minneapolis, Pittsburgh, Buffalo, Washington, Fort Worth, and many others, finally, at 12:05, I got WBS loud and distinct, but feared it was too late to receive the message that was to be broadcast to me. However, I hung on and, at 12:45 the message came, and the song followed, the program concluding at 1:10 a. m. I immediately sent a night lettergram diagnosing the program and messages broadcast to Panama, Kansas City, and other places, as proof of my fine reception and, the following night, the result was broadcast by radio and published in the press.

Saturday night, November 4, I received, loud and distinct, a program from PWX, Cuba. Have had several stations in Texas several times. My set is most sensitive. I have received the voice 3,000 miles and have had France and Germany on code. With the additions I am making, I fully expect to receive the human voice from across the ocean in the near future. One advantage I have, I am able to tune out all static. I did this during the summer. I am able to tune out

all nearby high-powered stations for the reception of long-distance programs.—L. R. Ault, Seminole Avenue, Hollis, Long Island, New York.

* * *

Hears Denver in Maine

EDITOR, RADIO WORLD: Sometime last May, I forget the exact date, a local amateur operating a Westinghouse R-C set picked up part of a concert broadcast from the Reynolds Radio Company, Denver, Colorado. I consider this quite a record as the conditions were only normal and the transmitter was not of very high power.—Maxwell K. Murphy, 2 Orange Street, Eastport, Maine.

* * *

DX without Antenna

EDITOR, RADIO WORLD: I state here with what I believe is a record for long-distance receiving, without using some form of antenna.

On the evening of November 2 while listening to a fine number from WBAP, rendered by the Oil City Jazz Band, I had considerable interference and decided to close the station for the evening. Not thinking, I disconnected my antenna before cutting off the battery circuit. I was somewhat surprised to find that WBAP's program then came in exceptionally good. This brought on some experimenting and I found that I could easily tune in stations WHB, KSB, WGM, and WBAP.

On the evening of November 3, the experiment was repeated and I tuned in the following stations, WGM, WDAF, WWJ, KDKA, WSB, WHB, WOC, WHAS, KSB, and WOS.

My set is a simple home-made affair with U-V 200 detector and two stages of audio-frequency amplification.

This information is positive and I am ready at any time to produce my witnesses or repeat the experiment.

In order to ascertain whether or not the set was in any way connected with the antenna, I disconnected all wires, moved the set ten feet from any outside wires and the results were the same.

I would be glad to have your opinion on this matter, and will also be glad to hear from any other station that can duplicate the feat.—E. M. Pace, 423 Farmer Street, Vicksburg, Mississippi.

* * *

A First-Night Record

EDITOR, RADIO WORLD: With the hook-up suggested by Mr. W. Miller, as published in **RADIO WORLD**, I have received, very clearly, KDKA, WEA, and all the Philadelphia stations. This has been accomplished with a hurried hook-up without soldered joints. Also, I have had no trouble tuning out stations from 360 to 400. I think that with using a vernier condenser, I will get much better results. I accomplished the above the first day I hooked-up, using only old material I had around.—R. L. Jones, jr., Lanerch, Pennsylvania.

* * *

On Detector and One-Step

EDITOR, RADIO WORLD:—I have noticed Mr. Merklein's claim of a record for receiving. On a detector and 1-step of my own make, I have received such stations as KDKA, Pittsburgh; Louisville, Kentucky; WOC, Davenport, Iowa; the Sweeney Auto School, Kansas City, Missouri; KYW, Chicago; WSB, Atlanta, and, also, on October 29, at 10.30, I heard a station call letters ending with X, Havana, Cuba.—E. Garbutt, 56 Clark Street, Stapleton, Staten Island, New York.

Radio and the Woman By Crystal D. Tector

"DON'T be late with your 'copy' for our issue of November 25th," the editor of RADIO WORLD wrote me the other day, and as I looked at the date on his missive, I was somewhat startled. "That means that Christmas is only a month away," I said to myself.

Only a month away—just thirty days more and the glad season with all its blessings and happy burdens will be at the peak of its celebration. And I must frankly admit that I haven't made a single thing—either with knitting needle or sewing machine—things that women usually start early in fall and seldom finish—and I am not worrying.

The popular slogan, "This is a radio Christmas," I have nailed to my door. There is going to be a big surprise in store for Friend Husband, however. Heretofore, I have given him cigars and neckties; but, this year, I intend to present him with a new radio set—because I want another set so very badly myself! When he sees it in his stocking, he will frown and say a few things under his breath; but when I explain that I need this new set because I am intending that my present layout shall be used exclusively in a little country bungalow we are fitting up for summer, he is going to be perfectly satisfied and congratulate himself on having so clever a wife.

At any rate, I say to all mothers—and all fathers, too—if you do not know what to give your boys and girls this Christmas, do not overlook radio. Get them interested. It will keep them home. It will educate them. It will bring them the proper sort of friends. It will fascinate them. And a radio set is something that is not played with for a few days or weeks. It is something that one will grow more interested in as time passes—something one will want to improve and study and make a part of his very life.

I have already helped a number of mothers who are planning radio sets or parts as Christmas gifts—and I cheerfully offer my services to any others who may be in need of information regarding prices, just what to buy, the why and wherefore of different radio elements, why certain things are needed for certain sets—and so on. I have made a very thorough study of all things pertaining to radio, of all the different goods on the markets; and I have even read about every book on radio that has come from the press. So, I feel, I am in a position to help you this Christmas—and I offer my services cheerfully.

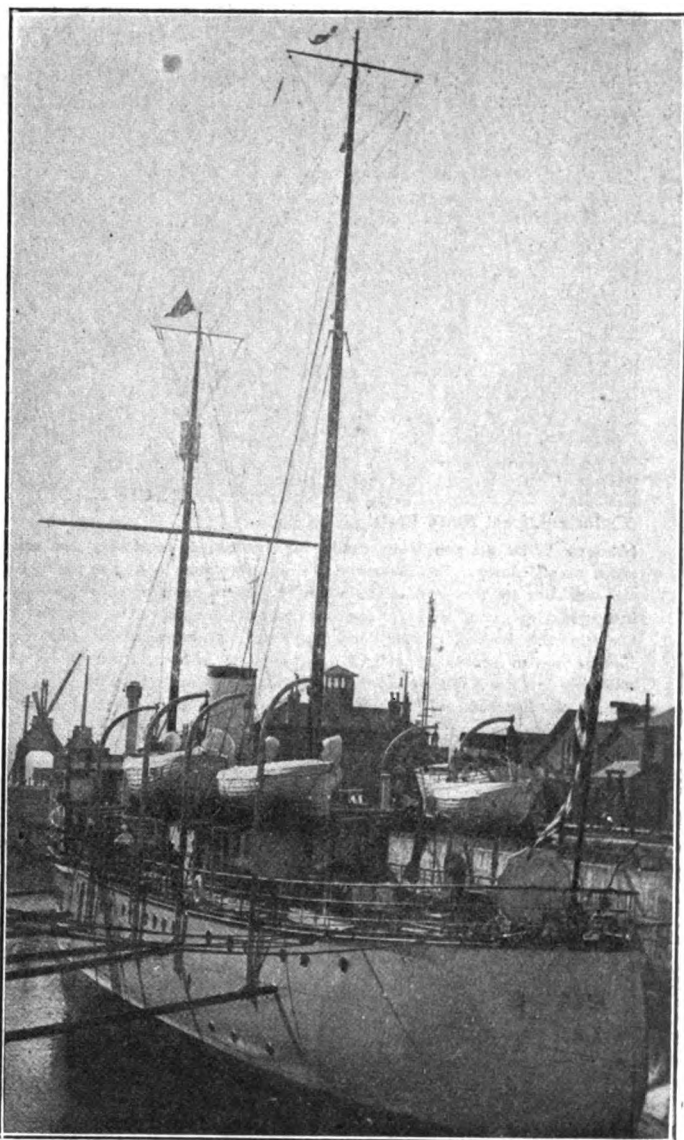
Whoever thought of the slogan, "This is a radio Christmas," hit on a happy idea; but I would rather have said, "This is to be the first radio Christmas." You will find that the Christmas of 1923 and the Christmas of 1924 and every Christmas thereafter will be even more radio in atmosphere. Next year will be more remarkable from a radio point of view than this year. And radio will continue to grow and grow until it becomes so much a part of our lives that we will not be without it under any circumstances. When grand opera and baseball and football and every big public event is as accessible by radio as it is through the daily press, only the people who are behind the times will be without it.

And I want to tell you all that I heard the broadcast of "Aida," by the Metropolitan Opera Company and orchestra. All I can say is that if I had shut my eyes, I would have imagined myself in the "golden horseshoe" of that favored place. The rendition lost none of its beauty coming over the ether. In fact, it seemed to me that it was particularly beautiful. Everything—from the deep diapason of the bass instruments to the thrills of the soprani and the birdlike notes of the flutes—came through with wonderful charm. A woman friend whom I had invited to listen in, who had never heard a grand opera in her life, was thrilled almost to tears. She never could have afforded the price of an admission, and for the first time in her life, her deep-rooted love of music was partly satisfied.

Miss Mary T. Jackson, of New Orleans, writes me to advise her regarding C batteries for radio-frequency. After reading her letter carefully, I will ask her to read my answer herewith just as carefully.

Do not interfere with the set that is giving you such good results unless it is to add another stage of radio-frequency. The 201 tubes should be used for the amplifying circuits and the 200 tube only in the detector. C batteries are not used in radio-frequency, as the job of putting a negative potential

"Ara," Most Elaborate Radio-Equipped Vessel Afloat



(C. Kadel & Herbert, N. Y.)

The "Ara" played her part in the World War in the French navy. Later she was purchased by Mr. W. K. Vanderbilt, of New York, refitted from stem to stern, and is now ready for a long cruise in the South Pacific Ocean. Perhaps the most important part of her equipment, however, is the elaborate radio apparatus which Mr. Vanderbilt installed regardless of cost. This yacht, now flying the American flag, is more thoroughly equipped for radio transmission and reception, it is claimed, than any other vessel afloat—more so, even, than Senatore Marconi's famous "Electra."

on the grid of the amplifying tube is taken care of by the potentiometer across the A battery. In radio-frequency amplification there is no step-up ratio in the transformer. The primary and secondary are of the same number of windings. The transformer merely passes along the amplified output of one tube to the next tube of the further amplification.

Whisper! The editors let me have a peek at the Christmas cover for RADIO WORLD, the other day. It is a beauty—warm and cheering and full of the radio-Christmas spirit. You must not miss it. The big Christmas number will be out on December 9.

Latest News-Ph Week

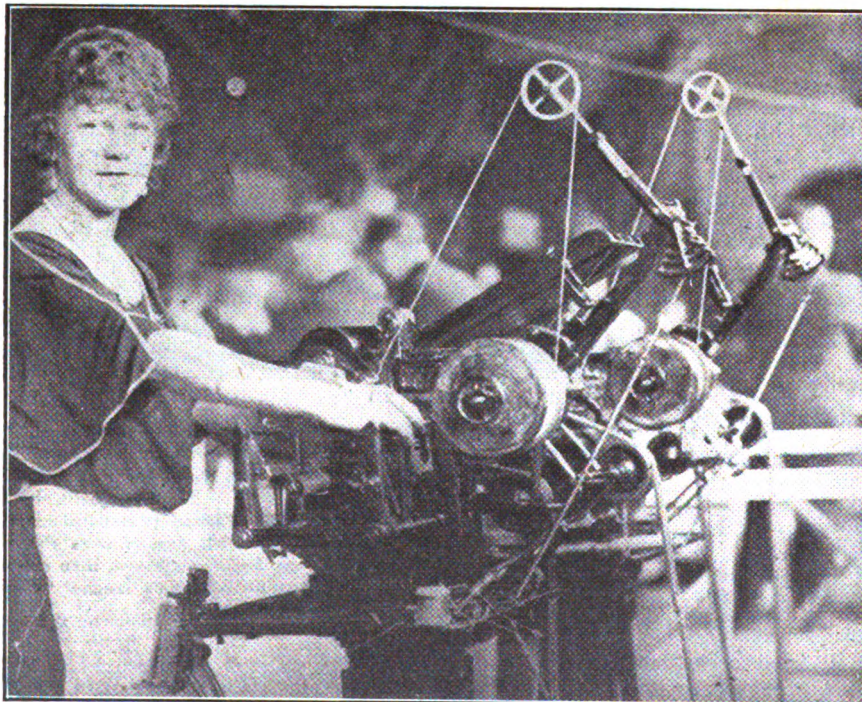


(C. International News Reel)

(Above) With no provision made for tuning, a receiving set must, perforce, be of a low order of efficiency. Furthermore, all signals come in at the same time, if several transmitters are working in the immediate vicinity. Such receivers are possible, but are never brought into practical use, due to the fact that they have no means of controlling the wave-length. Usually the beginner starts off with an arrangement of this sort. In the accompanying illustration, a receiving set of this type is shown, built on a rubber heel. It employs a mineral detector, with outdoor antenna and water pipe as ground. It was constructed by George E. Johnson, of Minneapolis, Minnesota, at a cost of \$1.35, exclusive of the receiver. Mr. Johnson claims that he can receive with this make-up within a range of about ten miles.



(C. Kadel & Herbert)



(C. International News Reel)

(Above) One of the most important elements in radio is the inductance coil and the transformer. These instruments make it possible for us to hear the long-distance transmitting stations. Due to the many fine wires in the transformer, it is necessary that they be wound with absolute correctness. By hand would be a tedious and tiresome job. In the photograph, a machine is shown by which Miss Alma Stark winds the transformer or inductance coils. Note the spools of wire at the right of the machine. These spools of magnet wire are of two different sizes—one is of a coarse size, which makes up the primary winding; the other is of a finer wire, used on the secondary. Transformers, due to their peculiar winding, must be given the utmost care in their manufacture, as one error in winding will cause the transformer to function in an unsatisfactory manner.



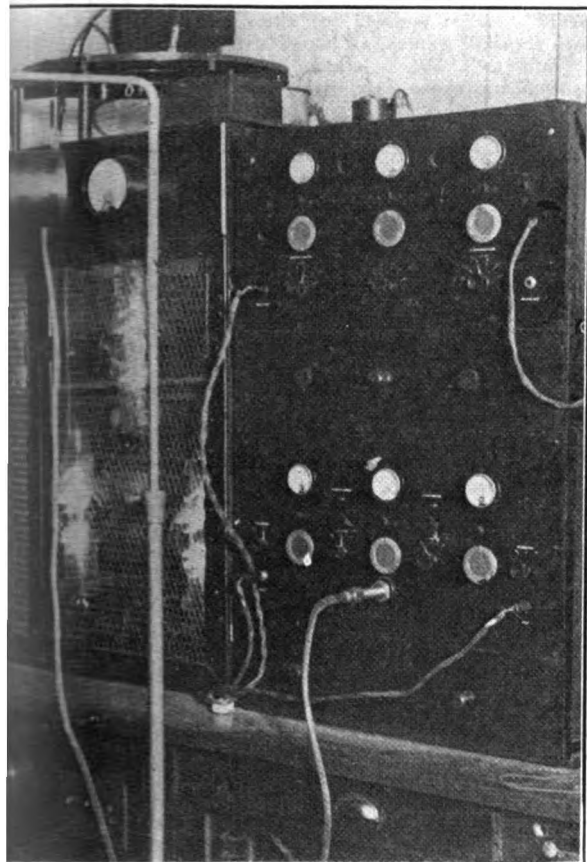
(C. P. & A. Photos)

(Above) Dr. Royal S. Copeland, who, on March 4, 1923, became State Senator from New York, is a radio enthusiast. He is in the photograph giving his son, Royal S. Copeland, Jr., a lesson in radio.

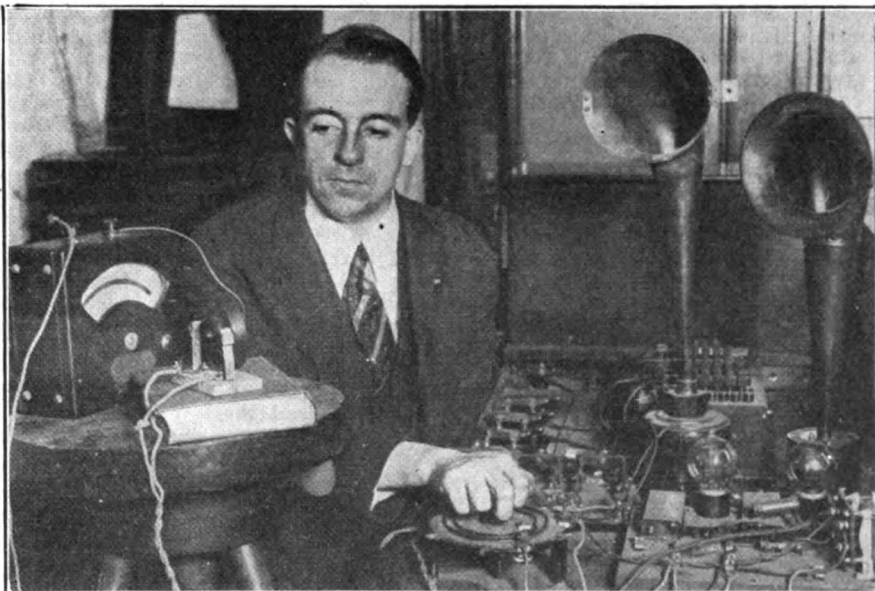
Photos of a Busy in Radio



(C. Kadel & Herbert)
 (Above) Reverend Francis Duffy O'Laughlin, of Fordham University, New York, is one of the original radio fans of the United States. He believes that the future of radio is unlimited. He early saw the great possibilities of the new science and it is largely due to his efforts that Fordham University possesses so elaborate and perfect a radio equipment. It was one of the first universities to use radio in broadcasting and receiving, particularly athletic events. During the football season, it has proved that radio is the long-looked-for necessity in disseminating news of important games. The photograph shows Reverend O'Laughlin seated at the Fordham radio-receiving station.



(Above) This photograph shows how phonograph music is picked up and broadcast by microphone and broadcast. It is part of the radio equipment of station WJZ, Newark, New Jersey. This equipment, together with the skill of the operators there, is responsible for the great distances it covers and the quality of its transmissions. This photograph shows operator George E. Oliver broadcasting a phonograph selection and gives a good idea just how it is accomplished. The sound leaving the phonograph horn is picked up by the microphone, then carrying it into the modulator, shown on the right. From there it goes into the speech amplifier, shown on left of modulator, and thence to the aerials.



(C. Kadel & Herbert)

(Above) Testing the quality of loud speakers by means of the latest equipment, that photographs defects. To test the quality of loud speakers an elaborate layout of scientific apparatus is necessary. The photograph shows how this testing is done at Columbia University, New York. J. G. Aceves, research engineer, is testing the quality of various loud-speakers for manufacturers. The sounds produced by loud-speakers is picked up by the small special-type microphone shown, then the microphone passes these sounds on to the oscillograph, where these loud waves are photographed. The slightest distortion or any other defects will be shown.



(C. Kadel & Herbert)

(Left) Former service men become radio experts at free radio school. The radio school of the Knights of Columbus, New York, has over a hundred students, the majority of whom are ex-service men. The photograph shows one of the radio classes receiving instruction in wiring a Marconi receiver. The men are taught how to operate and build all forms of radio equipment.

ness United
 towns in the
 in radio.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

OVER fifty stations have qualified in the final tests between this country and Great Britain beginning December 12. When reports from the outlying districts have been received over a hundred contestants will be enrolled. A number of stations have already been logged by British amateurs, confirmation reports having been made on stations 2 HJ, Harold Hasbrouck, Port Chester, N. Y., and 2 ZK, George Cannon, New Rochelle, N. Y., and it is expected that many others will be confirmed. From the results obtained so far, and from the interest shown in the preliminaries, it is certain that the coming tests will comprise the greatest amateur event in radio.

A lighthouse station on the Maine coast reported to the district office by telephone that a large can buoy had broken adrift and was moving away. A radiogram was sent to the tender working on buoys, a few miles away. The buoy was recovered and returned to its place before sunset. Radio saved the buoy and probably a day's steaming of the tender. It also safeguarded shipping by promptly replacing the buoy on station.

Dr. Charles P. Steinmetz, research engineer of the General Electrical Company, running for engineer and surveyor of the State of New York, on the Socialist and Farmer-Labor tickets, polled a surprisingly large vote in the recent election. In the midst of a Democratic landslide, supposed to be unfavorable to "scratched" tickets, he polled 207,000 votes, 144,000 more than the candidate of his own party for governor. Dr. Steinmetz did not leave his laboratory to make a campaign. He spent no money. He lost the election, but the large number of votes he received indicates the value placed by men and women on sheer ability. He is one of the most distinguished inventors, scientists, engineers and radioists in the world.

Dr. S. W. Stratton, for twenty-one years the director of the Bureau of Standards, has been elected president of the Massachusetts Institute of Technology, in Boston. This institution will give a four-year course in radio engineering, and is the first college in the country to inaugurate such a course in that branch of engineering.

WGY will tell the story of the Harvard-Yale game, at New Haven, by means of a telephone line running from the press section of the Yale bowl to the transmitting equipment of WGY. Mr. William McGeehan, sporting editor of "The New York Herald," will describe the game. You will hear his voice and his description will be literally on the heels of the runner, his voice will be on the ball as closely as the eyes of the players. In addition to the speaking microphone into which Mr. McGeehan will pour his story, one microphone will be placed in front of the Crimson cheering section and another in front of the blue. At intervals during the game, the cheering section microphone circuits will be switched on and the radio audience will get the atmosphere of the big game.

Radio's Big Place in World

Dr. Lee De Forest Says It Is Now an Absolute Necessity in the Home.

ALL radio enthusiasts may well take pride in the fact that the present tendency in the radio field is away from the amateur experimental stage," said Dr. Lee De Forest in his greeting to the Boston Radio Exposition. "The reason for this is plain. In the short period of less than one year since radio has taken hold of the American public, we have seen a most remarkable acceptance of radio as a means of communication. This acceptance on the part of the American public is nothing short of marvelous. Science has again demonstrated in radio that it can perform miracles for the benefit of the human race.

"Radio has enriched the lives of countless thousands who are not in a position to attend concerts and operas in the leading centers of the country. Radio,

however, has gone far beyond the province of the amusement stage and will, I venture to say, go down in history as one of the few revolutionary devices bringing happiness and joy to countless millions in the way of educational instruction, entertainment and as a means of distributing the news of the world to the people in their home."

Marvelous Developments Include Radio

Navy Communication Service Handled 3,750,000 Words by Radio Last Year.

AERONAUTICS and the radiotelephone are, perhaps, the most marvelous developments of a marvelous age," said Rear Admiral William A. Moffett, chief of the Naval Bureau of Aeronautics, U. S. N., speaking over the radiophone from NAA, Arlington.

Admiral R. E. Coontz, chief of operations, who broadcast a speech in the

"The New York Herald" radio reports of the Harvard-Princeton, Yale-Princeton football games, as broadcast through the General Electric Company's WGY station, were heard clearly and greatly enjoyed by radio fans over a wide area in the East. The "Herald" received a number of congratulatory telegrams from a wide range of territory. The Brompton Pulp & Paper Co., Sherbrook, Quebec, wired: "Details of game very much appreciated."

Perfection of apparatus for insuring the secrecy of radiotelephone and radiotelegraph messages was claimed recently for a French electrical engineer, Edouard Belin. The apparatus is called "radio-cryptotele-stereographe," or "crypto-telestereographe," according to whether it is used for radio or the ordinary telegraph. The instrument is different from Marconi's to direct waves to a given point. It resembles a safety-lock. Sending and receiving instruments, each of which consists of six concentric disks, are perfectly synchronized. The disks each contain a notch and may be moved at an angle in relation to each other. A lever falling into the disks causes rotation of the cylinder and valves a given space between the notches to reproduce the message, which is received according to a code analogous to Morse's, but is reproduced in letters and figures. To keep listeners-in from deciphering the values used between stations, a simple arrangement is added whereby false signals, which do not affect the cylinders, but which cannot be distinguished by outsiders from real messages, are being constantly sent when the instrument is not in use.

The Chicago Opera Company has decided to broadcast its productions.

Leading scientists of Norway propose to install a series of radio observation stations around the North Pole so that the air currents from the polar regions may be followed and the centres of conflict with the warm southern currents determined. Such polar outposts would be of great importance when a regular daily weather forecast becomes necessary for the North Atlantic in connection with aviation service from Europe and America.

Radio messages were sent by automatic machinery at a rate of between 80 and 100 words a minute by the White Star liner Majestic to the station of the Radio Corporation of America, at Chatham, Massachusetts. This speed is about four times as fast as ordinary operators can send and receive, while the greatest speed made by the most expert senders is about thirty-five words a minute. The speed is nearly as fast as that at which messages may be sent by wire, and may open a vast new field for usefulness. The value of radio in handling transcontinental and transatlantic news has been reduced by the slow pace at which messages could be sent, but this new device, it is expected, will obviate this.

interests of the Marine Exposition in New York, said that among its activities the Navy Communication Service handled 3,750,000 words by radio for the American Merchant Marine in the past year.

"During the winter months," he said, "the Naval Communication Service handles on an average of thirty SOS distress calls a month, or one a day." That the value of this service to the American public as a whole, and to shipping interests in particular, cannot be over-estimated, he insisted.

He also mentioned the developments of the radio compass, or direction finder, and stated that the Navy has established stations equipped with this apparatus at various points along both coasts of the United States near the entrance to harbors. When a ship is approaching one of these harbors in a dense fog and is uncertain of her position, all that is necessary for her now to do is to ask two or more radio compass stations for her bearings.

Latest Radio Patents

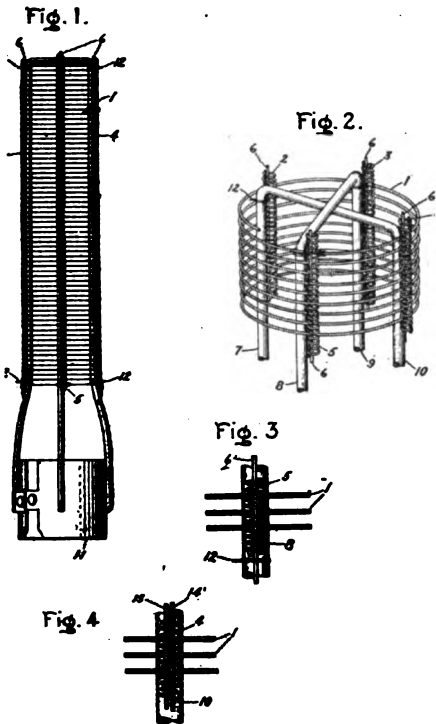


Figure 1 is an elevation of a complete grid electrode of the invention of Mr. John H. Payne; Figure 2 is an enlarged perspective on one end thereof; Figure 3 is a still further enlarged detail view of a small portion; Figure 4 is a detail view of a modification.

Grid Electrode Structure

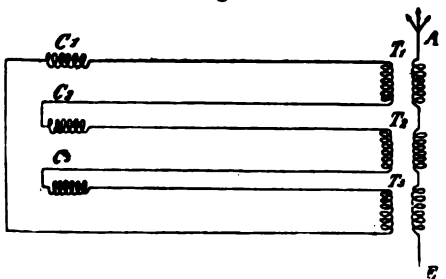
No. 1,432,411. Patented, October 17, 1922. Patented: John H. Payne, Schenectady, N. Y.

MR. PAYNE'S invention is, in simple terms, a structure for a grid electrode made of a large number of turns of wire of small diameter which will be self-supporting, and which will be so arranged that adjacent turns of the wire will be maintained in desired spaced relation to one another. In such a structure there will be no necessity for welded joints between the different elements for maintaining them in their proper spaced relation.

Radiotelegraph Coupling

No. 1,432,438. Patented, October 17, 1922. Patented: Joseph Bethenod, Paris, France.

MR. BETHENOD'S invention relates to an improved system of coupling between radiotelegraphic communication and a high-frequency alternating-current generator of the type of those susceptible of furnishing directly a current necessary for feeding the antenna. This station comprises in combination a high-frequency alternator in which the armature winding is divided into sev-



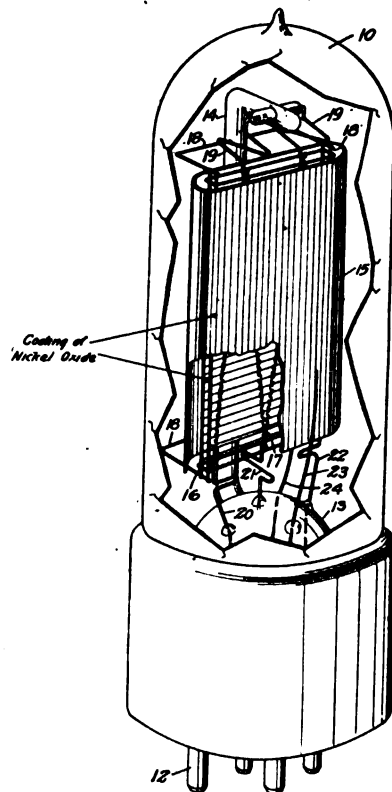
Schematic diagram of Mr. Bethenod's radiotelegraph coupling.

eral Sections not comprising any direct electric-connection between them, and a complex of transformers magnetically independent of one another; the number of transformers being equal to that of the sections of the armature. The primary windings of the transformers are inserted in series in a circuit alternately with the sections of the armature, and the secondary windings of these transformers are connected to the transmitting antenna in a suitable manner.

To Increase Discharge

No. 1,432,867. Patented, October 24, 1922. Patented: Mervin J. Kelly, New York, N. Y.

MR. KELLY'S invention is to increase the amount of power which may be applied to an electron discharge device while still keeping within the safe limits of temperature under which the electrodes can function; to eliminate the objectionable effect which is sometimes produced in electron-discharge devices, namely "blocking," which is caused partly, at least, by undesirable secondary emission from the grid; and to eliminate the effects upon the operation of



Mr. Kelly's invention comprises a preferably evacuated bulb to which the usual base portion is attached. This base portion provides a support for suitable terminals.

electron discharge devices which the lodgement of particles of the filament coating upon the grid have caused.

An important feature of this invention comprises the provision of a black coating on the electrodes of electron-discharge devices, particularly the plate and grid.

Electron discharge devices have been deficient in their operation in one respect because only a limited amount of power could be handled by them without heating the electrodes beyond a safe temperature. By increasing the capacity of the electrodes to radiate heat faster, we can increase the power applied and still keep the temperature within safe limits.

No Wireless Receiving Set is complete without



MAGNAVOX products are designed in our own laboratories and manufactured in our own factory—greatly extended in size during the past few months.

The Magnavox Power Amplifier has been designed for use especially in connection with the Magnavox Radio, and its use greatly increases your range and signal strength.

Every owner of a Magnavox Radio should also add the Power Amplifier Model C if he has not already done so.

R-2 Magnavox Radio with 18-inch Horn

FOR those who wish the utmost in amplifying power; for large audiences, dance halls, etc. Requires only .6 of an ampere for the field.

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Type R-3 Magnavox Radio with 14-inch Horn

THE same in principle and construction throughout as Type R-2, and is ideal for use in homes, offices, amateur stations, etc.

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INSURES getting the largest possible power input for the Magnavox Radio. Can be used with any "B" battery voltage which the power tube may require for best amplification.

AC-2-C, 2-Stage..... \$80.00

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Answer to Readers

CAN a small dry-cell tube be used as an amplifier. If so, will the regular amplifying-transformer function with it? Can such a tube be used in the Armstrong super circuit?—Joseph Mulacaha, Omaha, Neb.

This tube is called the aeriotron dry-cell vacuum tube and may be used as an audio-frequency amplifier; but it cannot be used with radio-frequency or the Armstrong super circuit. In employing this tube for audio-frequency amplification, the regular standard amplifying transformers may be employed. This tube will stand up under a plate voltage of 45 volts. Its filament operates on a single dry-cell, such as is used in an ordinary door-bell.

In a two-wire antenna, how far apart should wires be separated by the spreaders at each end. Are they joined at each end or only at the lead-in end? Can radio- or audio-transformers be put into a crystal circuit with satisfactory results?—Jacob Murs, Bayonne, N. J.

About two or three feet is the correct spacing for the wires. They should be joined only at the lead-in. Radio- or audio-frequency amplifying transformers are useless in a crystal circuit.

What is the best pair of phones to be had at a price not exceeding ten dollars? Can a pair of 2,000-ohm phones be used with any set?—Albert Murphy, Philadelphia.

It is impossible for this department to discuss the relative merit of the various competitive makes of radio instruments.

Is a loop aerial all right for a crystal set? Will it prevent interference? Which condenser is best for receiving, 43-plate or 23-plate?—Arthur Horn, Philadelphia.

The loop antenna will not give satisfactory results on a crystal set unless the set is located near a broadcasting station. Loop aerials, when used with vacuum tubes, have the marked advantage of eliminating interference. Either the 43-plate or the 23-plate condenser may be used, although the latter will permit of finer tuning. The 43-plate condenser has the greater capacity.

Will you advise me what to do with my variometer set? I cannot get any signals, only a lot of screeching and howling. Enclosed you will find my hook-up?—Anxious.

The only change that may be suggested is to place the rheostat in the positive side of the A battery and join both negatives of the A and B batteries to the return lead from the secondary of the vario-coupler. In order to make this change, all that is necessary is to simply change the connections of your storage battery, leaving the set wired as it is. If you have the set wired up, exactly, according to your diagram, with this one exception, there is no reason why you should not hear signals. Are you sure you have the positive terminal of the "B" battery jointed to the plate of the vacuum tube?

If a radio-frequency transformer is enclosed in a metal covering which is grounded, would it prevent induction received from the transformers of the set and the coils used?—Harry Starr, Duluth, Minnesota.

In a case where a radio-frequency transformer has an iron core, it should not be necessary to shield it in the manner you suggest. If an air-core transformer is employed then the various steps must either be very widely spaced or some shielding arrangement made. The shield, however, must

be perfect, or it will possess undesirable capacity effect.

Is the enclosed hook-up of a 2 vario-meter, 1 vario-coupler set correct? What would be the wave-length range and receiving range of such a set? Are the 23-plate or the 43-plate condensers better? Would it be all right to hook a loading coil in series with the antenna of such a set; or, is it necessary to load the secondary also? Can a 3step amplifier be later connected to the set?—Julius Hemmer, Albany, New York.

The hook-up is correct; but as you do not give us details as to the windings, we cannot tell you the wave-length range. However, such sets usually tune to about 600 or 800 meters with the average antenna. It is impossible to tell the receiving range of any outfit. The smaller the variable condenser, the more accurate the possible tuning; although, in your case, we would recommend a 43-plate condenser in the primary circuit and no condensers in the secondary circuit. You must load both primary and secondary simultaneously; but loading is not satisfactory with this type of set. An amplifier may be connected later to the phone terminals.

Where may I obtain a list of calls of the various stations?—Austin Foote, Tenafly, N. J.

Write the Government Printing Office, Washington, D. C., enclosing a money order for 15 cents.

I have a two-stage regenerative set with

His First Concert



(C. Photopress, N. Y.)

a hundred-foot aerial. I was receiving WOR wonderfully. By disconnecting the tuner and replacing it in its original position, previous signals were not so loud. What is the reason for this?—Grenville Moller, Tonawanda, N. Y.

This is the old story of fading. It is a condition which cannot be controlled. It generally happens when signals are loud. This paralyzes the tubes, making the signals weak. Shut' down the set, allowing the tubes to recover, and experiment again.

If U-V 201 bulbs are used on the super-regenerative set, what adjustments are required?—Joe Poli, Kew Gardens, N. Y.

If you use U-V 201 tubes in place of the 202 tubes, it will be necessary for you to cut down the necessary amount of plate voltage. In this event, we suggest that 80 volts be used on the plate circuit of the first two tubes, and 120 volts on the plate circuit of the second tube. No other change is necessary.

With reference to the Armstrong super-regenerative circuit, how many coils of wire are used on the vario-coupler primary for 360 meters? How many on the secondary of the coupler? How does the loop connect itself to the coupler?—Paul Remmeler, Poughkeepsie, N. Y.

Any standard vario-coupler with a wave length from 150 to 500 meters will answer the question. The only difference being that you will have to put twice as much wire on the secondary. The two leads from the loop aerial should be fixed to each end of the vario-coupler. The tuning of the loop is then obtained by means of varying the condenser, which is placed across the loop and the vario-coupler; and, also, if necessary, by placing the attaching clip on the lead at different points along the outside wire.

Is a loop aerial all right for a crystal set? Will it tend to prevent interference? Which condenser is best for receiving sets—the 43-plate or the 23-plate?—Kenneth Kiefer, Mineola, L. I.

The loop antenna will not give satisfactory results on a set employing the crystal, unless you are very close to a broadcasting station. The loop antenna will eliminate much of the interference. Either the 43-plate or the 23-plate may be used, although the latter will permit fine tuning when placed across secondary of vario-coupler. The 43-plate is used in series with antenna.

I wish to construct a crystal receiving set employing a double-slide tuning coil, a variable condenser in the aerial lead-in with a fixed phone-condenser. It is desirable that the coil be as short as possible, but long enough to insure the reception of 400 meters. Assuming a properly installed aerial, 100 feet long with a 30-foot lead-in, what should be the diameter of the coil and how long the winding? Would a coil wound on a solid wooden block be as efficient as one wound on the regulation cardboard tube? If so, would a coil wound on a flat wooden block of equal circumference be equally as efficient?—John Matheus, Huntington, N. Y.

Your coil should be about 2½ inches in diameter and wound for 3 inches of its length with No. 22 wire. A solid core is not as efficient as a hollow core, as solid cores cause dielectric losses. A coil is almost efficient when it is round and, therefore, a flat wooden block is much less efficient than a round one.

Is it possible to use a very small coil with a condenser to increase its wave length? Why is this not done more frequently?—George F. Rye, New Bedford, Mass.

In receiving work, it is advisable to have a preponderance of inductance, as a maximum of efficiency is obtained when the voltage is greatest; and the greatest voltage is obtained across a coil rather than across a condenser. Therefore, it is advisable to use as little capacity as possible.



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BUILD YOUR OWN. This marvel of mystery, using no aerial, no loop, no ground, brings in music instead of static showers. We consistently hear concerts on Magnavox, from stations 550 miles distant, audible 100 feet from horn. The simplicity of this set will surprise you. No radio frequency. Complete instructions with photo of circuit sent prepaid for 65c.
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Variometers with dial, \$2.38
Variocouplers with dial, \$1.88
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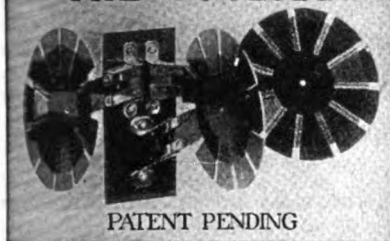
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Major _____, Halifax, N. S., writes: Delighted. Received Shenectady clearly on one tube first time I tried the GOODMAN. Would have saved trouble and money by buying months ago.

MO, New Radio Craft

Test of New Radio-Equipped Naval "Spotting" Plane Made At Cleveland.

A NEW Naval "spotting" plane equipped with a recently perfected radiotelegraph set was tested officially before a board of Naval officers at Cleveland, Ohio, November 15. The plane is a three-seater, designed for observing and reporting to ships in action the fall of shells and their distance from the enemy ship or target. It is the first of several newly developed spotting planes designed for Naval work and was built by the Glenn Martin Company.

One of the most important features of the "MO," as the craft is designated, is its radio equipment, which is said to especially meet the requirements of instantaneous and constant communication by radiotelegraph between the spotters and the flagship, where the fleet gunnery officers and the admiral control the fire, or to individual ship's gunnery officers if the fire is controlled separately.

Only general information regarding the Navy's spotting radio sets is available, but it is known that the sets so designated are modern tube telegraph sets operating on continuous wave, and having excellent characteristics for range and reliability. They are especially rugged in their construction and guaranteed to "stand up" better than the ordinary radioplane sets. Power and range are withheld, but it is understood that they will transmit 300 or 400 miles. Satisfactory communication is assured, even though a great number of planes are sending messages at the same time.

The power is generated by a wind-driven generator with a self-regulatory fan giving constant revolutions at all air speeds, so as to furnish the tubes with a steady voltage.

Progress in Electricity

From Data Compiled by the Society for Electrical Development

GENERATING CAPACITY OF CENTRAL STATIONS	
Year	Horsepower
1902	4,000,000
1907	9,000,000
1912	17,000,000
1917	30,000,000
1920	47,000,000
CENTRAL STATION REVENUE	
1914	\$336,980,000
1915	360,000,000
1916	436,000,000
1917	526,886,408
1918	664,850,000
1919	773,650,000
1920	922,300,000
1921	931,000,000

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Grand Central Palace
New York

December 21st to 30th

(Sunday excepted but Christmas Day included)

This first really comprehensive Exposition to be staged in a manner worthy of a great industry includes such representative exhibitors as:

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- National Carbon Company
- C. Brandes, Inc.
- Sloper Radio Company
- General Insulate Company
- Executive Radio Council
- Coto-Coll Company
- Western Electrical Instrument Co.
- American Radio Relay League
- Stromberg-Carlson Mfg. Co.
- Holtzer-Cabot Company
- Clapp-Eastham Company
- Dubilier Condenser Company
- DeForest Radio Telephone & Telegraph Co.

All of the above and other leading manufacturers have contracted for space and many more are at present negotiating for representation. The opportunity to display Radio products to thousands of buyers during the holiday season is an unusual one. The exposition will be one of New York's big features in connection with National Radio Week.

For further particulars write or wire

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Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and exhibitions. Keep us posted by mailing full information.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31. Colwell & Korbell, Fisk Building, New York City, directors of publicity.

INTERNATIONAL RADIO SHOW, Madison Square Garden, New York City, November 20 to 25, inclusive. E. C. Buchigani, director of publicity.

SOUTHEASTERN RADIO EXPOSITION, Auditorium Armory, Atlanta, Georgia, December 4 to 9, inclusive. Co-operative Radio Sales Assn., 205 Peachtree St.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

A Loud-Speaker Crystal Set

THE Steinmetz Wireless Manufacturing Co., of Pittsburgh, claims to have perfected an amplifier for crystal receiving sets which possesses the added advantage of requiring no storage battery.

This amplifier may be used on any crystal set. It is sold in convenient units so that one, two, or three stages of amplification may be added when necessary. These units use a "peanut" tube requiring only a single dry-cell instead of the usual storage battery.

To insure against interruption in the operation due to cat's whisker not being on sensitive point, the manufacturer provides an ultrasensitive crystal which, he claims, makes interruption almost impossible.

Eisemann Magneto Line

THE Eisemann Magneto Corporation announces a line of radio parts designed to suit the most critical. Each part has points of originality that separate it from all other products now on the market. Ready for delivery are vario-couplers, variometers, variable condensers with verniers, audio-transformers, sockets, and phones, each made to the highest standards.

A feature of the panel parts is the concave bridge-dial which eliminates all protruding knobs, and acts as a shield. Switch points and levers are eliminated with the vario-coupler. All molded parts are of genuine bakelite highly polished.

This line may be had through Clark & Tilson, 1 East 42nd street, New York City, who are prepared to supply descriptive matter for each part. The prestige of the Eisemann Magneto Corporation is guarantee that its articles are the standard of quality.

Outcasts!

THE radio manufacturer of lesser magnitude who would succeed should advertise—after he has assured himself that he has a product worth advertising, says "The Mail," New York. The last two months of merchandising experience has shown that the buying public is insisting upon the products of the better known manufacturers. *The product without a name is rapidly becoming an outcast.* All of the big department stores are carrying only apparatus that has established itself in the mind of the public.

This is a very healthy indication. It shows that the radio industry is fast reaching rock bottom. It is actually starting to gather the prestige that it

deserves. In another six months' time, many of its ills and sores will be cured.

During the past few months, capital has flowed out of the radio field almost as fast as it flowed in last spring. That is also a good indication, for the get-rich-quick artists have been shown that radio is more than a match for their wits.

U. of I. Gets Busy

THE University of Illinois has opened its fall season with broadcasts on Monday and Thursday nights from 8.30 to 9.15. Its station, WRM, is operated by the electric engineering department.

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Wilmac Electric Corp., Queens, \$5,000; J. J. McFarlane, Mr. Williams, A. Schichowsky. (Attorney, M. Friedberg, 116 Nassau St., New York.)

Fremont Radio Sales Co., Manhattan, \$5,000; E. and S. and H. Nagler. (Attorney, J. D. Nussbaum, 84 Rivington St., New York.)

Educational Radio Corp., Del., 3,000 shares common stock, no par value. (Representative, D. Freeman, 342 Madison Ave., New York.)

Let Radio World Test Your Goods

MANUFACTURERS, send a sample of your goods to our Technical Editor, Fred Charles Ehlert, 9006 Pleasant Street, Queens, Long Island, New York. It will be carefully tested. If your goods satisfy our experts, RADIO WORLD'S endorsement will be published in our merchandise department without charge or obligation of any kind on your part. When the radio purchaser sees a published test in RADIO WORLD with the seal accompanying this editorial attached, he will know that the product stands for perfection and has the guarantee of RADIO WORLD. RADIO WORLD is rendering a service through its testing department that is prompt, accurate and produces results. All goods will be returned to manufacturers, after testing, provided stamps are sent for that purpose.



Remember "This Is a Radio Christmas"

and that millions of dollars will be spent during the holiday time for radio gifts.

Be sure to get your share of this business by advertising in the issue of RADIO WORLD of December 9, which will be

RADIO WORLD'S CHRISTMAS NUMBER

Thru this medium you can reach thousands of readers, who are not only interested in radio themselves, and want new equipment, but who also will give presents to others whom they wish to make radio fans.

ADVERTISING RATES:

Regular advertising rates in force for RADIO WORLD'S HOLIDAY RADIO GIFT (CHRISTMAS) NUMBER, as follows: \$150 a page, \$5 an inch. Discount, 10% four times, 15% thirteen times.

Last form closes November 30, A. M.

Take advantage not only of RADIO WORLD'S circulation, but also its cash-thru-the-mail pulling power.

Be represented in RADIO WORLD'S Holiday Radio Gift Number, and reach the many thousands who actually want your goods and are ready and willing to pay for them.

Preferred Positions Must Be Booked Immediately.

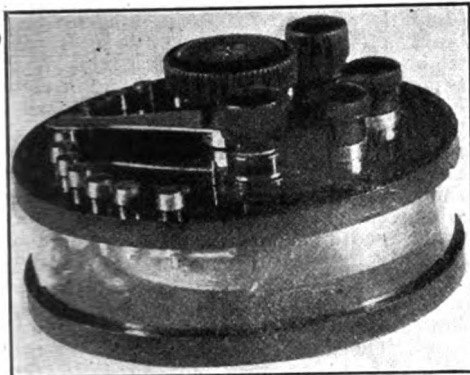
Copy for run-of-paper position will be received up to November 30, A. M.

RADIO WORLD, 1493 Broadway, New York

My Emergency Radio Receiver at 2 AAR

By George Steier

2AAR, 584 East 139th Street, The Bronx, New York, N. Y.



In response to RADIO WORLD'S request for any interesting constructive work in radio that might have been perfected by its readers, Mr. George Steier, 584 East 139th street, The Bronx, New York, sends the following account of an emergency receiving set which, he claims, may be depended on in all sorts of weather.

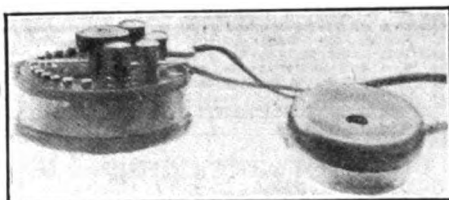


George Steier

Mr. Steier's receiver employs a new circuit designed after careful research—a crystal detector mounted inside and adjusted by a set screw at the bottom. Its wave length is from 150 to 750 meters. The selective tuning is by means of a 15-point switch. The actual size of the receiver is 3 inches by 2 inches.

tance reception. As a broadcasting receiver, the results equal that of a one-bulb set. WGY, Schenectady, and a host of other stations at quite a distance are heard every night.

The set has had a more or less interesting career, having been adjudged the second best receiver for use by the New York City Police Department. In a pocket-receiver contest of over sixty entrants, this receiver was nosed out of first place by the small margin of five points. It was considered by the judges a most ingenious piece of radio work. The set is, also, very satisfactory for amateur reception. Government stations on 600 meters can be heard pounding in, five feet from the phones.



The pocket radio-receiving set invented by George Steier (shown at left) compared with a single head-phone (shown at right), and fully described in the accompanying article

HOW many times during a year are radio amateurs using tube sets, forced to give their phones or loud-speaker an involuntary rest due to a rundown battery. The writer, being no exception, found it annoying to shut down for a few days and determined that an emergency set that required no "juice" was the necessary thing. But, alas, no spare space was available for a rather cumbersome crystal set. The writer began a battle of wits with his radio knowledge, and, after some research work, designed the set shown in the accompanying photograph which requires the small space of 3 inches by 2 inches.

A number of pocket, or small, receiving sets have been described from time to time. I make no claim to first honors. However, most of these sets are of a freakish nature, more or less. My emergency set may be depended on during all sorts of trying weather conditions. The circuit employed is one of my own and was especially designed for long-dis-

Brooklyn Man Wins Code Honors

J. C. Smyth, 2 CKB, Declared World's Champion After Taking Three Contests.

JOSEPH C. SMYTH, 2 CKB, 269 Eighty-Sixth Street, Brooklyn, holds the World's radio championship. The title was awarded him at the New England Amateur Convention held at Boston.

Competing against Mr. Smyth were Theodore R. McElroy, former world's champion, and Walter Vetromile, both of Boston. There were three separate code contests: "jamming," cipher code, and straight press, the stipulation being that the contestant showing to best advantage in the three contests would be



(C. Sport-Commercial) Joseph C. Smyth at the "speed key"

awarded the silver cup and the title; Mr. Smyth won all three.

In the jamming contest two transmitters were sending simultaneously into the phones, and the contestants were required to ignore the signals from one transmitter, and copy the other, a rather difficult assignment. Mr. Smyth won this at a speed of thirty-five words per minute without error.

The cipher code consisted of ten-letter code words secretly prepared, and transmitted by a Wheatstone transmitter. This contest was won by Mr. Smyth who again made a perfect copy and broke the world's record for speed in cipher-code receiving by copying the difficult words at a speed of forty-four words per minute.

The straight-press contest presented the closest race of all, as both Smyth and McElroy made perfect copies at a speed of forty-five words per minute, and again at a speed of fifty words. However, at fifty-five words per minute McElroy made six errors, while Smyth made five, thereby winning the world's title in all three.

Free Radio Instruction at Mass. Inst. of Tech.

THE Massachusetts Institute of Technology, Cambridge, offers a free course in radio to extension students, this winter. The first care of this elementary course will be to give students an idea of what really constitutes radio and to supply the necessary theory for the intelligent handling of a receiving set. No previous knowledge of electricity is required. Classes are held at 7.30 p. m., in room 275 of Tech Building No. 10, on Tuesdays and Thursdays. M. T. Dow and E. L. Bowles, both of the Institute, are instructors.

Show Will Be Exclusively for Fans

THE Council of the Second Radio District has decided that the annual show to be held next year, (March 1, 2, and 3) at Hotel Pennsylvania tentatively, will be open exclusively for amateurs. This restriction has been made, it is said, because at the show held at the same hotel last year, the crowds were so large that radio amateurs were prevented from approaching the exhibition booths to see what manufacturers had to display.

FANS, AMATEURS, DEALERS, BROADCASTERS, MANUFACTURERS, AND THE GENERAL PUBLIC

Are Looking Forward to

NATIONAL RADIO WEEK

DECEMBER 23 TO 30, INCLUSIVE

All Interested in Radio Should Help to Make This Event a Smashing Success.

If you want to know more about it address:

NATIONAL RADIO WEEK EXECUTIVE COMMITTEE
J. ANDREW WHITE, Chairman

326 BROADWAY **NEW YORK**

AGENTS

Our established quality rewards your effort with liberal commissions even on large orders. "Triple-test" multitum crystals and "Triple-tone" special gold alloy cat-whiskers are today the best sellers to jobbers and retailers. High priced but unequalled in quality and sales help. Repeat orders assured. State territory you want. **FOOTE MINERAL CO., Inc., 107 N. 19th Street Philadelphia, Pa.** :: Established 47 years

Did you see our ad in **RADIO WORLD** of Nov. 18, Page 277
Watch for future announcements.



RADIO EQUIPMENT MFG. CO
Dept. "B," 1803 JEROME AVE.
NEW YORK, N. Y.

IS YOUR TELEPHONE HEAD SET WEAK?

Let me remagnetize it. Guaranteed, in one day good as new. **\$1.50** Per Set

I rewind for higher ohmage. All radio telephone repairing at moderate prices. Mail orders attended to. Dealers write.

ROYS, 101 West 42nd St., N. Y.

Thordarson Transformers \$3.25

Dictograph Phones, \$6.50
3000 Ohms, \$8.00 Value Special

Amateurs—We Pay Postage.

Perfection Radio Corp. of America
140 West 23d Street New York City

Subscribe for **RADIO WORLD**. \$6.00 a year, \$3.00 six months, \$1.50 three months.



HIGH GRADE CABINET

LOUD SPEAKERS

Do not be deceived by our prices. **SPIROLAS** are not cheap instruments—they are a remarkable development made possible by the invention of the **SPIRAL** tone chamber (pat. pend.), which not only allows us to market a cabinet speaker of established high grade at an almost sensational price but gives many exclusive advantages over even the usual cabinet type, which is nothing but an ordinary horn enclosed in a cabinet—extreme compactness for a full-sized tone chamber and really complete elimination of metallic "horn" noises. **SPIROLAS** are made for music lovers who appreciate absolutely pure, natural tone.

We make a complete line—of equally high-class construction throughout, with fine hand-rubbed finishes. **ALL SPIROLAS ARE SOLD UNDER ABSOLUTE MONEY-BACK GUARANTEE—price immediately refunded if returned in ten days.**

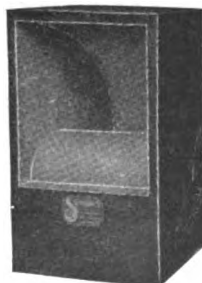
SPIROLA CONCERT—complete with special powerful built-in unit and cord ready to hook up like phones, beautiful oak (Model CO) or mahogany (CM) finish **\$12.50**

SPIROLA DUPLEX—improved type for use with your headset, two complete in one, eliminating usual interference between phones, oak (DO) or mahogany (DM) finish, braided throat **\$4.85**

Set in black finish all over (DB) **\$3.85**
SPIROLA SIMPLEX—for use with Baldwin or other loud speaker unit, oak (SO) or mahogany (SM) finish, braided throat **\$4.85**

Set in Black finish all over (SB) **\$3.85**
At dealers or postpaid, carefully packed (C. O. D. if preferred).

L. H. DONNELL MFG. CO., Dept. B, Box 70, Ann Arbor, Mich.



RADIO WORLD

TELEPHONE, BRYANT 4799
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
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M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary

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Fifteen cents a copy, \$6.00 a year, \$3.00 for six months, \$1.50 for three months.
Add \$1.00 a year extra for postage to Canada and foreign countries.

Receipts by our subscribers of the first copy of **RADIO WORLD** mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

Advertising rates on request.

ADVERTISING RATES:

One page: One time—\$150.00.
Half, Quarter, Third and Two-thirds pages at proportional rates.

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On thirteen consecutive issues, 15% discount.
Cover and preferred-position rates made known on application.

Terms: 30 days Net. 2% 10 days.

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Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 20, 1923, at the Post Office at New York, New York, under the act of March 3, 1973.

IMPORTANT NOTICE:

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

New Broadcasting Map

THE Radio Section of the Department of Commerce has found it necessary to use a larger broadcasting map, the old one having become too small for practical use in locating the 564 broadcasting stations now in existence. The new map, which is 5 by 7 feet in size, is divided into radio districts, and each station is located in its approximate position.

The Difference Between Audio- and Radio-Frequency

WHAT is the distinction between "audio" and "radio" frequency amplification? ask Howard Allen Duncan in "The Globe," New York. And Mr. Duncan replies: The first is named "audio" frequency because it amplifies oscillations that vibrate within audible limits. This limit is usually reckoned to be between 16 and 20,000, this last being the upper limit for the human ear. For radio frequency, however, the oscillations may vibrate hundreds of thousands and even millions of times per second, and the detector must bring them down to audible limits, so that they will actuate the telephone receivers, or other recording devices connected in the circuit.

Radio- and audio-frequency amplifications are entirely distinctive, and they both fulfil different and separate functions. One cannot take the place of the other, and one may not produce the same results as the other.

Radio-frequency amplifiers should not be used to obtain loud signals, or when it is desired to have volume. This work will be better performed by the audio-frequency amplifier. However, when it is desired or necessary to amplify weak signals, so that they can be made to actuate the detector, the radio amplifier is the one used.

In distinction to the audio-frequency amplifier, which is hooked on after the detector in the receiving circuit, the radio-frequency amplifier comes first, and then is followed by the detector. This is an advantage, for it permits the use of any type of rectifier, and allows the addition of audio-frequency amplifiers after the detector, so that the amplified signals can be made still louder by its means.

Thus, radio-frequency amplification magnifies signals so that they are much stronger when they reach the detector. This has the same effect as though the transmitting station were moved much nearer the receiving set. Any number of amplifying radio frequency steps, or stages can be used in a receiving circuit. There is, of course, a practical limit, and that is considered to be about four stages, for beyond that point the operation of the set becomes so critical and unstable as to make it difficult to tune it and get good results.

Argentina Organizing in Radio

ARGENTINA has just organized a radio association in the City of Rosario, with forty members, according to a report from Consul Bonney, to the Department of Commerce. The organization intends to obtain board-of-trade quotations from Buenos Aires by Adolfo Elias, J. Torres, Lorenzo Aguerreberry, Alfredo Muzzio, C. J. Todman and G. O. Caesar are the organizing committee. Experimental receiving radio sets are made in Rosario by C. E. Smith, of Smith & Kirkwood, and sell for about \$38; but difficulty is anticipated due to the fact that the radio patents are controlled by a company in Buenos Aires and patent interference is anticipated.

Radio World, 52 issues, \$6.00.

Subscribe direct or through your news dealer. **\$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.**

Be a National Radio Week Booster!

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RADIO FREQUENCY SET
 175 to 500 Meters
 3 Radio Frequency
 3 Audio Frequency and Detector
 All on 4 Tubes
Bissell Engineering Company
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INSU-LITE
PANELS
 1/8" —.01 per sq. in.
 3/16" —.015 per sq. in.
 1/4" —.02 per sq. in.
 DEALERS: Write for discount.
General Merchandise Co.
 140 Market Street, Newark, N. J.

CRYSTAL SET \$4
"THE LITTLE WONDER"
 \$2.50 UNMOUNTED
 Wonder in name and a wonder in performance. Cannot be equalled for the price. Catches distinctly everything broadcasted within 30 miles.
 Send for FREE catalog, describing our "Little Wonder" set and listing radio supplies.
GUARANTEED, TESTED CRYSTALS
 Galena and Radiocets... **20c.**
 Radi-O-Plate Panels. All sizes cut to order.
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 236 Third Avenue New York City

GITHENS TRUTONE RADIO HORN—LOUD SPEAKER
 First one to sell on, ten day trial Money back Guarantee

 Retail Price \$21.00
 Includes Loud Speaker
 Trutone has been pronounced the best on the market by experts. It has a clear true tone. Every radio fan should try Trutone and compare it with others.
 If YOU don't find Trutone the best, your money will be refunded. It is sold on a ten-day trial money-back guarantee. If not carried by your dealer write us.
Distributors and Dealers, write!
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 1216 Tremont Ave., Detroit, Mich.

Future of Electricity
 In Next Seven Years It Must Accomplish as Much as It Has in Its History

BETWEEN now and 1930, the electrical industry will be called upon to accomplish as much as it has already accomplished so far during its entire history, and between the years 1930 and 1937 it will have to do four times as much, declares Guy E. Tripp, chairman of the Westinghouse Electric and Manufacturing Company in an article on the "Future of the Electrical Industry" in the current issue of the "Magazine of Wall Street."


Until recently, the electrical industry, like most industries, says Mr. Tripp, developed haphazardly and grew by blindly following lines of least resistance. In its early days, no one could estimate its possibilities—or rather, those who did foresee the immense development that has actually taken place, were derided as visionaries. To-day, the chief factors governing electrical progress are known with a reasonable degree of accuracy; and provided that no radical industrial or economic changes take place during the next fifty years, the electrical industry will, during this period, in all probability develop along well defined lines.

One of the established facts is that the United States can use to advantage practically all of the electrical energy that can be generated within its borders. Everyone concedes the superiority of electricity for lighting; for driving industrial and mining machinery; for producing heat for industrial processes; for the manufacture of many chemical compounds, such as abrasives and fertilizers; for supplying power on the farm; for cooking, heating and operating a variety of labor-saving devices in the home; and for limitation need not worry the present generation, or the next. We have available in the United States about fifty million horsepower of water power, of which only about eight millions are now in use. It will be many years before all of this power is developed; and, when it is, it will be utilized in conjunction with huge steam plants that will produce power from about one pound of coal per kilowatt hour. Though our fuel supplies are undoubtedly diminishing, it will be centuries before they are exhausted at this economical rate; and by that time some of the newer forces, with which our physicians are busy, may be at our disposal.

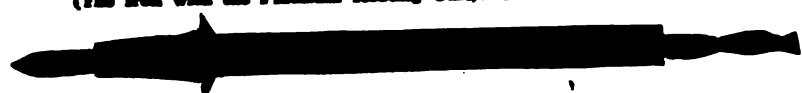
The real limitation to electrical development is set by finance. The nation's present annual income is figured at about seventy billion dollars, of which the average surplus available for permanent investment, after providing for the needs and pleasures of our people, is about ten per cent. From this surplus must come the funds for all permanent improvements of every kind—every addition to our railways, mines, factories, farms, homes and highways.

OUR NEW
 Dry Cell Socket, made on a novel principle, sells for only
60c.
LINCOLN RADIO CORP.
 116 W. 65th Street N. Y. City

WELCOME! COME IN AND HEAR THE
CORACO RADIO CONCERT
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 The Coraco Super-Radiophone is the latest and greatest improvement in radio. It has no outside connections—no installations expense—is as simple to operate as a phonograph. If you cannot call, write for full information.
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NOVO "B" BATTERIES FOR RADIO
 22½-45 & 105 VOLTS

NOISELESS DEPENDABLE GUARANTEED
ASK YOUR DEALER
NOVO MANUFACTURING CO.
 424-438 W. 33rd ST. NEW YORK
 531 SO. DEARBORN ST., CHICAGO.

PRICES SMASHED
 Each sale has created new friends and customers with the result that we now announce drastic reductions in our quality lines. All goods prepaid. Send card for complete price list. You'll be surprised. You'll tell your friends. A sample saving follows:
COMPLETE REGENERATIVE VACUUM TUBE SET Our Price Others
 Panel—Bakelite—7"x13" drilled. \$1.65 \$2.40
 Cabinet of 3-ply wood to fit panel. 1.50 2.50
 Two dials—each 35c. .70 1.40
 Sixteen switch points with nut. .10 .48
 Four switch stops with nut. .04 .12
 Eight switching posts. Nickel plated @ 3c. .24 .48
 Two switch levers @ 25c. .50 .90
 1 filament rheostat. Highest grade. .65 1.10
 1 vario coupler. Fourteen taps. 2.25 4.00
 1 25 plate variable condenser. 1.05 3.50
 1 tube socket—moulded. .45 .85
 1 grid condenser and leak. .10 .25
 1 phone condenser. .10 .25
 1 tube socket support. .15 .25
 12 feet spaghetti tubing @ 4c. .48 .84
 15 feet tinned copper connecting wire. .30 .45
 Blueprints showing details to assemble. .10 .25
\$11.32 \$20.02
 Other articles taken at random from our late price list are—
 Detector tubes—Cunningham—NOT rebuilt. \$3.95 \$5.00
 Crystal detector of closed type. .80 1.00
 Transformer—Audio frequency. 2.95 4.50
 Double slide tuner—knocked down. 2.50
 Loose coupler—knocked down. Coils wound. 3.75
 Loose coupler—assembled. 7.50 12.50
 Variometer—Hardwood stators 4%. Assembled. 2.25 4.00
 Frost Fuse—3000 ohms. 2.65 5.00
 Kellogg—2400 ohms. 6.75 12.00
 Western Electric 2200 ohms. 0.25 12.00
 Blueprints giving detail of 3 step amplifier. .10 .25
 Two step amplifier—knocked down Panel drilled. 12.00 23.50
 Two step amplifier assembled. In cabinet. 16.00 35.00
 Vacuum tube set in cabinet 7"x12"x2". Wood. \$7.00 \$5.00

"TUNING IN"
 TO THE RIGHT TUNE IS VERY SIMPLE WHEN YOUR CONNECTIONS ARE SOLDERED WITH THE NEW
"POST SOLDERING IRON"
 (The Iron with the Platinum Heating Unit). Removable Soldering Tip

 1/2 Actual Size
LIST \$6.00
 Designed especially to cover every requirement for delicate work. The smallest practical, efficient instrument on the market. Attached to any socket. Universal current. Fully guaranteed. From your dealer, jobber or write
POST ELECTRIC COMPANY
 30 EAST 42ND STREET, Div. 500 NEW YORK

5 Instruction Books of the **RADIO READING COURSE \$1.97**

Learn how to design, construct, install, operate and maintain all kinds of radio apparatus. No tedious study. A complete radio education. Course edited and approved by Prof. J. H. Mercey. Up-to-date, accurate, complete. **SEND NO MONEY.** Just send your name and address and pay postman only \$1.97 and you own this five-book Radio Library. Write today, Dept. RW4.

RADIO COURSES, Inc., 552 7th Ave., New York



Loud Speaker for Any Crystal Set by Using the Steinmetz Amplifier \$8.50

No Storage Battery Required

Amplifying unit uses Westinghouse Tube and requires a single dry battery in place of a storage battery. Tube and Batteries for this unit \$7.95. This makes the unit complete for operation.

For a two Stage Amplifier use two of these units.

STEINMETZ PHONES are of exceptional merit. 2000 Ohms \$5.00—3000 Ohms \$6.50. Equal to any \$10.00 or \$12.00 phones made. Send for Catalogue.

Steinmetz Wireless Mfg. Co., Inc.,
5700 Penn Avenue Pittsburgh, Pa.

V. T. TUBES

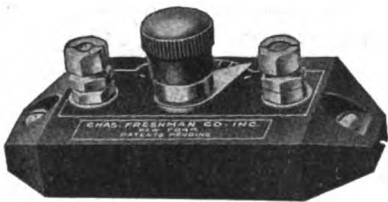
- Guaranteed, Detector ... \$2.50
- Amplifier 2.75
- 1-1/2 Volt Tube..... 5.75
- Socket for Same..... .75
- Suneco Adapter 1.20
- Genuine V. T. I..... 5.45

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Postage must be added with remittance. All parcels insured. Only best materials we offer.

Radio Distributing & Auto Supply Co.
64 West 66th Street, New York City
Broadway-7th Ave. Subway—8th or 9th Ave. "L"

The Latest and Most Essential Part of an Efficient Tube Set



Variable Grid Leak and Micon Condenser (Combined)

Obtainable in an unbroken range from zero to 5 megohms—all intermediate points. Fixed capacity—.00025 M. F. Improves your set wonderfully by

- Clarifying Signals
- Lowering Filament Current
- Increasing Battery Life
- Eliminating Hissing

Price Only \$1.00

At your dealers—otherwise send us purchase price and you will be supplied without further charge.

Manufactured by

CHAS. FRESHMAN COMPANY, Inc.

97 Beekman St. New York City

Home of Micon & Antenella

"HOLIDAY RADIO GIFTS NUMBER" of RADIO WORLD will be issued December 9. Last copy will be accepted on this number up to November 30. RADIO WORLD, 1493 Broadway, New York.

Broadcast Bill's Radiolays

By William E. Douglass

THANKSGIVIN' DAY at our house is a big event each year, when our folks get together, don't let nothin' interfere. There's me an' Min an' little Bill, an' Sister Jennie too, and my Aunt Soph from Goose Grease Creek an' also Uncle Lew. Then there's my brother Charley who works in a jewelry store down east in "Little Ol' New York." You know, he makes me sore the way he acts since he's been East with all his city tricks an' makin' fun of all of us—refers to all of us as "hicks." His wife, she ain't much better, puts on dog an' carries on, gets up about nine-thirty after all the work is done. Of course, there's Jim, our hired man, dressed in his Sunday best, with bran' new yaller button shoes an' fancy cross cut vest. Maw an' Paw live here with us; Maw helped Min with the dinner an' when them two start workin' they kin sure produce a winner. We had turkey, squash an' cranberries, spuds an' cabbage slaw, pickles an' homemade preserves, the best you ever saw. Maw mixed up some biscuits—Boy! they'd melt right in yer mouth, she says she learned to make 'em when she lived away down South. But when it comes dessert time, there's where my wife takes the prize. There aint no one kin beat her makin' mince and pun-kin pies. The dinner started off with grace then each one had to tell what he



had to be thankful fer besides just bein' well. Dad said that he wuz thankful he could have his children here so they could be together fer at least one day each year. Charley's wife said she was glad she had her "darling pet,"—my Dad just give her one good look, she aint fergot it yet. Aunt Soph and Min an' Jennie, Little Bill an' all the rest gave thanks fer all the favors with which each one had been blessed. An' when it came to my turn to speak I guess most of them thought I'd say how thankful I wuz for the crops this year has brought, but that's right where I fooled them fer I'm thankful I know because a feller called on me about a year ago an' handed me some happiness I never will ferget. You've guessed it right—for that wuz when I bought my wireless set. (Copyright 1922, Westinghouse Electric & Manufacturing Company.)

"Radio Golf!" Next?

SILENT periods between broadcast programs have been instituted in Boston by Radio Inspector C. C. Kolster, so that fans may have a chance of tuning in long-distance stations without experiencing local interference. They can now play "radio golf," as it is called, when trying to receive distant stations without sitting up late at night.

Big Show Getting in Shape

Space for American Radio Exposition Being Taken Up by Leading Firms

THAT the American Radio Exposition, to be held in Grand Central Palace, New York City, December 21 to 30, inclusive, promises to be a success, is emphasized by the large companies exhibiting that have pledged their co-operation. The exposition has the support of the National Radio Chamber of Commerce and, also, is sanctioned by the Radio Apparatus Section of the Associated Manufacturers of Electrical Supplies.

It will be one of New York's big features. The slogan, "This is a Radio Christmas," has caught on. Many firms connected with the wholesale and retail ends of the business feel that the combined movement will result in a remarkable trade stimulus.

The exposition to be held in the Palace will be the first of a series of annual shows national in scope and analogous to such expositions as the annual Automobile Show, Motor Boat Show, Silk Show, and the Flower Show. All of these expositions have been a big incentive to buyers in their respective industries. Dealers from many parts of the country visit them, as well as the consumer public.

The show at the Palace is primarily a manufacturers' official exhibit, but dealers and jobbers representing manufacturers will also display. Special morning hours will be arranged for dealers in the morning. During these periods the public will not be admitted.

With the exposition enjoying the support of such exhibitors as the Radio Corporation of America, De Forest Telephone & Telegraph Company, Western Electric Company, National Carbon Company and others, the attractiveness of the various exhibits is assured.

Frank Hitchcock, former post-master general, is head of the American Exposition Company. Walter Gordon Clark is vice-president, and Harold Bolster, secretary and treasurer. The offices are at 120 Broadway, New York City, where L. S. Byers, executive secretary, is in charge.

Some of the prominent manufacturing corporations that have engaged space at the exposition include:

Western Electric Company, Radio Corporation of America, C. Brandes, Inc., National Carbon Company, Novo Battery Company, Sleeper Radio Company, General Insulate Company, Sound Wave Corporation, Pacent Electric Company, Stromberg-Carlson Manufacturing Company, Holtzer-Cabot Company, National Airphone Corporation, Clapp-Eastham Company, Hutchison Radio Company, Henry Hyman & Co., De Forest Radio, Dubilier Condenser Co., Inc., Coto Coil Company, A. H. Grebe & Co., Weston Electrical Instrument Company, American Radio Relay League, Executive Radio Council, Burgess Battery Co.

To Germany on Telefunken Sale

ALFRID FRANKENTHALER, a lawyer of 120 Broadway, took passage on the Cunarder "Aquitania" for a hurried trip to the Continent to represent many Germans whose property here was seized by the Alien Property Custodian. He said that the sale of the Telefunken wireless concern by the Custodian "for a nominal consideration," had led him to urge upon Washington an amicable adjustment for his clients and that satisfactory progress was being made. He believed the Winslow resolution providing for the return by the United States to Germans of sums up to \$10,000 would soon become law.

Subscribe for RADIO WORLD. \$6.00 a year, \$3.00 six months, \$1.50 three months.

Radio in a Talking-Movie

THE General Electric Company through its radio broadcasting station, WGY, Schenectady, New York, recently told thousands of people listening to the program that a new device, other than the phonograph, was being used to "talk" into the radio transmitter. But no particulars were given of the device used.

Then came Thomas A. Edison to the Schenectady plant. He had not been there in twenty-five years and there was much to show him. Being the inventor of the first device to record speech so that it could be reproduced, he was intensely interested in this new machine.

So he was taken to C. A. Hoxie's experimental room in the General Laboratory, where the pallo-photo-phone, invented by Mr. Hoxie, was shown and demonstrated. Here a film, which looked in every respect like a motion-picture film, was run through a machine with a powerful light thrown against it—just as in the motion-picture projection machine—and from a loud-speaker and head phones the voice was heard, full and strong, with all its variations of tone, all its stops and hesitations, all its vital quality inherent in its reproduction.

Edison marveled, "What next?" he asked.

There are two great possibilities to this machine. First it makes possible the

talking movie, for on a film of the normal width can be the picture and voice, absolutely synchronized. The picture and voice must work together at all times for both are a part of the same film. Secondly, it means a boon to radio broadcasting studios. From a central studio, say in New York City where most of the great artists are located, the artist can sing, play some instruments or talk, into this machine which produces the film. Copies of the film

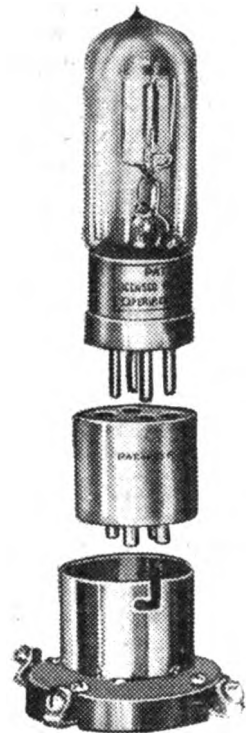
L. T. Robinson, engineer in charge of the General Engineering Laboratory in which this machine was designed, explains its operation:

"This is a device for the purpose of recording sounds upon a photographic film so that the sound may afterwards be reproduced in ordinary telephones or loud-speakers. The record is made by causing the sound waves to produce vibrations on an exceedingly minute and very delicate mirror. A beam of light reflected by this mirror strikes a photographic film which is kept in continuous motion. The film, when developed, shows a band of white with delicate markings on the edges which correspond to the sound which has been reproduced. On account of the exceedingly small size of the mirror, its low inertia, it is possible, by this means, to produce a sound record which includes the very delicate 'overtones' which give quality to speech and musical sounds. This has not been so successfully accomplished by any other method of recording sound waves.

"The reproduction of the sound from the film is accomplished by moving the film in front of an exceedingly delicate electrical device which produces an electromotive force which varies with the amount of light which falls upon it. In the past, attempts have been made to produce these results by means of selenium cells; but a selenium cell, though it responds to the changes in the amount of light which it receives, does not respond with sufficient promptness to produce good results. There is a sluggishness in the response which seriously interferes with the quality of sound which is produced.

"By an ingenious combination of vacuum tubes, there has been produced an apparatus which responds to variations in the light falling on it with a speed of light itself, or with the speed of propagation of wireless waves into space. Therefore, when this film is moved continuously in front of such a device, the device produces an electric current which corresponds very accurately to the original sound wave. This electric current may be used to actuate a telephone or loud-speaker. It has been used at the General Electric radio broadcasting station. The voice of the announcer was recorded on a phonographic film and sent out with such accuracy that it was impossible to distinguish it from the voice as directly transmitted from the station."

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If your dealer cannot supply you send money order or cash to Dept. W.

Price \$1.50 each

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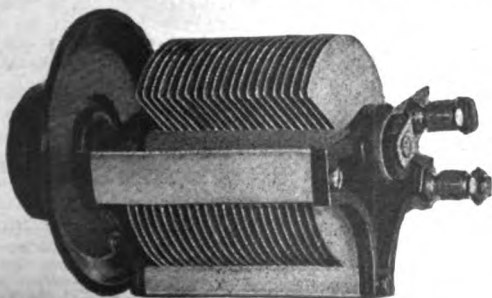
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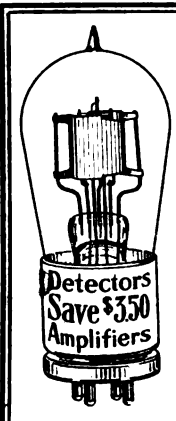


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Big Tubes for Trans-Atlantic Radio

Messages Flashed from New York to Nauen, Germany, at the Rate of Fifty Words a Minute

POWERFUL electron-tubes developed in the research laboratory of the General Electric Company and applied to wireless telegraphy by G-E engineers working in cooperation with the engineering staff of the Radio Corporation of America have successfully bridged the Atlantic Ocean. On October 14, for a period of sixteen hours, the regular commercial traffic of the Radio Corporation was handled by a tube set between the Broad Street transmitting office of the Radio Corporation, New York, and Nauen, Germany. The tubes replaced the alternator, and traffic was handled so efficiently that the operators at the German station were not aware that they were participating in a revolutionary and epoch-making change in radio transmission.

A week later, Saturday, October 21, a second demonstration of tube transmission was made for E. W. Rice, jr., honorary chairman of the board of directors of the General Electric Company, and A. G. Davis, vice president. In this test, traffic was handled for a period of ten hours between this country and the Canarvon station, Wales. The receiving operators knew that tubes were being used. Messages were sent at the rate of fifty words a minute.

The set installed at Radio Central, Long Island, consists of three 50-kilowatt, 15,000 volt, water-cooled, metal vacuum-tubes, known in the engineering world as "kenetrons," and used as rectifiers and six 15,000 volt, 20-kilowatt, water-cooled metal pliotrons used as oscillators. For the demonstration with the tube set, a mile-and-a-half long antennae suspended from six towers, 420 feet high, was used.

The 20-kilowatt, water-cooled tubes are similar to those shown Senator Marconi on his visit to Schenectady. The tubes were developed by W. C. White and H. J. Nolte of the research laboratory and are constructed on the principles discovered by Dr. Irving Langmuir. Both Mr. White and Mr. Nolte worked with W. R. G. Baker, of the radio engineering department of the General Electric Company, in the installation of the tube set at Radio Central. With Mr. Baker, who had charge of the work for the General Electric Company, were Irvn Weir and August Schmidt, Jr., and C. W. Hansel, representative of the Radio Corporation of America.

It is not expected that the tubes will immediately supersede the alternators but the General Electric Company has convincingly proved that it is possible to build a tube equipment that will handle commercial traffic efficiently and economically. It is further claimed for the tubes that high-speed transmission may be easily obtained. The tubes may be run in parallel with the alternators, or separately.

This is not the first time that transatlantic wireless telegraph has been accomplished but on previous occasions the British used fifty-two tubes.

Transatlantic wireless telephony is now believed a matter of a very short time as the tubes are especially efficient for this system of communication.

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Tropical Radio Company Gets Miami Naval Station

THE lease of the Naval Radio Station at Miami Beach, Florida, was awarded to the Tropical Radio Company of Boston, the highest bidder in the recent call for bids. This company, which is connected with the United Fruit Company, offered to take the station for eighteen months at an annual rental of \$3,600, with permission to extend the lease an additional year. The Radio Corporation of America, and Cutting & Washington of New York, also filed bids.

According to the terms of the lease, the Tropical Radio Company must replace the old rotary-spark set with modern equipment which will reduce the objectional noise to a minimum.

With the enactment of necessary legislation, it is understood that the Navy will ultimately offer the station for sale.



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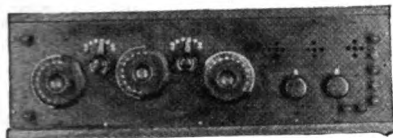
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Bank Windings are interchangeable for direct mounting on either Variometer or Variocoupler.

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Radio Aids Einstein Tests

SPECIAL radio time-signals sent from SNSS, Annapolis, for the benefit of scientists in the Indian Ocean working on a test of the Einstein theory of relativity during the recent solar eclipse, were nearly twice as audible as those of a commercial station, the United States Navy has been advised. At least their time signals reached Paris satisfactorily. A radio station there reports that a comparison of the time signals sent out by the Navy with those transmitted from Rocky Point, Long Island, showed that the audibility of the Navy signals was 158.3 compared with 87.5 for Rocky Point on the audibility scale. Reports from Australia and the Indian Ocean have not yet been received. Naval signals were sent out on 17,145 meters and those of the commercial station on 19,000.

PATENTS

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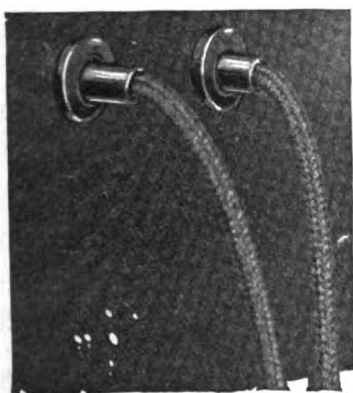
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UNION-RADIO. PHONE TIP JACKS

(Patent Applied For)



FRONT (Outside) VIEW

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REAR (Inside) VIEW

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MODELS and patterns made. Light manufacturing. Address H. W. Hathorn, Mason City, Iowa.

25% REDUCTION on C3 receivers. Write for circular. Cheney Radio Co., Cheney, Kan.

RADIO SUPPLIES. We carry a big stock. Prompt shipments on all parts and complete sets, including tubes, Magnavox, etc. An old concern, established in 1908, has \$100,000 stock, small overhead. We allow more discount to dealers than anyone else. Send for our Radio Catalogue. Washington Auto Supply Co., Washington, Ill.

SALESMEN that have been or are calling on electric or radio trade, see Mr. Rice, 6311 N. Clark St., Chicago.

Static in the Tropics

Only a Radio Operator Who Has Worked There Can Fully Appreciate It

EVEN during the winter months static is very noticeable," says Charles A. Reberger, chief radio operator of the steamer "Atlantic," in "The Morning News," Dallas, Texas. "All day long it is a continuous roaring, grinding and crashing in the receivers. During the

hours of the night it is worse—far worse. Nine times out of ten the crashes will entirely blot out all signals.

"It is very difficult to work through heavy static. Let me give you an idea. One evening we attempted to establish communication with a station in the Canal Zone, which was about two hundred miles away from us, and failed. It was absolutely impossible to even hear his signals, due to the heavy atmospheric conditions. A vessel only ninety miles north of us could not read our signals, although we were then getting twelve amperes radiation and had a fine, clear musical spark. Radio engineers claim a musical spark is easily read through static interference.

"A few nights later, I had the pleasure of listening to Swan Island working a United States fruit liner. After this station had sent each letter twenty times, the vessel informed him that it could not distinguish his characters. Only an hour before he had forwarded his 'TR' to Swan Island and was no more than two hundred miles south of this land station.

"If one should 'listen in' during one of those ugly tropical thunderstorms I guarantee you would think you were at the battle of Liège or in a boiler factory."

Attention, Newsdealers

You should keep a good supply of back numbers of RADIO WORLD on hand all the time. It has been the experience of many dealers that a purchaser of RADIO WORLD for the first time will almost immediately want the back numbers, some of which are already out of print and some of which are difficult to get. **THE PUBLISHER WILL FURNISH BACK NUMBERS TO DEALERS DIRECT OR THROUGH THE AMERICAN NEWS CO. AND ITS BRANCHES.** Dealers should hold their unsold copies for a reasonable length of time. RADIO WORLD of October 28 contained a full page of contents of back numbers to that date. 15 cents per copy; any seven numbers for \$1.00. RADIO WORLD, 1493 Broadway, New York.

That Armstrong Circuit

So much interest has been displayed in the special article, "TESTED INVENTION OF MAJOR ARMSTRONG AMPLIFIES SET 100,000 TIMES," by John Kent, that appeared in RADIO WORLD No. 13, dated June 24, 1922, the publisher decided to put aside a number of copies for those who were not able to get this issue when published. Copies will be sent, postpaid, on receipt of 15c, or send in your subscription, \$6.00, for one year (52 issues), \$3.00 six months, or \$1.50 three months, and subscription will be started with the issue containing the article about Major Armstrong's Amplifier.—RADIO WORLD, 1493 Broadway.

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Tobacco Redeemer banishes the habit completely, almost before you know it. An absolutely scientific, thoroughly reliable treatment. No matter how long the habit, or in what form used, you will have no craving for tobacco after you take this pleasant, inexpensive treatment. This we positively guarantee. Your money returned without argument or question if not satisfied. Write for free explanatory booklet and proof of what Tobacco Redeemer has done for men addicted to the tobacco habit. Send post card or letter today. **Howell Pharmaceutical Co., Dept. 971 St. Louis, Mo.**

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restful
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Department K, 60 Warren St., New York.

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HUTCHISON

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TYPE SK

This Complete Receiver

is simpler to operate, more efficient, more selective, less fussy than any we have ever seen. Embodies the Armstrong regenerative circuit, and many modern improvements found only in the highest grade instruments. Designed for the expert, but so simple that it can be handled easily by the novice.

Every detail of workmanship and finish is of the very highest grade. There is nothing finer at any price. Well known radio engineers have tested it

thoroughly, and marvel at its simplicity and efficiency.

The Type SK is a complete regenerative tuner, with detector and two stage audio frequency amplifier. Its output goes direct to phones or will operate any good loud speaker. Being designed for the usual broadcasting wave lengths (150 to 450 meters) it is very highly selective in this complete range, and delivers a clear, pure signal, remarkably free from the usual distortion or tube noises.

Offered only by leading retailers. If your dealer is not supplied, write us direct, mentioning his name.

Hutchison Radio Company

Canadian Pacific Building

342 Madison Avenue, New York

To the Trade:

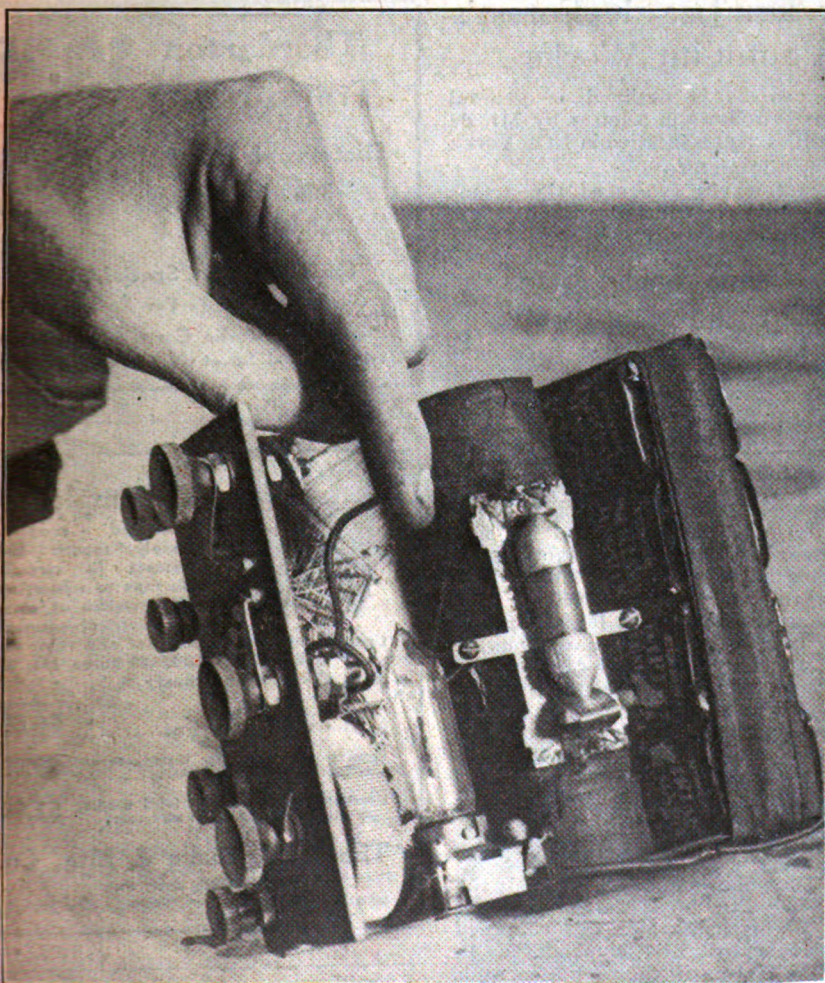
The discriminating purchaser instantly recognizes the Type SK as an exceptionally fine instrument. Dealers handling it usually select it for their own store demonstrator. Jobbers and Retailers find it a ready seller, and their customers report unusual satisfaction. Our terms give the purchaser exceptional value and also provide a fair profit for the trade. Write or wire for particulars.

RADIO WORLD

(Trade Mark)

ILLUSTRATED. WEEKLY

Miniature Radio Transmitter Fits Kodak Case



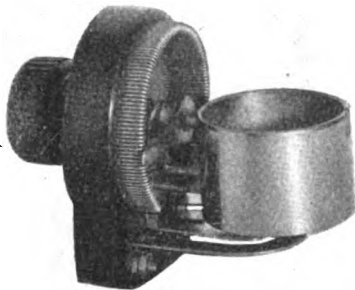
AN unusually interesting miniature transmitter is shown in the accompanying photograph. It was built and designed by Sterling G. Sears, and will give satisfactory service to the novice who is satisfied with comparatively short range. The set shown has a transmitting range of about three-quarters of a mile and a receiving range of about seventy-five miles. The apparatus is mounted so that it fits into the interior of a kodak-camera case. Note the neat appearance and arrangement of the coils, batteries, and the miniature vacuum-tube. For B batteries, in this particular case, flashlight batteries are used exclusively. The reason for this is that they take up little space and afford the necessary plate voltages for the vacuum tube. The filament may be lit by the ordinary battery. As a means of inductance a spider-web coil is used as a means of controlling the wave length. The taps are shown on the front of the panel. The rheostat, with the miniature vacuum tube, is also shown. At the rear of this is the spider-web inductance coil with its taps, while the grid leak and condenser are mounted on the center coil. The batteries are at the extreme back of panel. The wiring is extremely simple. With a limited knowledge of radio, the operator should find this set efficient. It is a practical transmitter and may also be used as a receiver.

(C. Kadel & Herbert)

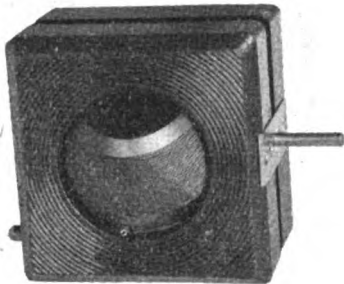
More Records by the DX Night Owls! Send Yours In!
CHRISTMAS NUMBER OUT NEXT WEEK!

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For Good Results!



Ajax Socket Rheostat
A device for which amateurs and professionals have long been waiting. Eliminates wiring between socket and rheostat. List..... **\$2.00**



Keystone Moulded Variometer
Made of a special composition—extremely light in weight and durable. Wave length ranges from 150 to 580 Meters. Terminals conveniently arranged to afford easy connections and avoid crossing terminal wires. Rotor and Stator windings guaranteed not to loosen. Brush type contacts. List each. **\$5.00**

THE name "Pruden" back of standard Radio Equipment is a guarantee of mechanical excellence, perfection of workmanship and scientific correctness of design.

Now, more than ever, when the market is flooded with inferior goods, it pays to buy standard trade marked products.

You can pin your faith to "Pruden." Money-back unconditionally if you do not get complete satisfaction.

Just a few leaders of Pruden Reliable Products shown here that will give you better radio results at no greater cost.

Dealers write today for our interesting proposition.

FREDERICK H. PRUDEN INC.

993 Bergen Ave.  Jersey City, N. J.



Phono-Phane Permanent Radio Detector

The only fixed radio detector requiring no adjustment. Used in place of crystal or vacuum tube detector. Gives excellent quality of sound without distortion, battery or tube noises. Detects telegraph signals at several thousand miles. Detects broadcast music more clearly than vacuum tube detector, and requires no amplification where the incoming signal has sufficient strength to actuate the sensitive phones. Ideal for use in regenerative circuits. Handsome, substantial, suitable for assembly in the finest radio equipment. Guaranteed against imperfection or faulty operation. List each.. **\$3.50**



Saturn Automatic Plug

The only perfect automatic plug, no need to take apart to make connections. First insert the terminals into the "Saturn" and a perfect connection is made. So constructed that pulling of the cords makes the connection more positive. List each **\$1.50**

The best SOCKET for the DRY CELL TUBE

60c.

LINCOLN RADIO CORPORATION
116 W. 65th St. Manufacturers New York City

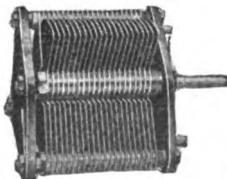
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Take the middleman's profit and selling costs for yourself. We sell you direct. These extremely accurate instruments made by experienced condenser people are minus the decorative frills that add to cost. Price reduced to rock bottom without sacrificing quality in the least. Satisfaction or your money back. Write today for very interesting circular.



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Complete with Mounting Screws

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No checks or money orders needed. Pay postman. Send the order TODAY, enclosing 5 two-cent stamps to cover mailing cost and receive your condenser in a day or two.

MANUFACTURERS' RADIO ASSOCIATION

90 East Kinney St. Newark, N. J.

How Dr. Lee de Forest's Photofilm Works

THE process is outlined in general terms as follows in a letter by Mr. de Forest to his representative in New York:

- "Taking the picture:
 - "1. Sound waves (voice of the actor) translated into electrical waves.
 - "2. Electrical waves translated into light waves.
 - "3. Light waves recorded on the edge of the film.
- "Reproducing the picture:
 - "1. Light waves translated back into electrical waves.
 - "2. Electrical waves translated back into sound waves.
 - "3. Sound waves amplified with loudspeakers placed near the screen for the audience."

The stumbling block which has impeded other efforts to perfect the talking film has been the difficulty in exactly synchronizing the voice and the picture. This is important, since sound travels at 1,090 feet a second and light at 186,000 miles a second. Unless the word and action correspond exactly in time, as rendered by the talking-picture machine, the effect is spoiled. With the picture and the sound-wave on the same film, the time unity is preserved to the thousandth part of a second.

Canadian Radio Directory

CANADA published its first issue of the "Official List of Radio Stations in Canada." This list, which was compiled through the efforts of Commander C. P. Edwards, director of the radiotelegraph service under the Department of Marine and Fisheries, contains a complete roll of every amateur, commercial, military, and broadcasting station in the Dominion, and is corrected to August 1, 1922.

Thordarson Transformers \$3.25

Dictograph Phones, \$6.50

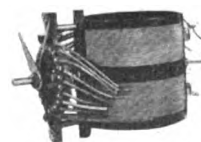
3000 Ohms, \$8.00 Value

Special

\$30.00 Tube Set, Special, \$15.00

Amateurs—We Pay Postage.

Perfection Radio Corp. of America
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A Completely

connected coupler. Simply mount and connect in circuit. No tape to solder, no extra switch at side, no electrical connection to any shaft. Compact and rotor always in center of field. 80 turns No. 22 green silk wire on primary.

- Complete with indicator arm..... **\$6.50** Postpaid
- Same coupler with rotor toward one end without special connections..... **\$3.50**
- Knockdown coupler with printed winding directions, complete, less wire..... **\$1.50**

The W. J. Radio & Mfg. Co.

3020 Fourth Ave., So. MINNEAPOLIS. MINN.

GREAT ADVERTISING MEDIUM
RADIO WORLD's special issue, "Holiday Radio Gifts Number," issued on December 9. Copy received up to November 29. RADIO WORLD, 1493 Broadway, New York.

WE NEED RADIO WORLD, dated April 22 and August 5. If you have copies you don't require, mail to this office and current issues will be sent you for them. RADIO WORLD, 1493 Broadway, New York.

VOLUME TWO OF RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the act of March 3, 1879.]

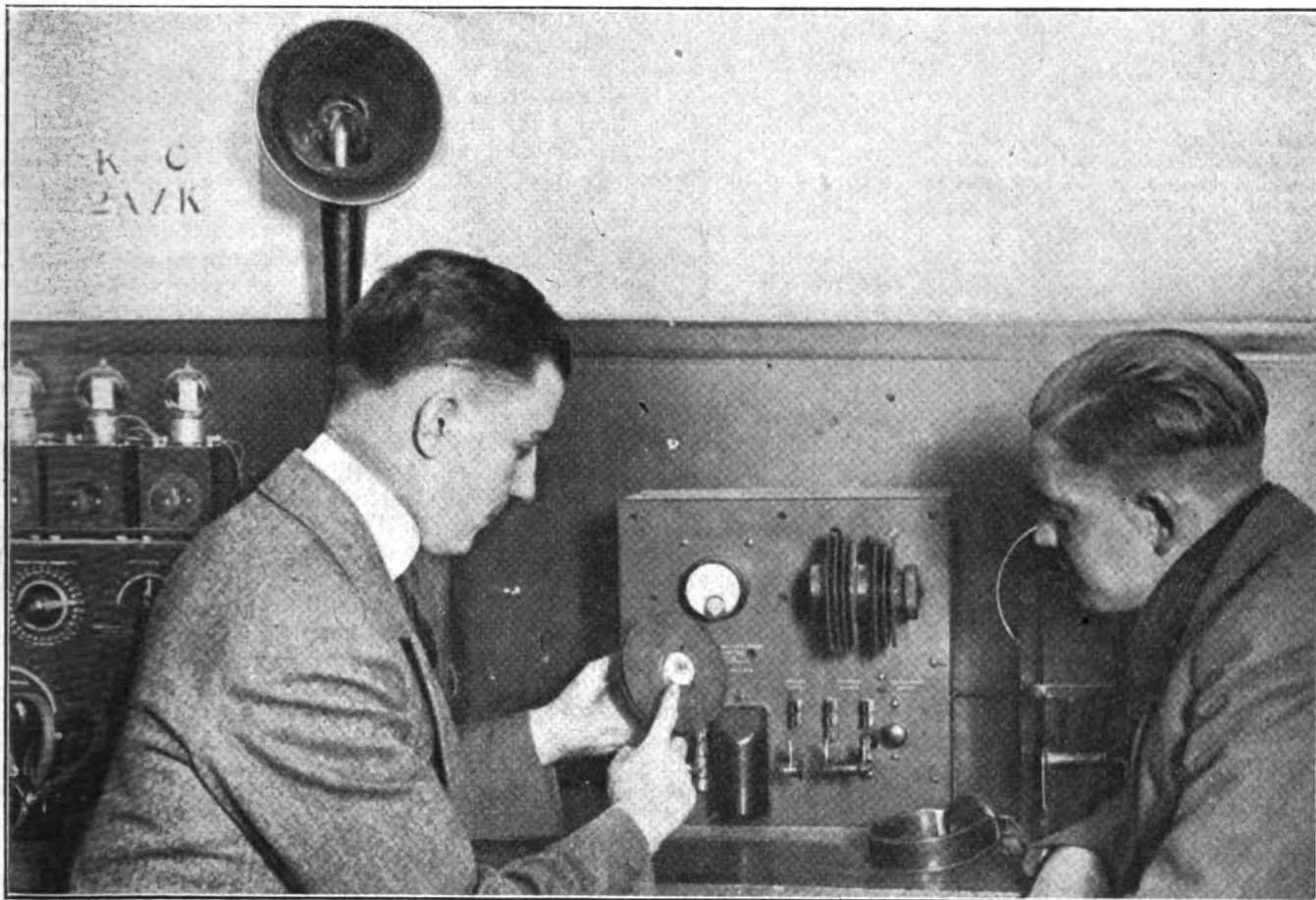
A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. II, No. 10. Whole No. 36

December 2, 1922

15c. per copy, \$6.00 a year

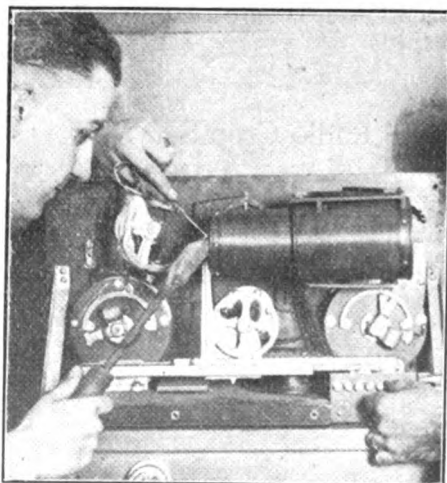
K. of C. Leads in Radio Instruction for Veterans of World War



(Both photos C. Kadel & Herbert)

Instructing a World War veteran in one of the radio schools of the K. of C., station 2AZK.

THE Knights of Columbus are conducting radio schools for the purpose of instructing veterans of the World War. Already nearly 20,000 veterans are receiving instruction in these schools. The large photograph on this page shows Instructor Thomas A. Berinati, at the left. He is instructing Ernest Vehstedt, a hero of the Argonne, in the workings of a half-kilowatt spark-gap transmitter. The spark-gap is the heart of the transmitter, and in this case, this particular gap makes it possible to secure what is termed a "pure, sharp wave." It is of the utmost importance that the student be familiar with the "how and why" of this gap, as it is vital when a man is taking examinations



How to solder a Marconi 106-B receiver.

for a governmental radio license.

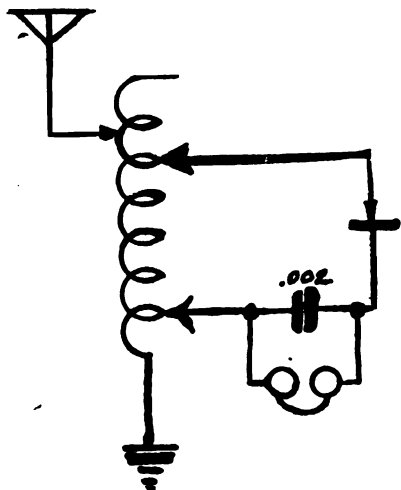
To the left of Mr. Berinati is the receiving instrument with its necessary array of vacuum tubes for high amplification. All of these instruments are of vital importance to the student who expects to be an expert operator.

The small photograph shows the rear of a receiver of the Marconi 106-B type of tuner. This tuner has for its inductance and coupling the loose coupler as shown in the picture. A wire is being soldered by Mr. Berinati.

Once the student receives a license, he has an opportunity to travel, and, if he is alert and makes the most of his eyes, camera, and notebook, he may gather knowledge that will broaden his vision on life.

Getting Results Out of Your Receiver

By Charles H. Plath



Schematic diagram of a slide tuning coil. By sliding the two sliders on the coil inductance the wave-length is changed. Drawn by Charles H. Plath.

WHY is it necessary to have an outdoor aerial in order that a radiophone concert may be received? This is a question that is being asked frequently, particularly in view of the development of Armstrong superregeneration, radio-frequency amplification and other systems, which will function provided the loop aerial is applied to them. This loop aerial does away with the outdoor aerial and makes it possible for most anyone to hear the broadcast.

The answer to the question is important, because the success of the receiver absolutely depends on the aerial.

In order to illustrate the operation of an aerial, it is, perhaps, best to take the hydraulic analogy that has been developed by radio engineers as a means of describing an aerial. In reality, it must be understood that the ground and aerial act as a condenser—the aerial being one plate, the other being the ground. The tuner which, after all, is a variable inductance, is merely an arrangement that will permit one to increase the length of the aerial itself.

If one looks upon the aerial circuit as a large trough of water he will understand its functioning a little more clearly. Only recently articles have appeared regarding the aerial problem; but I am assured that there are still many who would like a simple picture of just how it takes its action.

If we picture a water trough and place a paddle wheel in it, we can then see the action or wave motion.

If we commence a steady disturbance in this trough by aid of the water-wheel, the water will be set into wave motion and will oscillate between the two ends of the trough according to the length of the trough; in other words, the natural frequency of the trough.

If this paddle is moved back and forth at a correct rate of speed equal to the natural period of the trough it will set up waves of maximum height which, in time, will pour over the sides of the tub. If, however, the rate of movement is too fast or too slow, the maximum wave-motion will not be attained. If we study the wave motion in the trough we will find that the maximum height of the wave is reached at either end of the trough, and that, as the water flows back and forth in an oscillatory manner, the greatest height is reached at each end of the trough.

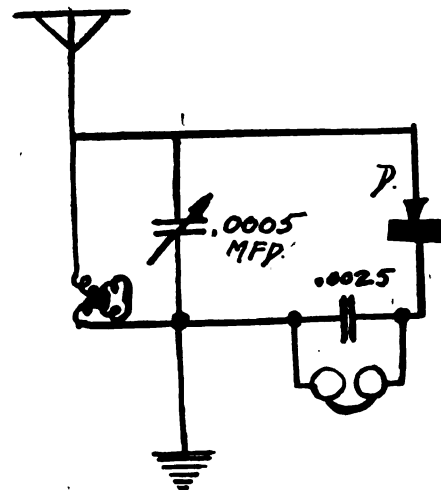
In our aerial circuit this action is reproduced when the incoming wave sets up an oscillatory current in the aerial circuit. It will be found that the highest voltage is at either end of the aerial wire, and it is necessary therefore, that these two ends be thoroughly and completely insulated in order to prevent losses.

Now, we have exactly the same condition in the aerial circuit as we have described in the trough. If the incoming wave-length is too small it will not set up an oscillatory current in the aerial circuit. If it is too large, the same results will be obtained.

With the incoming wave close to the natural frequency of the aerial, we can make up for any small difference by means of an inductance that is connected in series to it. It is for this reason, therefore, that it is necessary to have a well-constructed aerial, free and clear of all objects where the ordinary normal circuit is used in order to get best results.

Radio Crop Service

A WORLD radio-crop service has been established by the United States Department of Agriculture. The Department has representatives in many important European cities, who send reports of crop conditions to Washington. The information is then broadcast over the United States. A recent message from the Berlin representative was received in Washington and relayed throughout the country in less than five minutes from the time the news left Germany.



Schematic diagram of a variometer which gives continuous variation of inductance. The secondary variable condenser is necessary for good results. Drawn by Charles H. Plath.

The inductance in the circuit will enable the amateur to increase the range of his set so far as the wave length is concerned, which is equivalent to varying the trough in the analogy. The addition of a condenser in series with the aerial will have a tendency to reduce the wave-length range of the receiver within certain limits.

The condenser in series with the aerial can be used for more flexible tuning purposes in the aerial. There is a very important point, however, that should be taken into consideration in conjunction with a series condenser in the antenna. In the first place, it is a fundamental fact in electricity that condensers placed in series with each other reduce the total capacity of the circuit and that is exactly just what happens when you place the tuning condenser in series with the aerial, because the latter is also a condenser.

In this connection, there is a very peculiar situation; if the detector circuit is connected to the aerial circuit in such a way that this condenser is included, a great stress will be placed on the detector. Consequently the efficiency of the receiver will be materially reduced.

It is necessary to connect the detector circuit around the aerial tuning-inductance only. Whether this aerial tuning-inductance consists of a straight tuning coil, a honeycomb coil, or any other form of coil does not make any difference. The detector circuit should be connected around it in such a way that the series condenser in the aerial is not included.

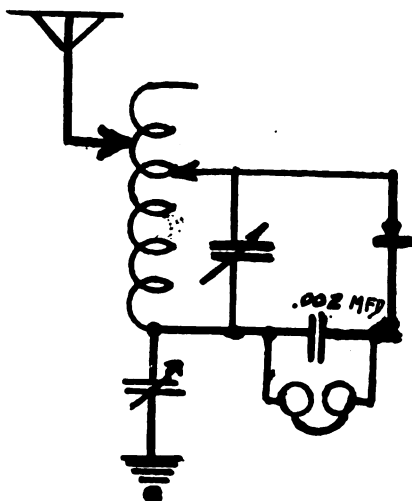
Sharp Tuning Will Help to Eliminate Interference

By Arthur O. Curtis

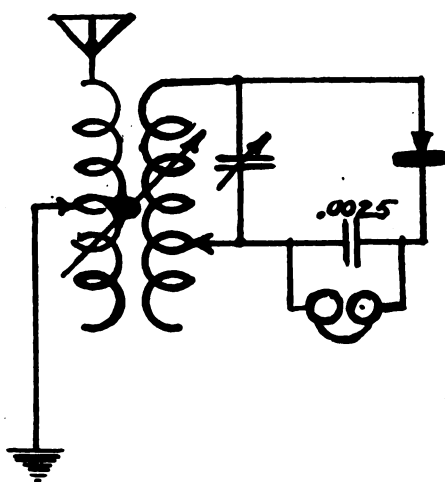
MANY sets made are almost impossible to tune sharply; but whatever sort of an outfit you have, an understanding of its tuning qualities will bring better results both in reduction of interference and signal strength. Interference is one of the greatest studies in the science of radio. With a crystal set using a single-slide tuner as the sole method of tuning, there is no choice in adjusting. Simply move the slider until the greatest sound is obtained. Interference from other stations may have to be tolerated. With this set, it may be impossible to prevent it due to the fact that a direct-coupler receiver is used.

A two-slide tuning coil offers a greater latitude of adjustment and, therefore, greater selectivity. It acts somewhat in the manner of a two-circuit, or loose-coupler receiver, with close coupling. The aerial slider should first be adjusted until signals are heard. The movement should be in the activity of the active end of the coil, or the end connected to the ground. When signals are heard, move the other slider until they are brought in loudest.

The loose-coupler set, which is the inductive type receiver, is the most efficient type for use with a crystal detector. In tuning such a set use close coupling—that is, have the secondary coil inside the primary coil. Set the secondary coil at some rather low value of inductance and adjust the primary by means of slider, or switch. The circuits are brought into resonance after the signals are heard by adjusting the secondary switch. Louder signals may be obtained sometimes by readjusting the primary. Interfering signals may be reduced by lessening the degree of coupling. For short-wave sets using vacuum tubes as detec-



The schematic diagram (above) shows a tuning coil with a variable condenser across the secondary. This makes the tuning sharp and helps to keep down interference from other stations. This tuning coil is of the single-circuit type. The schematic diagram (below) shows the inductive type of coupler. It has a primary and secondary. Again the variable condenser which is of .0025 mfd. capacity, helps to eliminate interference. This is known as a vario-coupler and is far more advantageous in radio work than the tuning coil. Drawn by Arthur O. Curtis.



tors, the regenerative hook-up has proved the best. The tuning elements in such a circuit consist of a vario-coupler, a grid variometer, a plate variometer and, sometimes, a series variable-condenser in the aerial circuit.

Tight coupling should be used in this vario-coupler. Adjust the primary switch; next, rotate the knob on the grid variometer until a howl or squeal is heard. Another squeal will be heard just past this point. Between these two points will be found a point of resonance at which the incoming signals will be heard. The plate variometer should next be adjusted until signals are loudest. It will be found that coupling variation will make a slight difference in the tuning, or in the strength, of signals.

It will be seen that the loose coupler has its limitations but it is far better than the tuning coil. It is more selective. It has two coils. It is of the inductive-type receiver—that is, one may select the station he wants among others that are transmitting at the same time. It is easier to receive with a loose coupler as it acts as a filter which passes the signals that are tuned in and rejects the undesired signals. This is true to a certain point, for it is not always that a very pure wave comes from a transmitting station.

If the transmitting station is very near the receiving station, it also will be hard to tune out. Thus it will be seen that the loose coupler is much more advantageous than the tuning coil.

The loose coupler probably is the most common tuning device used with a crystal detector. The lower diagram is a simple crystal detector, utilizing a loose coupler, also a fixed condenser across the head phones.

Nine More Broadcasters

Gimbel Brothers, Philadelphia, Licensed to Carry on 400 Meters

THE following Limited Commercial or Broadcasting Stations issued by the Department of Commerce, for the week ending November 17, carry on 360 meters:

KFAV—Abbot-Kinney Co., Venice, Calif.

WPAM—Awerbach & Guettel, Topeka, Kans.

WHAL—"Capitol News," Lansing, Mich.

WLAT—Radio and Specialty Co., Burlington, Iowa.

KFFA—Dr. R. C. Shelton, San Diego, Calif.

WNAY—Shipowners Radio Service, Baltimore, Md.

WPAD—Wieboldt & Co., Chicago, Ill. Two new Limited Commercial Class-B Stations on 400 meters are:

WIP—Gimbel Brothers, Philadelphia.

KHJ—Times Mirror Co., Los Angeles.

Belgium's Rulers Become Radio Fans

THE king and queen of the Belgians have become radio fans. According to recent dispatches they listened in to a test concert of the Maline Cathedral chimes, broadcast from the tower by radio.

The suggestion of broadcasting by radio

the carillon of Maline Cathedral, the seat of His Eminence, Cardinal Mercier, resulted directly from the successful broadcasting of chime music, on April 27 last, by WGY, radio broadcasting station of the General Electric Company. On that date, the McKim Memorial bells, now in the lofty tower of Epiphany Church, Washington, D. C., were played in the Old Meneely Bell Foundry at Water-vliet, New York. The foundry was connected to the transmitting equipment, sixteen miles away, by a telephone line. Colonel William Gorham Rice, of Albany, an international authority on carillon, heard of the success of the WGY concert. Since the World War, Colonel Rice has been devoting himself to the rebuilding of war-torn Belgium.

Inventors! Here Are Some Things Sorely Needed in Radio

By C. White, Consulting Engineer

THERE are, perhaps, thousands of radio amateurs and novices with practical ideas concerning radio improvements that, probably would net them modest fortunes if they had the courage to get behind their ideas and give them the necessary scientific backing. That a man is not a technical expert in no way renders him disqualified to perfect a new radio idea; in fact, many inventions come from men who had very little technical training prior to their conception of the lucky idea. If an amateur does not possess the right amount of scientific skill to perfect an invention, he should either take steps to acquire that skill or hire someone with the skill to supply the information and help him over the rough spots. I have personally known of many practical inventions along scientific lines that have proved profitable for the men who had sufficient foresight to seek the right kind of aid.

Radio as a field for inventions is exceedingly fertile, and the wise amateur is the one who fully realizes this and carefully sets his mind to work to accomplish some greatly desired improvement. Consider the radio receiver. We know that the art of transmission is far in advance of the art of reception, mainly because we have spent more time for the development and research of more powerful methods of sending; yet the receiver has been given very little attention until recently. The fact that radio reception has long been neglected is quite obvious when one stops to consider that some deep-sea vessels are still using the old magnetic type of detector, which is much inferior to the ordinary crystal that many novices have in their small sets. Another proof that reception has been neglected is the fact the radio-frequency had to wait so long in the experimental stage before completion; and, in some respects, it is still in that stage. If we resort to the tuned plate-circuit for radio-frequency amplification the tuning of the circuit becomes too critical for an ordinary case of adjustment and manipulation, while it is next to impossible to keep tuned if more than one stage is used. Then, again, if we employ many of the transformers for radio-frequency amplification, we cover the desired increase in range, but the band of

wave-lengths amplified greatly cuts down the desired selectivity which is quite paramount for long-distance work. There is, no doubt, some compromise between the two which will give perfectly satisfactory results and still give us selective amplification; so it is up to radio fans to find that combination and have it duly developed. It can be done, and if some one will only take the time to think up a possible scheme and then try it out with the aid of some reliable manufacturer, or technician, reward for his efforts will follow.

We need better types of tuning coils—coils that are relatively free from distributed capacity and have a very low effective resistance at radio-frequencies. In a recent test of some coils used in radio work, I actually found them not only to be extremely high in resistance loss but also extremely high in effective or distributed capacity. Now, since distributed capacity is a variable with frequency, it was actually found at high frequencies that the condensive action of the coil was greater than the inductive. This meant that the coil was nothing more than a condenser from the electrical standpoint. While it is true that the spider-web, and the honeycomb types of inductance are marked developments in the right direction, I think that there remains an ample field for further progress along that line. Specially stranded wire has aided to a certain extent,

to cut down high-frequency skin-effect, but, as we all know, there is still more room for improvement. We are just beginning to realize what may be done. In fact, the foremost technicians and radio-research engineers are so swamped with prospects of development along so many lines that they are forced to set aside many promising ideas that need careful consideration.

In the field of the short-wave, Mr. Marconi has asserted that we have entirely neglected the vast possibilities to be obtained from carefully planned study along this line. It hardly seems possible that we should plug away so many years on the development of the long wave for transmission of radio signals and completely—and for no good reason—ignore the realm of the short wave. Perhaps millions of dollars have been spent in the development of high-frequency alternators and different types of Poulsen arcs for generating long-wave undamped signals; yet the development of short waves has been generally overlooked. Amateur C-W stations have proved that with relatively small amounts of power they can send signals further than some commercial stations using many times as much power. I personally know of one amateur station, situated in New England, that has been heard at rather frequent intervals in Honolulu and England. This station uses only four 50-watt tubes. The amateur transatlantic tests that are to be held this month will show us how short-wave signals will carry with a relatively small amount of power.

I have given only a few suggestions of the needs in radio, but there are many more that are just as much needed as those I have outlined. For instance, there is still wanting, a simple yet effective means of filtering out static interference. Inventions for increasing the selectivity of a receiver are favorable from the scientific point of view. Methods of obtaining distortionless detection and amplification of radiophone signals are badly needed. Thousands of design improvements in every phase of radio-apparatus construction are awaiting solution. If you have an idea don't let it go to waste simply because you have not the means available for skilful perfection and development.

The Grid Condenser and Leak

THE sensitiveness of a receiver is greatly increased by inserting a grid condenser and leak in the grid circuit in series with the grid of the tube. This usually consists of a small fixed condenser of about .00025 mfd., in shunt, or parallel, with the grid leak of about .5 megohms (500,000 ohms), though these values are not fixed value but should be adapted to the correct tube used. Simply defined, the grid leak is an instrument that will allow extremely small currents to "trickle" through. Grid leaks are generally supplied in complete units and are frequently encased in glass tubes for protection.

Radio Facts

IRON, steel, or galvanized wire is never used for aerials, because they have too low a resistance. Copper is generally used, simply because it is a better conductor of electricity than any of the other conductors mentioned.

* * *

If your ground is poor, signals from broadcasting stations cannot be expected to be heard at any great signal strength. Signals may be so weak at times that it will be impossible to hear anything at all. This is very discouraging. When making a ground connection, don't wrap the wire around the pipe or radiator.

* * *

Body or hand capacity effects may be eliminated if the back of the panel is shielded with thin copper and grounded to the ground binding-post. Copper sheeting may be placed also between the various variometers, care being taken that the sheeting does not come in contact with any of the wires. The variometers should be spaced about 4 inches apart.

* * *

Electrically, the cage antenna handles a given amount of energy with less rise in voltage than any other aerial, and, therefore, has less tendency to leak to the ground. This advantage comes especially into play when this type antenna is used for C-W work in transmission.

* * *

When high-frequency currents flow in a circuit, they travel on the surface of the conductor and are known as "skin effect." For this reason Litz wire and stranded wire are generally used in radio work where high-frequency currents are to be carried.

Cost of Installing a Set

A SIMPLE receiving-set which will copy commercial stations from a distance of 500 miles or more, is quite small. If all necessary instruments are purchased, the cost should be under \$50. When made by the experimenter himself, the cost of material is less. Experimenters who are really interested in "What it does and how it does it," find most satisfaction in mastering the details and operation of each instrument as they add to their stations. That is the way of the logical mind and, under cover of providing for real indoor sport, radio work offers to the younger minds valuable development in logical and analytical thinking—more effective than school-book methods since it is accomplished by real entertainment.

Radio-Wire Tables

By Frederick J. Rumford, E.E., R.E.

No. 3—Double Cotton-Covered Wire

Showing the Number of Feet in a Pound and Fractions of a Pound

APPENDED is the third of a series of five tables which the radio amateur will find useful for many purposes. The succeeding tables—"Single Silk-Covered Wire" and "Double Silk-Covered Wire"—will be published in early numbers of RADIO WORLD

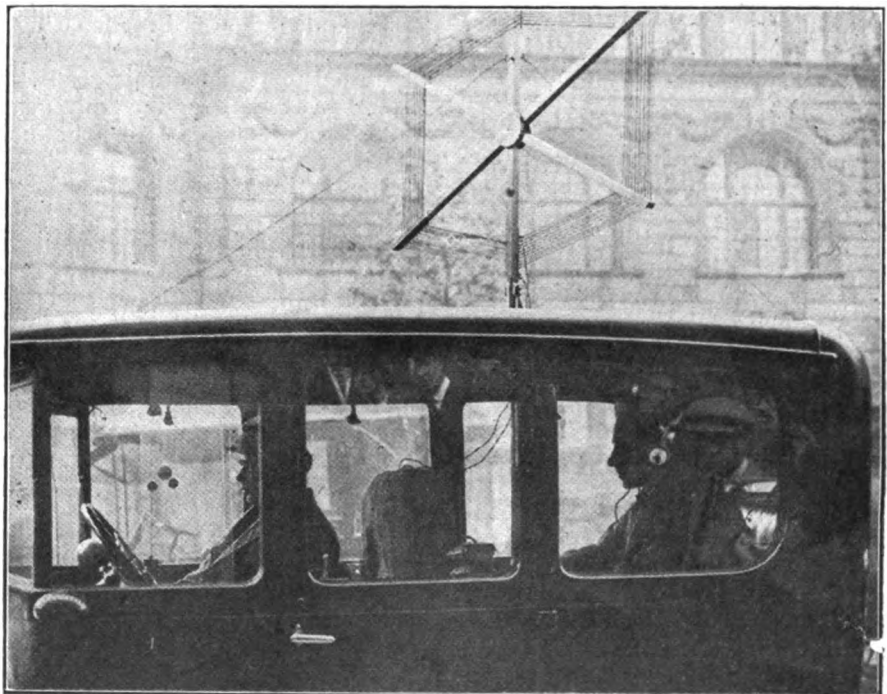
Size	1/8 lb.	1/4 lb.	1/2 lb.	3/4 lb.	1 lb.
20	37	74	148	222	298
21	46	92	184	276	370
22	57	114	228	342	461
23	73	146	292	438	584
24	93	186	372	558	745
25	112	224	448	672	903
26	139	278	556	834	1118
27	177	354	708	1062	1422
28	219	438	876	1314	1759
29	275	550	1100	1650	2207
30	316	632	1264	1896	2534
31	346	692	1384	2076	2768
32	382	764	1528	2292	3137
33	587	1174	2348	3522	4697
34	771	1542	3084	4626	6168
35	842	1684	3368	5052	6737
36	984	1968	3936	5904	7877
37	1163	2326	4642	6968	9309
38	1333	2666	5332	7998	10666
39	1488	2976	5952	8928	11907
40	1777	3554	7108	10662	14222

The following tables have already been published:

No. 1—Enameled Magnet Wire, RADIO WORLD, No. 34, dated November 18.

No. 2—Single Cotton-Covered Wire, RADIO WORLD, No. 35, dated November 25.

Motor Car Receives Radio Messages



(C. Central News)

The above photograph shows a loop aerial erected on the roof of a motor-car. It was an important experiment conducted by the Marconi Wireless Telegraph Company of London. The set was installed in the center of the car in order that the lead-in wires from the loop might be brought to the set. Results were obtained thirty miles from a broadcasting station. Note this peculiar loop aerial. It can be rotated from the interior of the car, making it possible to manipulate the direction of the loop while receiving electromagnetic waves from a broadcasting station. Loop aeriels are being used by many radio amateurs. When the loop is employed, radio-frequency amplification or the well-known Armstrong superregenerative receiver must be used in order to get results. This loop has the distinction of eliminating interference, a marked advantage over the outside aerial.

Arlington to Be Government's Radio Broadcasting Center

WASHINGTON, D. C.—With 573 private broadcasting stations offering daily programs, the radio public is apt to lose sight of the fact that the United States is also broadcasting information on many subjects. Six departments are scheduled for daily or semi-weekly programs and forty-two Naval radio stations are carrying news of one sort or another.

Requests for permission to broadcast have become so numerous that the co-ordination of all government broadcasting has become necessary. A committee of twelve officials, representing as many branches of the government at Washington, is endeavoring to supervise matter submitted for public broadcasting over radiotelephone circuits furnished through the courtesy of the Navy Department. In order that the listeners-in may receive the maximum service with a minimum of interference and without duplication, this committee was appointed last spring at the suggestion of Herbert R. Hoover, Secretary of Commerce. It is known as the Interdepartmental Advisory Committee on Radio Broadcasting. Although the committee meets biweekly, its subcommittees are busy almost continually with this work.

Scope of Interdepartmental Work

Demands for broadcasting of telegraph matter, as well as telephone, are constantly increasing and the scope of the committee's work is gradually growing greater. Recently the question of broader activities and supervision has arisen, due to the frequent requests for investigation and advice on matters other than telephone broadcasting, originally the committee's sole function. Extension of activities is understood to have been generally approved by the different departments so as to cover the subject of radio communications, and the matter is now before the Secretary of Commerce for further action. It is quite probable that this committee will eventually become the statutory advisory committee provided for in the radio bills sponsored by Senator Kellogg and Congressman White.

Activities of the committee to date have made possible the broadcasting of several interesting programs from NOF, the Naval radio station at Anacostia, which is primarily the experimental radio station of the Navy's Bureau of En-

By Carl H. Butman

gineering. The Anacostia station, however, cannot carry the load and does not operate on Saturday afternoons, due to other official duties. As soon as arrangements are completed, all radiotelephone broadcasting for the government will be transferred to the big Arlington station.

Origin of Interdepartmental Committee

Last spring, when the popular demand for broadcasting reached its height, so many official and semi-official requests to use NOF were made of the Naval Communications Service that Secretary Denby could not grant them all; in fact, he finally ruled that only official messages could be transmitted. At one time, NOF was closed to all except the highest governmental officials. Suggestions that an interdepartmental committee be appointed to pass on broadcasting and supervise its operation, made by Secretary Hoover, therefore, were welcomed by the Navy Department. The committee began to function on June 1. Matter submitted for broadcasting is inspected and methods of operation arranged by subcommittees which attend to all details, determining the value and demand for particular broadcasts.

Applications for broadcasting by the Interior, Agriculture, Labor, Treasury, Commerce, and War Departments have been approved by the committee and fixed schedules, giving each applicant a maximum service of three fifteen-minute periods each week, have been put in operation. Many listeners-in throughout the country have undoubtedly heard the evening lectures and band music over the NOF phone on 412 meters.

The Government's Schedules

On Monday, Tuesday, and Thursday evenings, the Treasury Department broadcasts deal with the activities of the Public Health, Internal Revenue, and Savings Bureaus. The Commerce Department's schedule on Tuesday and Thursday evenings includes information on foreign and domestic markets, trade news, and fisheries. Talks on immigration, women's activities and child welfare are made on Monday, Tuesday, and Thursday evenings by officials of the Labor Department. The Interior

Department furnishes lectures on education and mining on Monday and Thursday evenings and Tuesday afternoons. Information pertaining to crops and weather is transmitted every Monday, Tuesday, and Thursday evening by the Department of Agriculture. Officers of the Department of War will shortly broadcast a series of talks on military activities and recruiting on Monday evenings. Sometimes special broadcasts are arranged for national associations, such, for example, as the series of speeches on Naval Activities by officers of the Navy, requested by the American Marine Association during its exposition in New York. The evening programs are so grouped as to make a compact schedule and not interfere with private broadcasting. Each week the programs will be announced by the Navy Department.

Arlington Chief Broadcasting Station on Two Waves

The opening of NAA, Arlington, as the official government broadcasting station, has been delayed due to difficulty experienced in operating on the lower governmental wave-band designated for telephone broadcasting. Very soon the Arlington station will open two telephone broadcasting circuits. It is a very busy station and it is necessary to operate several circuits simultaneously without interference. NAA's new broadcasting telephone set of 750 watts, recently installed, operates very successfully on the 2050-meter wave telephone circuit, using the main antenna, but does not give good results on the government's 490 wave due to reactions between other sets when in use. For this reason, the subcommittee on technical matters has been requested to consider the use of a wave length of 430 meters in this work. If it is approved, special permission will be requested of the Department of Commerce for its use, since it lies in the band assigned to private and toll broadcasting. The lower wavelength is believed necessary so that the service will be available to the people who do not own sets capable of picking up the long 2050-meter wave.

Code Broadcasting Extensive

Telephone broadcasting for the departments is not the only work handled by the Naval Radio stations; many messages are broadcast also in telegraph code. NAA car-

Transmitter That Slips Over the Head

By S. R. Winters

THE multitude of instruments in the cockpit of a modern airplane is graphically pictured in a recent diagram indicating that the pilot must manipulate or watch forty units of apparatus. The use of radiotelephony and radiotelegraphy in aerial navigation has enlarged the mass of instruments and controls, this communication service including a radiotelephone transmitter, radioreceiving tuner, wireless amplifying switch, radio-tuning condenser, wireless transmit-receive switch, radio-receiving helmet, telegraph key, and radio direction finder.

Obviously, then, the hands of the pilot are never off duty. Since the control levers for the actual manipulation of the air-going machine are likely to monopolize his hands, the use of the radiotelephone is possible while the pilot fingers with the throttle of the engine or other mass of instruments of the aircraft proper. Once the telephone receiver is placed directly over the ear canals, and the telephone transmitter is ad-

justed in front of the mouth, both the transmission and reception of communications may be negotiated while the thumbs and fingers are engaged in controlling the fortunes of the airplane. The accompanying photograph herewith shown illustrates a type of radiotelephone transmitter and receiver which snugly fits over the head of the pilot.

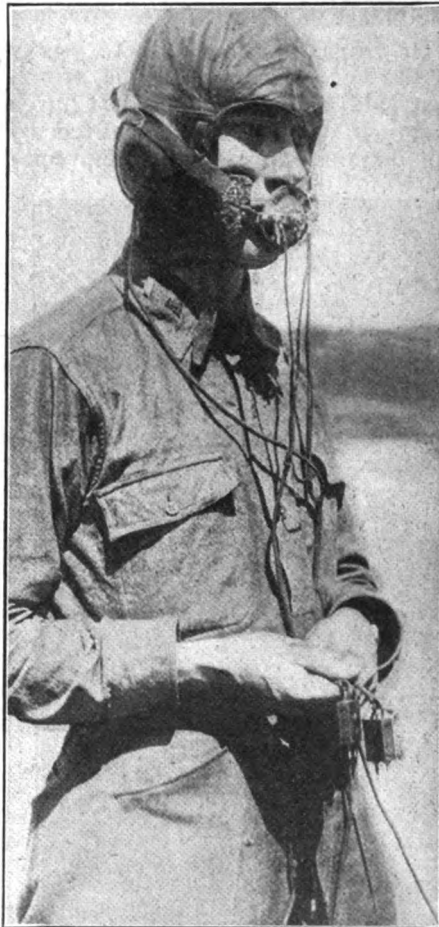
Contrary to the common system of transmitting wireless messages from ground stations, the hands are absolutely relieved from holding the telephone and they may be employed in making adjustments of the wireless apparatus proper or in manipulating the control levers of the flying machine. The helmet is made to

order; that is, each unit is designed for an individual wearer and the owner is cautioned not to loan it to others. The telephone receiver is adjusted directly over the ear canals and is fitted thereon snugly as a means of excluding vibrations of the airplane engine and other noises foreign to the incoming wireless signals.

The telephone transmitter is so adjusted in front of the mouth that the wearer can use it without causing him to bend his head. Close inspection of the photograph illustrating this type of telephone-transmitting device shows that it is not far removed from the lips of the operator. Voice tests have indicated that indistinct transmission of speech is produced when the pilot wears the transmitter too far from his lips.

This design of telephone transmitter may be conveniently employed for intercommunication between two airplanes, or a squadron of flying machines, or between aircraft and wireless stations on the ground. When used in connection with the transmitting circuit of SCR-68, a popular radiotelephone set of the Signal Corps of the United States Army, it operates thusly:

If no voice vibrations are impinged on this transmitter, the potential of the modulator tube grid remains constant. Consequently, there is no fluctuation in the electric currents of the plates of the two electron-tubes. However, when the pilot impresses his "gift of gab" on this telephone transmitter, a pulsating electric current is caused to flow in the primary circuit of the input transformer. This is the resultant action of the transmitter, which impinges on the grid of the modulator electron-tube an alternating or varying potential electric current following the modulation of the voice. Such variations cause corresponding changes in the electric current permitted to get into action in the plate circuit of the modulator electron-tube, and, therefore, in the plate current of the oscillator-audion bulb. Finally, these variations find their way into the amplitude of the oscillations in the circuit of the antenna. Consequently, the electro-magnetic waves radiated by this telephone-transmitting outfit, instead of being of constant amplitude, have an envelope reproducing the pulsations of electric current in the telephone-transmitter circuit. The electric waves are modulated to the speech.



The above photograph illustrates a type of radiotelephone head gear, consisting of a microphone and a set of ear pieces, which fit snugly over the head. This is a marked improvement in radio for operators who work aboard airplanes. It is possible for the operator to manipulate the controls, dials, direction finder, and key without holding a microphone, which had to be done prior to the use of this device. The microphone is so adjusted before the speaker's mouth that he can use it without bending his head. Close inspection shows that it is not far from the lips of the operator. Voice tests have indicated that indistinct transmission of speech is produced when the operator wears the transmitter too far from his lips.

(Continued from preceding page)
ries ten telegraph broadcasting schedules daily, totaling thirty hours each week and comprising, chiefly, quotations on foodstuffs for the Department of Agriculture approximating 35 per cent of its day's work. NAT, the Naval station at New Orleans, broadcasts two schedules a day, aggregating four hours a week; the Great Lakes station, NAJ, carries eighteen daily schedules, constituting thirty-six hours a week.

In addition to this matter, twelve Naval stations broadcast two time-signals daily; twenty carry hydrographic information; thirty-seven transmit weather forecasts; and six broadcast press matter. Sandwiched between these many schedules, the Navy carries on its own official communications, as well as many for the State Department, to ships and foreign stations, and is busy with experiments.

A glance at the operating schedule of any governmental radio station will explain why the government requires the service of the Interdepartmental Committee in an effort to simplify and standardize government broadcasting. Uncle Sam is not only generous with his information but he is also generous in his means for transmitting it to the country at large.

Broadcasting God's Word to Millions

By Peter Gray

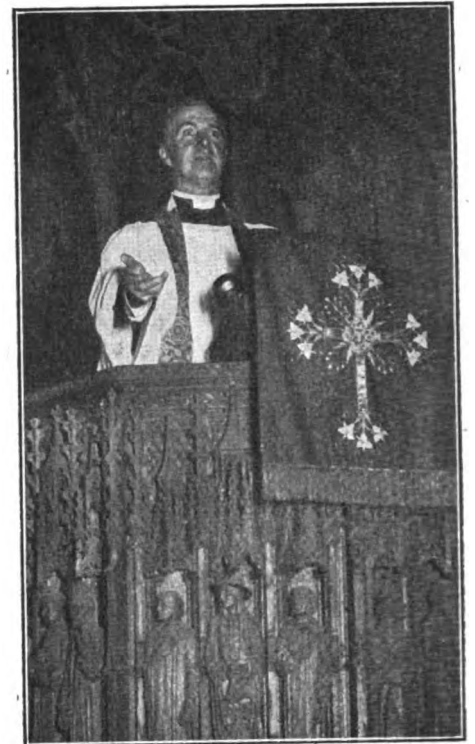
IN the Beginning God," the first four words in The Holy Bible, was the text chosen by Reverend Ernest M. Stires, D.D., for twenty-one years rector of the Saint Thomas Episcopal Church, Fifth Avenue, New York, for his sermon, "The Inevitable Faith," which was the vital part of the first church service to be broadcast from a church edifice in Greater New York.

Dr. Stires became a radio enthusiast last winter after conducting a radio chapel service in WJZ's broadcasting studio in Newark. Various members of the Saint Thomas's parish who were out of town, as well as others, telegraphed, telephoned or wrote about the helpfulness of the service and the clear reception. The request was then made by the Westinghouse officials that they would like to broadcast services from the Saint Thomas Church. The suggestion was favorably received by Dr. Stires as he was overwhelmed by the immediate response of the invisible audience.

The Saint Thomas Church is con-

sidered by architects to be the finest example of Gothic architecture of very recent construction. The interior of the church with its wonderful pillars, beautiful pulpit, and exquisite altar and reredos is almost beyond description. A sound-proof brick ceiling makes the acoustics of the Saint Thomas Church almost perfect. The microphones are hidden so as not to detract from the church services. One is on the pulpit, near the Bible, for broadcasting the sermon, one at the lectern for the reading lesson, two on the chancel for prayers and solos, two at the altar for prayers, one on the balcony for the organ and choir, one in the hall for the processional and opening prayer and one for WJZ's announcer.

Dr. Stires in an introductory way in the second service to be broadcast said the Saint Thomas Church is much pleased and benefited by the instant expression of apprecia-



(C. Kadel & Herbert)

Dr. Ernest M. Stires in the pulpit of St. Thomas, New York, delivering a sermon by radio. Note the microphones on the lectern.

tion of the great world outside of the parish and that if any opposition had existed (there was none by the parish), it would have been dispelled by reading the letters piled upon his desk—some came from those who were ill for years and never expect to leave their homes, who said they were benefited and helped and were grateful; a group around a receiving set took up a collection and sent \$11.25 to help defray the church expenses.

A suburban resident, who used to attend church regularly, was working on his auto and, grease besmirched, listened in during the wonderful service, and did not feel free to break the silence of his home during the Communion any more than he would in church. Others stated that it was their habit to spend Sunday morning playing poker with friends. Now when 11 o'clock comes around, the cards are cast aside and the radio receiver set to work. And so with pipes alight they follow the service. Two instances of lazy ways to go to church but far better than not going at all.

It was not many months ago when there was a great diversity of opinion in religious circles about the propriety of broadcasting church services as it seemed almost sacrilege to broadcast prayers and hymns. That was before the first experiment was made, in the history of radiotelephony.



(C. Kadel & Herbert)

Part of the radio equipment of St. Thomas Church, New York. Note at right ordinary telephone transmitter with special microphones.

National Radio Week Is Gripping the Entire Country

WHAT it IS—NATIONAL RADIO WEEK is a movement to popularize radio, to double the number of broadcast listeners, to show the progress made thus far in broadcasting, to reveal new possibilities, to kindle the spirit of radio in as yet unresponsive breasts.

What it is NOT—It is NOT a movement by any one organization. It is NOT a manufacturers' drive. It is NOT intended to be anything but a thoroughly unselfish, co-operative effort, national in scope, exhaustive in material.

When it is to be held—December 23 to 30 (inclusive) this year.

The campaign is being directed by an executive committee, of which J. Andrew White, editor of "The Wireless Age," is chairman. Others on the committee are: H. Gernsback, editor "Radio News"; Arthur H. Halloran, editor "Radio"; Roland B. Hennessy, editor RADIO WORLD; Laurence Nixon, editor "The Radio Dealer"; and Arthur H. Lynch, treasurer, editor "Radio Broadcast."

Headquarters—NATIONAL RADIO WEEK headquarters are at 326 Broadway, New York City, N. Y.

What is to be accomplished—Every listener will endeavor to interest one person into a radio fan. This will double the number of broadcast listeners. Programs from every station in the country, specially prepared to fit the holiday season and the spirit of the week, will be sent out on the air. Sporting events, operas, jazz bands, speeches, and other particularly interesting programs will fill the air. Nation-wide broadcasts of a single event to be heard in every section of the country at once will be made.

Country-Wide Words of Praise

The following additional acceptances of places on the general committee, and expressions of approval for the campaign, have been received:

"Radio Journal," 113 Stimson Building, Los Angeles, says:

We are glad to put our shoulder behind National Radio Week. Our new editor, K. P. Frederick, is lining up local newspapers. Our general manager, Hugh Harlan, is getting support from local dealers. Mr. Frederick accepts the honor of being on your committee.

"Radio Topics," Oak Park, Illinois, says: We shall be glad to co-operate with you,

and in our December issue there appears a timely editorial. Our January issue, which will be out December 10, will also carry publicity of assistance to the movement. We should be very glad to have you include our name on the active press members.

"QST," Hartford, Connecticut, K. B. Warner, editor, says:

Our December magazine contains an editorial in which we have pointed out to our members the idea of doing what we can to boost radio during National Radio Week. I will accept a place on your general committee as the editor of QST.

Mr. H. Lewis, "Radio News," Toronto, Canada, says:

I will be only too pleased to co-operate with your committee in putting across a "Radio Christmas." I have been playing up this idea. I should be glad to accept a membership on your committee.

J. B. Taltavall, publisher of "Telegraph and Telephone Age," 253 Broadway, New York, says:

You are at liberty to add my name to your general committee.

Frederick A. Smith, editor, "Radio Age," Chicago, wires:

Pleased to accept membership on National Radio Week Committee. Will lend hearty co-operation through magazine. The idea is good.

Telegram from "Radio Digest," 123 West Madison Street, Chicago, Charles F. Smisor, editor:

Count me in!

S. Gernsback, editor of "Radio News," says in the December issue of his magazine:

December 23 to December 30, inclusive, is to be the first National Radio Week, suggested originally by Mr. Roland B. Hennessy of New York City. During that week every radio enthusiast should try to think, talk, dream and do it nothing else but Radio.

The object is to acquaint the public at large with Radio.

"Radio News" has prepared a beautiful colored post card which we shall be glad to send to every one who asks, in any reasonable quantities. This postal card, the picture of which will be published in the next issue of "Radio News," is to be sent to all your friends who are as yet

not interested in Radio, inviting them to come and see your station, or any first-class station of which you know.

This is a preliminary announcement, and we shall have more to say about National Radio Week in the January issue.

"The Evening Journal," New York, says:

The great part which radio communication has taken in the dissemination of education and entertainment and its service as a means of interchanging information is to be demonstrated by a co-ordinated program of the radio interests, in a country-wide undertaking to establish a National Radio Week as an annual event.

The effort to establish National Radio Week as an annual institution is backed by co-operative effort on the part of the newspapers, the radio press, manufacturers, dealers, amateurs and the great army of broadcast listeners.

The tentative program is arranged for the week December 23 to 30, inclusive. It is a most comprehensive plan to popularize radio with the public, and while only a general outline of the plan is so far available, it is known that it embraces programs of national, State and local character in which the 550 or more radiophone broadcasting stations of the country will take an active and important part.

Special programs to include the leaders among public officers, statesmen, educators and the musical and entertainment world in general are being arranged, all with the main idea of introducing radio to the uninitiated and firmly establishing it in its proper place as a recognized agency of bringing radio instruction and entertainment into the homes.

Under the heading "Hail National Radio Week and Help Put it Over Big," the "Radio Retailer and Jobber" says:

The idea was first announced at a luncheon of radio paper editors held at the Bankers Club, in the Equitable Building, 120 Broadway, New York City, early on a Tuesday afternoon in October last.

The innovation was seized upon with alacrity by all present and provision was made for a very formidable and well-balanced committee to sponsor the institution and make of it a crowning success.

The broadcasting stations were called upon to transmit the announcement that Radio Week was scheduled soon to come; thus saving a huge outlay in postage, though extensive circularizing has been provided for.

The broadcasting stations have also been urged to commemorate National Radio Week by particularly notable programs which would prompt listeners-in to look forward to Radio Week as an annual institution.

Every effort will be made to make Radio Week a national and not a localized innovation.

So one and all from coast to coast, and from the lakes to the gulf, with Canada thrown in, let us root for National Radio Week, and let us put it over with a great blare of trumpets, so that it may be a national institution, an annual visitor and a great stimulator of activity in the radio trade for many years.

Send in your Ideas for the
Success of
National Radio Week

Help to Make It the Big
Christmas Event

Be a National Radio Week
Booster

Progress in Radio Devices

Approximately 3500 Patents Already Granted, 400 of Which Are Held by Fessenden, De Forest, and Stone

By *B. R. Cummings*

Radio Engineer, General Electric Company

THE fundamental phenomenon which is utilized in radiotelegraphy and radiotelephony was first demonstrated by Heinrich Hertz, the German electrician, in 1888, thirty-four years ago. Hertz, at that time, showed that it was possible to radiate energy through free space. He was not interested in accomplishing results over great distances, apparently not having conceived the idea that this phenomenon could be utilized as a method of communication, and his tests were carried on only over distances up to approximately 300 feet.

In fact, Hertz deliberately avoided using an earth connection in his apparatus, which would have immediately increased the distances over which he worked, believing that this would detract from his demonstration of the transfer of energy through space and that it would appear that the energy was being transferred by the conductivity of the earth. He was interested only in a pure demonstration in physics.

It is of interest to note, in comparing Hertz's equipment with modern radio apparatus, that his receiver consisted only of a single loop of wire which included a minute spark gap, and that his indication of the transfer of energy through space was the spark which jumped this gap when the so-called "Hertzian Oscillator" was in operation. His receiver, or "indicator," therefore, was extremely crude as compared with modern radio-receiving.

The Hertzian oscillator remained a laboratory instrument for a number of years, and was used only in connection with experiments in physics.

In 1894, Marconi, who was a wealthy young man with a scientific training, saw in the Hertzian oscillator a possibility of developing a new method of communication which would permit communication being carried on over areas previously considered impassable. Instead of avoiding the earth connection, as Hertz had done, he used it both as the transmitting and receiving stations and was immediately able to secure an indication of the transfer of energy over much greater distances than had been realized by Hertz.

The years immediately following 1894 were marked with intensive development on the part of Marconi, both of transmitting and receiving equipment, with gradually increasing ranges, until, on December 12, 1901, he succeeded in transmitting the letter S across the Atlantic from England to Newfoundland.

While Marconi, since that time, has contributed greatly to the advancement of the radio art, his greatest work may be said to have been completed at that time, for he had shown that the Hertzian oscillator, which had previously been considered only as an interesting laboratory experiment, could be used in establishing communication over great distances, and that the widespread use of this system depended only upon the further perfection of the apparatus utilized.

This accomplishment attracted the attention of scientists in all parts of the world toward "wireless," as it was then called. In the years immediately following, tremendous strides were made in improving the sensitivity of receiving equipments and in increasing the power radiated at the transmitting station.

The individual accomplishments in radio from this point on are somewhat hard to define, although several of the outstanding contributions to the art can be touched upon.

In 1884, Edison, and several years later, Fleming, discovered that it is possible to pass an electric current from a hot body to a cold body in a vacuum. This phenomenon was investigated by Fleming for a number of years. After he discovered that such a device would pass current in one direction only, and was, therefore, a rectifier, he secured a patent on it in 1905, the device being known as the "Fleming Valve." This valve was utilized in radio-receiving circuits as a detector and was a tremendous improvement over previous forms of detectors.

Shortly thereafter, Dr. Lee de Forest obtained a patent on a device which he called the "audion" and which was essentially the Fleming valve with a third electrode by means of which it was possible to control the current flowing in the tube.

Strangely enough, in spite of the

progress made in these devices, which are grouped under the heading of "vacuum tubes," comparatively little was known of exactly what takes place in them. A number of years elapsed before their functioning had been analyzed.

In 1915, Armstrong made known what has since come to be called the "feed-back" circuit, by means of which the detection and amplification of received signals, by a single tube, was made possible, and also by means of which the three-element vacuum tube could be made to function as a generator of alternating current, making possible the modern vacuum-tube transmitter.

Although radio broadcasting is a recent development, radiotelephony was first accomplished as far back as 1905, and the broadcasting of music was successfully carried on by de Forest as early as 1914. Practically no interest was shown by the general public in broadcasting at that time, and his concerts were discontinued. Broadcasting has also been carried on, although in the Continental code, by the Navy Department station at Arlington, Virginia, which, since 1915, has been transmitting time signals, weather forecasts and news events each night after 10 o'clock. It has been from Arlington's transmission that ships at sea have been able to print daily newspapers.

To indicate the great number of devices and circuits which have been developed for radio communication, approximately 3500 radio patents have been granted up to the present time. Naturally, some means have been much more prolific in this respect than others; and three men, who were most active in the early days of radio, Fessenden, de Forest, and Stone, hold among them a total of nearly 400 patents.

And yet, the tremendous amount of research and development work which has been done in advancing the radio art has only served to indicate fields and applications for this method of communication which have as yet been unexplored. It seems assured that radio will eventually find its place as a public utility and be utilized to an extent far surpassing any of the other existing methods of communication.

The Radio Primer

*For Thousands of Beginners Who
Are Coming into Radio Circles*

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

I*S all electricity made up of electrons?*

All electricity is made up of electrons. You will get a correct idea of electricity if you try to visualize it as being made up of electrons. Everything contains electricity; in other words, everything contains electrons.

* * *

What are electrons?

An electron is a minute negative charge—it is but the smallest fraction of an atom. A negatively charged body has more than its usual number of electrons. A positively charged body has less than the usual number of electrons.

* * *

How do these electrons flow?

Electrons flow along a conductor when that conductor connects objects, or points, which do not have the same share of electricity, not the same amount of electricity. One body may have a greater amount of electricity than another and yet have the same share in the same way as if a grown man and a two-year-old child were sharing food. The man would have a greater amount of food than the child, and yet he would have shared it with the child. In electricity the size, shape, and other elements of a body determine what the share should be.

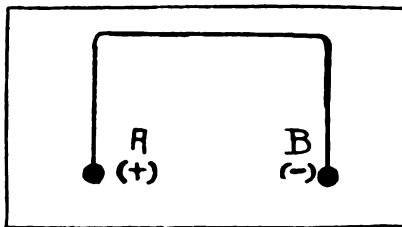
* * *

How many ways are there in which an object may have a different share of electricity?

There are five ways in which an object may have a different share of electricity. One object may have more than its usual number of electrons and another object less than the usual number. Electrons will travel until both have the same share. Still there are four more ways in which an object may have a different share of electricity. Years ago, before much was known about electricity, it was understood that something "flowed" along a wire. The men studying electricity then agreed to say that it "flowed." They had an even chance of being right, but they made the wrong guess. The word has not been changed. To do so now would only create confusion. In a similar sense, we state that the sun rises. It is a stationary body. The earth moves. However, electricity "flows" along a wire from one end to another. The force of this is called "voltage."

What is voltage?

Voltage between two points measures the effort which the electrons make to move from one point to another. The effort which electrons make to move from one point to another depends on the difference in the proper share of electrons in excess of the other. The greater the difference in the share of electrons, the greater the voltage. However, we do not measure voltage by saying that one point has a certain number of electrons in excess of the other. It is measured in volts. This is somewhat



Schematic diagram of a conductor across a plus, or positive line, and the minus, or negative, side. Its duty in radio is to carry the electrons from pole to pole. In radio work this is termed a short circuit. Drawn by Lynn Brooks.

similar to the fact that we do not buy beans by ordering a certain number—we buy them by the quart. When you speak of voltage you must have two points in mind. Voltage is an expression of the effort made by electricity to get from one point to the other. It is measured in volts.

* * *

How do the electrons travel?

Electrons travel, or try to travel, from the point which has the greater share of electrons to the other point. As the point which has the greater share of electrons is negative (—) and the other point usually positive (+), the electrons travel, or try to travel, from negative to positive. The current is said to flow in the opposite direction—that is, from positive (+) to negative (—).

* * *

What is necessary to produce an electric current?

If we can keep a point so that it will always have more than its usual number of electrons (—), and another point that will always have less than its usual number of electrons (+); and if we connect both points by a conductor, we will have the condition necessary to produce an electric current.

How to Determine a Detector Vacuum Tube

TO determine a detector tube from an amplifier can be accomplished only by experiment. Place the detector tube in the amplifying socket and use from 45 to 60 volts of plate potential. Turn on the filament current and pay close attention to the results. If the tube should happen to turn blue, turn off the current at once. This test will show that this tube is a soft tube and should be used as a detector and for detecting purposes only. In case the blue glow is not present, it is a sure sign that this tube is an amplifier of the hard-tube class.

What Is Meant by Coupling

THE object of loose coupling is to eliminate the effect of interference by loosening the coupling between the two coils, the primary and secondary. It has been found in practice that when the primary and secondary circuits are in resonance with each other, the primary and secondary coils may be separated quite a distance and signals still be recorded in the telephone receivers; whereas signals that are not in resonance with the circuits will be eliminated by widening the coupling between the primary and secondary.

The Tickler Coil's Use

THE tickler coil is a coil of wire placed in inductive relation to the primary and secondary circuits of a receiving set. The tickler itself is in the plate circuit of the vacuum tube and affords a feed-back system that produces regeneration. The function of the tickler is best explained by describing what happens if you take the telephone receiver from the hook when the bell is ringing and then place the receiver to the transmitter. The result will be a continued "howling." This is regeneration. In a radio circuit, the tickler coil produces regeneration.

The Radio Primer has been published regularly in RADIO WORLD since issue No. 1, and will be a regular department in order to instruct and aid the many thousands of amateurs who are joining the ranks of radio enthusiasts every week.

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

MAJOR GENERAL JAMES G. HARBORD, deputy chief of staff of the United States Army, on his retirement will become president of the Radio Corporation of America. General Harbord was elected head of the Radio Corporation at a recent meeting in New York. His retirement from the Army will be effective December 29, Secretary Weeks announces, and he will assume his new duties on January 1, 1923. Edward J. Nally, president of the Radio Corporation, it is announced, has been elected to a new office—that of managing director of International Relations, with headquarters in Paris.

* * *

The Mexican Government is about to receive four powerful radiotelegraph sets, which are to be presented to the republics of Guatemala, Honduras, Costa Rica, and Nicaragua in accordance with the decision of the president of the Republic.

* * *

The London Free Press of London, Canada, recently opened its broadcasting station. Its call letters are CJGC and its wave is 430 meters. At present its power is derived from two 50-watt oscillators.

* * *

Probably no other broadcasting station in the country can claim the distinction recently achieved by station KSD, San Francisco. A concert was sent out from this station, which was heard in every State in the Union.

* * *

A radio message, picked up at the Santiago Station of the Naval Wireless System and relayed from San Francisco, purporting to come from Hilo, Territory of Hawaii, told of an earthquake and tidal wave there. Efforts to communicate with the Hilo Radio Station, operated by a private concern, later were unsuccessful, but radio men declared it was not usual for that station to communicate direct with mainland stations.

* * *

The completion of the new radio station at La Prairie, Canada, will connect Sydney, Australia, and London.

* * *

The United Fruit Company has announced the inauguration of a free medical radio service from its hospitals in the various countries of Central America and from its passenger steamships to all ships at sea. This service is to be available without charge to ships of all nationalities through the following radio stations operated by the United Fruit Company and the Tropical Radio Telegraph Company: New Orleans, WNU; Burwood, Louisiana, WBW; Fort Morgan, Alabama, WIO; Swan Island, US; Tela, Honduras, UC; Puerto Castilla, Honduras, UA; Tegucigalpa, UG; Port Limon, Costa Rica, UX; Almirante, UB, and Santa Marta, Colombia, UJ.

* * *

To London and back, by radio, in 45 seconds! To Berlin and back, by radio, in 2 minutes and 40 seconds! These were the records made at the Engineering Societies Building, 26 West 39th Street, New York City, on Wednesday evening, November 22, during a discussion on radio by David Saranoff, vice-president of the Radio Corporation of America. "How's the weather?" was the query flashed across the Atlantic. Within three minutes the members of the society heard the dot and dash replies hurled back through the night from three countries of Europe. Within forty-five seconds London's answer came

in: "Raining, mild." Ten seconds later came the reply from Norway: "Overcast, mild." France was third with: "Lovely weather," and Germany came last, two minutes and forty seconds after the question. She answered, "Gloomy, cold," and then added, "Greetings." A new development in radio, which Mr. Saranoff predicted would come soon, he described as the "wrist-watch wireless set or radiolet." "Such a set could be carried easily on the person," said Mr. Saranoff, "and signals could be received from stations twelve or fifteen miles distant, thus a man could receive in his vest pocket market reports, weather reports and details of championship games."

* * *

Amateur long-distance radio records were shattered at the radio station of Hiram P. Maxim, president of the American Radio Relay League, when a radiogram was sent to Clifford Dow, Waikiki, Hawaiian Islands, and the answer was received in 4 minutes and 18 seconds. The radiogram was relayed at Sleepy Eye, Minnesota, by Lloyd V. Berkmer. The distance from Hartford to Sleepy Eye by air line is about 1,200 miles, and thence to Wailuku 4,000 miles.

* * *

Cavalry Church, Pittsburgh is using radio-receiving sets as an extension work.—"Our parish is now doing organized work by wireless," said Dr. E. J. Van Etten, the rector. "We now have receiving sets. On certain nights, the Church Home is hearing our service through one of them. Two invalids are hearing these services through smaller sets in the hands of the new Calvary Radio Club. We send greetings of others who every Sunday night hear these sermons."

* * *

For the first time symphony music by a large orchestra has been broadcast by radio direct from the theatre.—That distinction falls to the Capitol Grand Orchestra, New York, whose performance of Richard Strauss's symphonic poem "Fun Heldenleben" was broadcast recently. The American Telephone and Telegraph Company, which perfected the sending, pronounced the achievement successful in every respect. The music was heard over a radius of 1,000 miles and over 600,000 radio sets caught the concert. The feat was accomplished by a highly sensitized microphone suspended from the roof, by which the sounds of the music were amplified and carried over equalized telephone wires to station WEAJ and then sent.

* * *

Radio communication is successfully used on airplanes to communicate to military bases from the air or enemy territory. The apparatus comprises a small sending and receiving station of light weight. Remarkable success has been attained over long ranges with radiotelephone, radiotelegraph, and direction-finding equipment. The receivers are provided with sound protectors, but receiving is less successful than sending because of the propeller noise. This defect has been overcome to some extent by using sound insulated telephone-headpieces. The aerial is generally, mounted on the planes and a counterpoise or additional aerial is used instead of a ground.

* * *

The first dress rehearsal of a theatrical performance to be broadcast by radio is also reported.—"This Little Kangaroo," the new musical comedy with James T. Powers, has been arranged was sent out by WJZ from the Morosco Theatre, New York. This important radio event took place at 5:30 p. m., November 22.

Getting Ready for the Big Show

S. H. FAIRBANKS, who managed the recent successful Radio Show in Boston, has been retained as advisory director by the management of the American Radio Exposition. This apportionment will be held in Grand Central Palace, New York, December 21 to 30, inclusive, and from present indications will far surpass any radio display of the past. Mr. Fairbanks will take charge of exhibits, the appointment of space, and other details of staging the show. L. S. Byers, executive secretary of the committee in charge of the show, will continue with the program of organization. A series of novel and sensational features are be-

ing worked out at present to make the exposition unusually interesting to the general public, as well as the fans and those unfamiliar with radio.

A number of new exhibitors contracted for space during the past few days. These include the Electric Storage Battery Co., A. H. Grebe & Co., Jewett Manufacturing Co., Newark, N. J., and the Burgess Battery Co. Exhibits are promised by the Western Electric Co., Inc., The Radio Corporation of America, and the National Carbon Co.

For economical reasons, practically all industries holding yearly expositions have learned that the East will support only one exposition a season, with perhaps one in the Middle West and one in New England. In view of the importance

of the metropolis as an industrial and export center, the numerous manufacturers exhibiting are talking co-operation in one big annual New York event, staged in a manner that will mean profit to manufacturers and dealers alike, and attractive to the public.

Held in 'Radio Stock Deal

MRS. MYRON CLEVELAND HARRIET SIMS, a stock broker, alleged to have sold stock in a radio company under misrepresentations to women investors, was held in \$7,500 bail for the Grand Jury when arraigned before Magistrate Joseph E. Corrigan in West Side Court, New York. Mrs. Sims denied the charges.

Radio and the Woman

By
Crystal D. Tector

ONE of the leading doctors of New York City took me through his hospital for children the other day. He is the head physician and guiding spirit of this institution; and he has decided to put a radio set in every room—not one set in the building, but, actually a set in every room! He said that he had read so much about radio being such a wonderful source of entertainment that he decided to see if the reports were true. He visited several institutions where radio is used as a means of entertaining the inmates, and came to the conclusion that the reports were in no wise exaggerated.

* * *

I was called in because he really knew no one else who might give him some advice. Immediately he decided that radio was a necessary element of his institution. He rushed to a newsstand, he says, and purchased a copy of RADIO WORLD. He opened the paper to my page, and, he continued, "as a matter of luck, I sent for you."

* * *

I gave him the names and addresses of several experts who will fit him out—who will install in each of the sixty rooms of his hospital just what he needs in the way of radio reception. But this fact is neither here nor there. It is a purely commercial matter in which I am not interested. I am only thinking of the big, human, charitable idea back of it all. I am extolling this man for thinking of someone else—of his willingness to go to any expense, as he told me, that the little sufferers in his care might have some entertainment to relieve their hours of convalescence.

* * *

Children—and grown-ups, too,—have suffered from the beginning of time; and as the world has progressed, and, little by little, efforts have been made to relieve their suffering. Here, in the midst of the first lustrum of this benighted century, comes the happiest method of all—the bringing to little bedsides where patient sufferers lie, the wonderful and fascinating things that come over the ether. I think that the success of this doctor's experiment will urge other institutions to follow suit. I make the prediction that it won't be long before every hospital in this country is installed with radio—and that radio will be as necessary to it as the doctors themselves.

* * *

And as the gladsome time of the year approaches, what can be of greater satisfaction to this man of medicine, this eminent diagnostician, than the fact that he is not purchasing a few trinkets and toys that will be cast aside as soon as they are broken—that he is not doing something that will please only his little patients of today, but that he is building, for all time, for the unfortunate children of the future who will come into his care. And as radio is improved and its scope becomes wider, there will be special broadcasts for hospitals—stories, and songs, and messages of cheer, and church services for all—young and old—who are temporarily incapacitated.

* * *

More power to this good doctor.

* * *

In reply to several correspondents: It is not difficult—or, it should not be difficult—to start the nominating for the offices of a National Radio Week committee. You say that when it comes to nominating a chairman, no one seems inclined to start the ball rolling. Why not all speak at once? Now, I don't mean to be funny; I am just trying to be practical. Out of this method, some one is bound to be heard and the temporary chairman, if she has any pep, is bound to recognize one of the speakers.

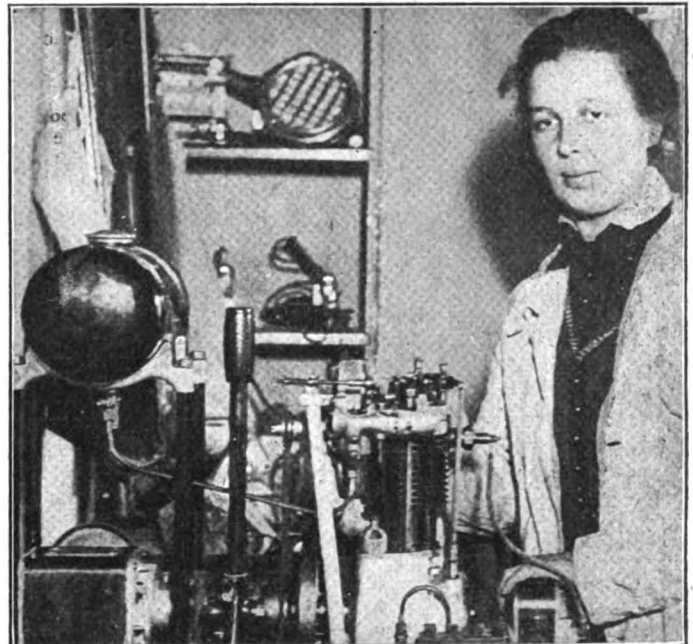
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Mrs. A. H. L., Walla Walla, Washington—By all means give your husband a radio set for his Christmas. I assure you that radio is not "wholly a man's field," as you write. I cannot praise it enough as a source of entertainment for women as well. And as for the children—well, if your boy "has not taken to it as yet, and seems wholly uninterested," all I can say is that something is wrong somewhere. You get the set and, about a month later, write me what effect it has had on the family.

* * *

Miss Hattie Kane, Harrisburg, Pennsylvania—Your idea of a red-white-and-blue ribbon with the letters N. R. W. thereon, to be worn during the big week is splendid. But why not the word

Woman Electrical Engineer Constructs Own Radio Sets



(C. Kadel & Herbert)

Miss Elizabeth Martrodge, of Exeter, England, is one of the few women electrical engineers in the world. Aside from this distinction, she is the inventor of a number of electrical appliances, and, to-day, is undertaking the installing of electrical lighting sets in country houses. However, since radio came into prominence in her country, she has "fitted up," as they term it on the other side of the Atlantic, a number of radio sets for "listeners in." Miss Martrodge is, perhaps, the pioneer woman radioist of Great Britain. She believes in it heartily and has done much to promote interest in the new science and to give valuable advice in order to help the British Government in its broadcasting problems. Miss Martrodge is shown in the photograph with her petrol-lighting set—petrol, or gasoline, being used there for heating country houses.

"RADIO"? You say that the ribbons are to be worn by women. Now, we want radio week to be the means of bringing thousands of fans into the fold and there are many so totally uninitiated that they might think N. R. W. stood for New Republic of Women, or something like that. With but the one word—"RADIO"—pinned jauntily to each feminine breast, the big idea is at once indelibly stamped and no time is wasted making explanations.

* * *

Vast possibilities of radio broadcasting are demonstrating themselves every day. In fact, every hour brings forth some new achievement for the great invention. For instance the postman delivered, several days ago, the following letter, which was addressed to the studio manager of WLW, the broadcasting station being operated by the Crosley Manufacturing Company:

Studio Manager, WLW

Dear Sir:

I am sick in bed, and my mother has moved my radio set into my bedroom so I can listen in. I enjoy this very much and sure get WLW very loud and clear. My collie dog likes to listen in, too.

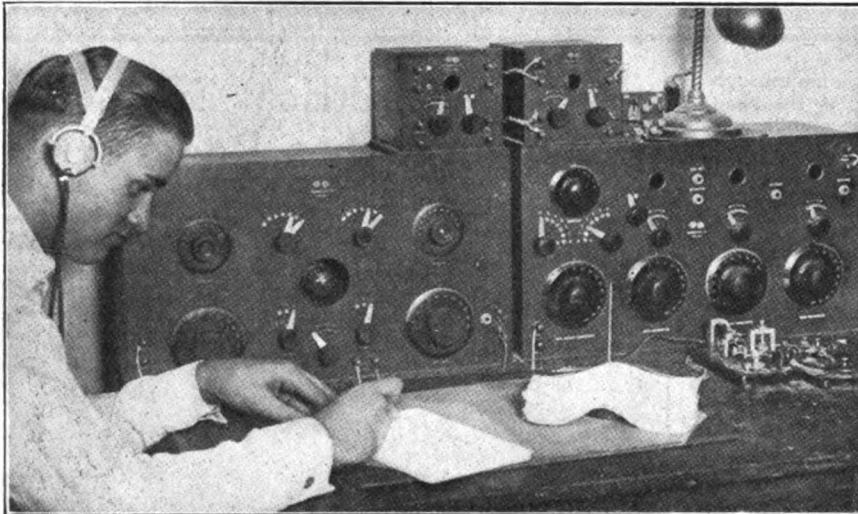
Yours sincerely,

J. CLYDE FOX.

2640 West Sixth Street, Cincinnati, Ohio.

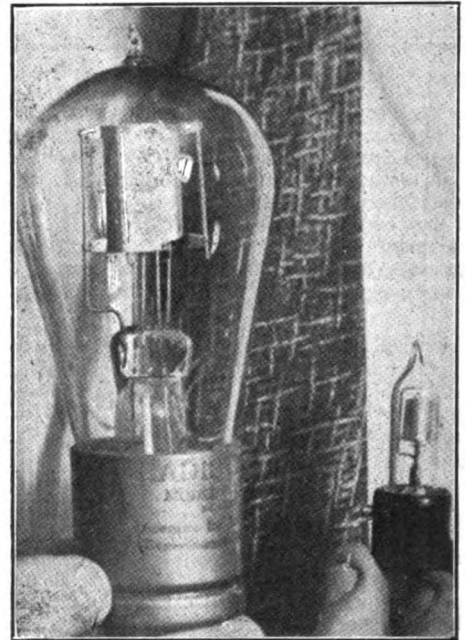
You who are in good health and enjoy listening to concerts, close your eyes a moment and picture this boy who, we have learned, is but 14 years old, lying in bed fighting off an attack of diphtheria and still reaping the harvests of pleasure that WLW is sowing. Also picture this boy's dog beside him, with head phones at his ears, and sharing the enjoyment of his little master.

Latest Radio Equipment Plays an Imp



(C. Kadel & Herbert)

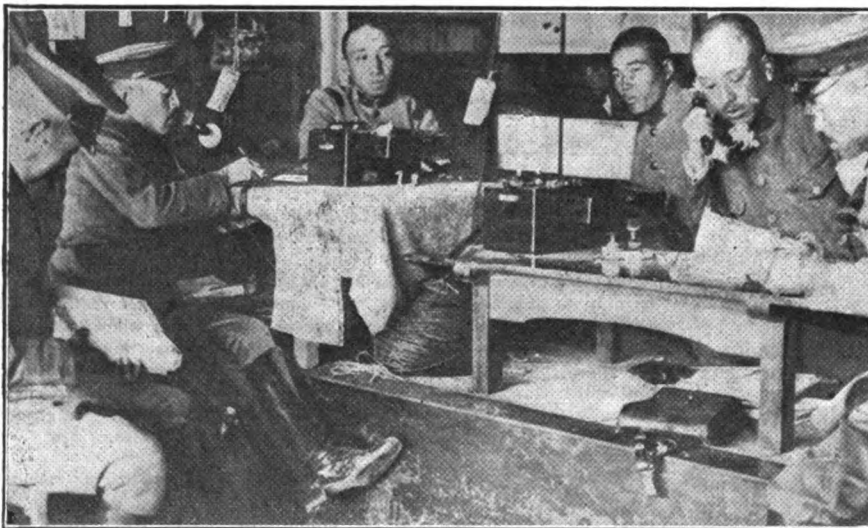
(Above) W. F. Bingham, Manhattan manager of the Radio Relay League, who has charge of all radio-message traffic in the Second District. To carry on this important work successfully, a perfect receiving station is essential. On the left of the photograph may be seen Mr. Bingham's long-wave receiver. On the right is the short-wave receiver and part of the transmitting apparatus.



(C. Kadel & Herbert)

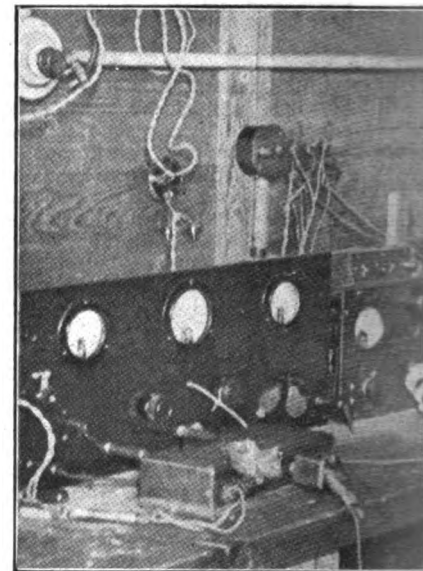
(Left) It claimed, is well-known three element cell. It is made by connection in a prize it with

(Right) H carried in slung over a transmit of about 7 used when case with also in the part of th



(C. Underwood & Underwood)

(Above) Interior of GHQ, the radio-receiving and transmitting station of the Imperial Army of Japan. This station is situated at the base of the picturesque and storied mountain, Fujiyama.



(C. Keystone View Co.)

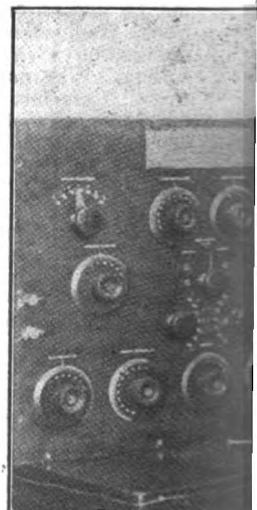
What is believed to be the first municipal station on the roof of the Chicago City Hall as station, with the call letters 9 XAM. For messages, but in March, 1922, it was entered



(C. Underwood & Underwood)

(Left) Newspaper men reporting the Dartmouth-Cornell football game by radio. How times have changed! Up to a year ago, we had to wait until the papers came out next day before we could tell about the plays of each big game.

(Right) Professor John Hassett Vegessy, of Fordham University, at the receiving set of that institution. The radio students at Fordham are fortunate in having some very fine radio equipment. This photograph shows their receiving station. On the left is a very interesting regenerative set of the "composite" type that covers a wave-length range from 150 to 16,000 meters. There are three distinct sets in this cabinet, the first being used for 150 to 550 meters, the second for 550 to 5,000 meters, and the third (using honeycomb coils) for 5,000 to 16,000 meters. Most of the large foreign stations, including Poz, Germany, have been picked up by this set.



(C. Kadel & Herbert)

Important Part in the Service of the World

miniature vacuum-tube shown in this photograph, it is the smallest ever made. It is less than half the size of the "audion tube," invented by Dr. Irving Langmuir. It has a plate, grid, and filament. It operates on a small dry-cell battery. It is claimed that it will bring in signals loud and clear. It was used by a New York radio amateur solely for experimental purposes in a miniature pocket vacuum-receiver which he is entering in a contest. An idea of its small size may be gained by comparing it with a regular radiotron tube shown in the same photograph.

Another wonderful miniature radio set—one that may be carried in a camera case. It will fit into a small kodak case and may be carried by the owner on his travels. It has a transmitting range of about three-fourths of a mile and a receiving range of about a mile. Note particularly the miniature tube and the microphone. The dry batteries may be carried in the camera case. Mr. Sterling G. Sears, who built the set, is shown in this photograph. He is talking into the small microphone that is attached to the set. This is another view of the receiving set shown on our front cover.



(C. Kadel & Herbert)

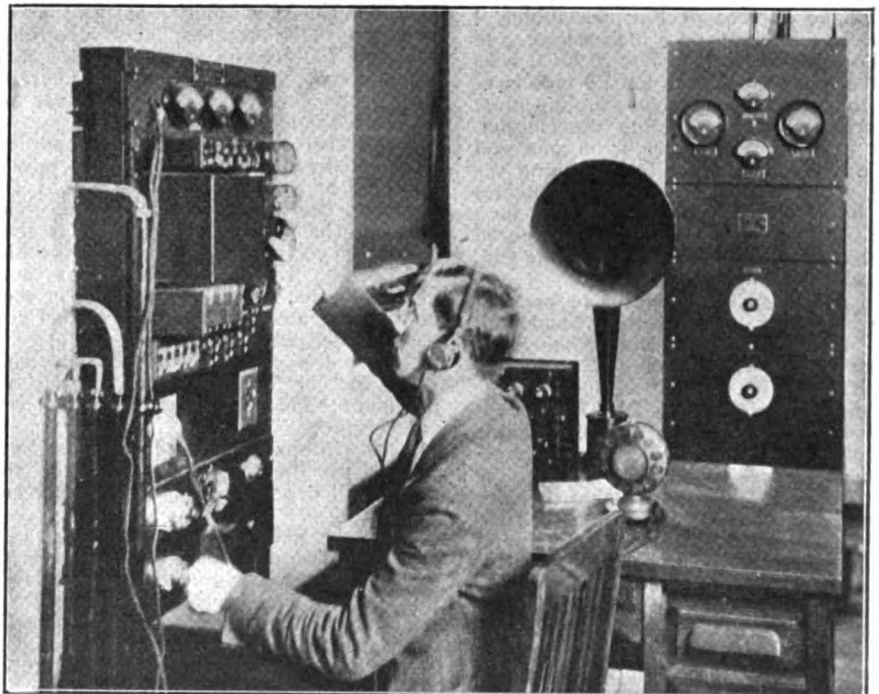


(C. Keystone View Co.)

(Right) The Prince of Wales, now an ardent radio fan, is broadcasting a message to 60,000 boy scouts in his country. He is photographed speaking into a field telephone, his words being carried by wire to Marconi, London, and from there broadcast over Great Britain.



station in the United States, was established in June, 1921, and operated as an experimental station. At that time the station was used merely for local broadcasts. Its call is WBV.



(C. International News Reel)

(Above) The transmitting room of station WWZ, Wanamaker's, New York City. This station which works on a 300 meter wave-length is equipped with a vacuum-tube transmitter of the Western Electric type. The operator is shown here adjusting the transmitter to maximum signal strength. On the table is the power amplifier and loud speaker. This station also uses a power voice-amplifier. Without this device success in broadcasting would be questionable; but this new device is able to convey, without losing even the fraction of a sound, music and the human voice—from any place where they may be produced—to the broadcasting apparatus, where it is generated into radio high-frequency currents and sent broadcast.

(Continued from preceding page)

also 90 turns wound on the same tube at 1 and taped every 15th turn for tickler inductance, a 4 $\frac{7}{8}$ -inch rotor, wound with 90 turns of No. 24 on the same end, and in plate circuit on other end of the coil. I have a sliding secondary 4 $\frac{7}{8}$ inches in diameter wound with 320 turns of No. 24 enameled wire. The switches are provided to use either loose coupler, vario-coupler, or both. I have a 23-plate condenser in aerial circuit, and a small fixed condenser across phones. My aerial is a 3-wire, 86 feet long and 38 feet high. I have heard KSC, San Jose, California; KQA, Denver; the Fort Worth, Texas, "Journal"; WHB, Kansas City, Missouri; CJCE, Vancouver, B. C., and WGY, KDKA, WSB, WOC, and KSD regularly. Some say that my set is a freak; but it delivers the goods and is always under control.—J. T. Cavanaugh, 1024 Leahy Street, Muskegon Heights, Mich.

83 Stations, His Record

EDITOR, RADIO WORLD:—From 5 o'clock until 11 o'clock p. m., I average from 15 to 18 stations. Last election night, from 5 p. m. to 3 a. m., I caught 30 stations giving election returns. I keep a map and log. My record to date is 83 stations outside of the State of Georgia, including Canada and Cuba. The words and music come in clearly. I operate a one-tube home-made short-wave regenerative set with vario-coupler and two variometers, mounted on back of panel, and a variable condenser. I also use a 6-wire cage-aerial, 80 feet long, 50 feet high, north and south direction. The diameter of the cage is 12 feet. My lead-in, which is a 6-wire cage, is 50 feet. My counterpoise is a 3-wire, 80-foot, mounted 8 feet from the ground. I invite anyone to write me about my hook-up.—James L. Fischer, 72 Spring Street, Newman, Georgia.

Claims the Record

EDITOR, RADIO WORLD:—I have read with interest the letters from Mr. Merklein, Mr. McKinley and Mr. Miller, each giving their receiving records on one tube. I think I can beat their records. Using a two-variometer type set, one detector tube and 48 volts, I receive the following loud and very clear: WGY, Schenectady, New York; WDAP, WJAZ, and KYW, Chicago; WOC, Davenport, Iowa; WNB, Kansas City, Missouri; WGM and WSB, Atlanta, Georgia; NOF, Anacostia, D. C.; WJZ, KDKA, WBZ, WOR, WIP, WEA, WBAY, WHAZ, WWJ, WNAC, WQAA and others in New York State and other States. These are all heard on a 4-wire inverted-L aerial 40 feet long and 35 feet high, 15 feet above a tin roof.

With the same set and tube not lit to extreme brilliancy, with no aerial connection, only ground connection, I have heard WGM, WSB, WOE, KYW, WDAP, WGY, WJZ, WBAY, EEF, KFAF and 2X1 very plainly. I think this record can surpass any of those RADIO WORLD has published.—E. Sherow, Box 365, Millbrook, New York.

Takes His Set with Him

EDITOR, RADIO WORLD:—I have been reading in RADIO WORLD of the excellent results accomplished by other "radio-phans." Messrs. Merklein, Brooklyn, New York; W. G. McKinley, Bayonne, New Jersey, and E. L. Miller, Chappaqua, New York, seem to be doing very well, indeed.

I am a resident of Brooklyn, down here on business, and have my set with me.

It consists of the conventional vario-coupler, variable condenser, variometer, detector and one stage of a. f. I only use 22 $\frac{1}{2}$ volts for the detector and 45 on the amplifier. Why waste the power?

I am surrounded by high hills. My aerial is a single wire, 115 feet long and only 14 feet above ground. A 440-volt lighting line passes 5 feet above it, and a 5500-volt power line is less than 50 feet away. The aerial also passes close to the roof of an electrically operated printing plant, and is parallel to a 220-volt light line and a couple of telephone lines. In spite of these handicaps, my set "does its stuff right niftik" every day and night.

I have received concerts from more than 45 stations in 17 different States and Canada. These stations are from 59 to 1169 miles distant (accurately measured air-line). My best reception is from stations upwards of 560 miles. On the night of November 9, I received music from 18 stations in 13 States from Massachusetts to Minnesota, and from the Mississippi Valley to Texas.

Here are some of the fellows I hear every time we are on the air together:

KDKA, Pittsburgh; WOO and WIP, Philadelphia; KSD, St. Louis; WOS, Jefferson City, Missouri; WDAF and WHB, Kansas City, Missouri; WWJ, Detroit; KYW, WDAP, and WMAQ, Chicago; WBAP, Fort Worth, Texas; WLAG, Minneapolis; WFAC, Superior, Wisconsin; WKN, Memphis, Tennessee; WSB, WGM and WDAJ, Atlanta, Georgia; WOC, Davenport, Iowa; WGY, Schenectady, New York; WGI, Medford Hillside, Massachusetts; WBZ, Springfield, Massachusetts; WNAC, Boston; also WJZ, WEA and WOR, the ones I hear most while at home in Brooklyn.

I can easily tune out KDKA which is only about 59 miles away and very powerful.

Frequently I use a small funnel for a megaphone loud-speaker while receiving WWJ, and WHB.

My set is home made (by myself) and I have not yet soldered the connections. Some nice cold evening I hope to hear something from the Pacific Coast! Until then.—John S. Frampton, Spangler, Pennsylvania.

Good Detector-Tube Reception

EDITOR, RADIO WORLD:—I get KHJ (Los Angeles, Cal.) regularly, having had them five evenings this week: DNA of Denver, also Winnipeg, Canada, and Havana, Cuba. I receive many other stations at 1,000 miles and over. All this is being accomplished while experimenting on a detector tube without amplification. I don't just get them and hear the call, but I get as much of the broadcasting as I care to hear. Without amplification, I think this record is pretty good for detector-tube reception.—H. S. Rahiser, Box 43, Crafton Station, Pittsburgh, Pa.

Harlem Club Wants Members

THE Radio Club of East Harlem was organized September 20, 1924, the following officers being elected: Harold Itzel, president; John N. Itzel, secretary; John D. McEvily, treasurer; William Bogdel, instructor. The main object of the club is to bring together radio amateurs living in the district from 125th Street to 166th Street, east of Fifth Avenue.

The present total membership of the club is fifteen, and as the membership is limited to thirty-five, there is room for twenty more members. Write the secretary, John N. Itzel, 175 East 111th Street, New York City.

No Wireless Receiving set complete without it

Make it the **GREATER Radio Christmas**

This year the message of Christmas will flash one inspiration over all lands and to all peoples — no frontier can turn back the swift messenger, Radio, whose steed keeps pace with light.

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THE MAGNAVOX CO.
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MAGNAVOX
Radio
The Reproducer Supreme

Answers to Readers

PUBLISH a hook-up for a short-wave regenerative receiver consisting of a vario-coupler and two variometers to a one-step of radio-frequency amplification; also a detector and two-stage amplifier of the audio type. I intend to use filament-control jacks. I would like to use this set for long distance. I have a V-T 1 and 3 V-T 2 vacuum tubes.—George Buser, Springfield, Mass.

Radio-frequency cannot be employed with the variometer type of receiver. Radio-frequency is a different hook-up entirely and is of a different principle. In RADIO WORLD, No. 19, dated August 5, also in No. 24, dated September 9, are some very interesting diagrams of radio-frequency amplifiers. These hook-ups for one tube, two tube, and three-tube radio-frequency amplification.

Give me a hook-up for a receiving set using Myers tubes and vario-coupler, grid variometer, plate variometer, and detector.—W. A. Lewis, Ashtabula, Ohio.

See above reply to Mr. George Buser.

I have just bought a crystal receiver. I would like to know if there is any chance of increasing the mileage of this set so I can

hear stations of greater distance?—Carl Righter, Jr., Davenport, Iowa.

You may increase the range by adding a two-stage amplifier to your crystal set. Get a vacuum-tube detector and make your set regenerative.

Can a tickler coil be used with a crystal set? How many plate-variable condensers should be used with a double-slide tuner set? With a loose coupler?—Paul Moller, Schenectady, N. Y.

A tickler coil cannot be used with a crystal set. The number of plates that the variable condenser should have depends on how you intend it for. A condenser having 43 plates, or one rated as having a capacity of .001 microfarads, will give quite a range of wave lengths. It is best not to use a condenser of very large capacity across the secondary of a loose-coupler when a crystal detector is used. More than .0005 mfd., is not advisable for this purpose.

I have a set consisting of loose-coupler and a crystal detector with variable and fixed condensers which I intend changing into a vacuum-tube receiver. Is it better to discon-

nect the loose coupler entirely and construct the set with a tickler coil; or would you advise adding a variometer and variable condenser to the loose coupler?—Harold Johnson, Milwaukee, Wis.

This depends entirely on the range of wave-lengths on which you desire to work. If you want a set covering all wave lengths, the honeycomb coils or spider webs will be best. But if you want a set solely for short waves, the loose-coupler set might be better.

I am using a two-stage hook-up. I would like to substitute a 1½-volt detector tube for a U-V 200 and still use the U-V 201 as amplifiers, also to add variometers to grid and plate circuits.—Michael Baschia, Coney Island, N. Y.

It will be all right for you to use the 1½-volt tubes in your set provided you use separate battery circuits entirely for the detector and amplifying sections. Use the dry battery to light the tube of the detector and a separate B battery. The input to this section can be led from the place where the telephones are in the detector-circuit unit. You can add the variometers in the usual manner.

The radio set I purchased last month was going along all right until something happened and I didn't get a peep out of it. Looked it over—but cannot find any loose connections. The batteries are still new. I have some German condensers with a 2,000-adjustable clearance space between plates.—Maurice Kaplan, N. Y.

It may be possible that your condensers are short circuited at certain points, due to metallic dust between the plates. This sometimes happens, especially in condensers where the clearance is so small. Test them by joining them in series with the wire connected to the buzzer, then varying the condenser. Should the buzzer work, it will indicate that the condensers are short circuited. Clean the plates carefully or ascertain just where the shorting takes place. Your connections are all right.

With my home-made detector, I hear most of the local stations. Sometimes I hear WGY faintly. Enclosed find my diagram and aerial. Is there anything I can add to increase the range of my set? Possibly I may add something that will help me to tune better.—Alvin Jones, Syracuse, N. Y.

Your results are very good for a 4-wire aerial, 50 feet long. Your location must be high and unobstructed. You might try the .001 mfd., variable condenser in series with the tuning coil and then use more inductance to get the same wave length.

Is it possible to hookup regenerative circuit with honeycomb coils or D-L coils instead of variometers or vario-couplers? Can I use two WD-11 tubes in the above circuit and hook it up as one step of radio-frequency and one stage of audio-frequency?—L. C. Edgar, Detroit, Mich.

It is possible to hoop up a regenerative circuit with either of the honeycomb coils or the duo-lateral coils. Using the W D-11 tubes as radio-frequency amplifiers is impossible. They will not stand up for radio-frequency amplification.

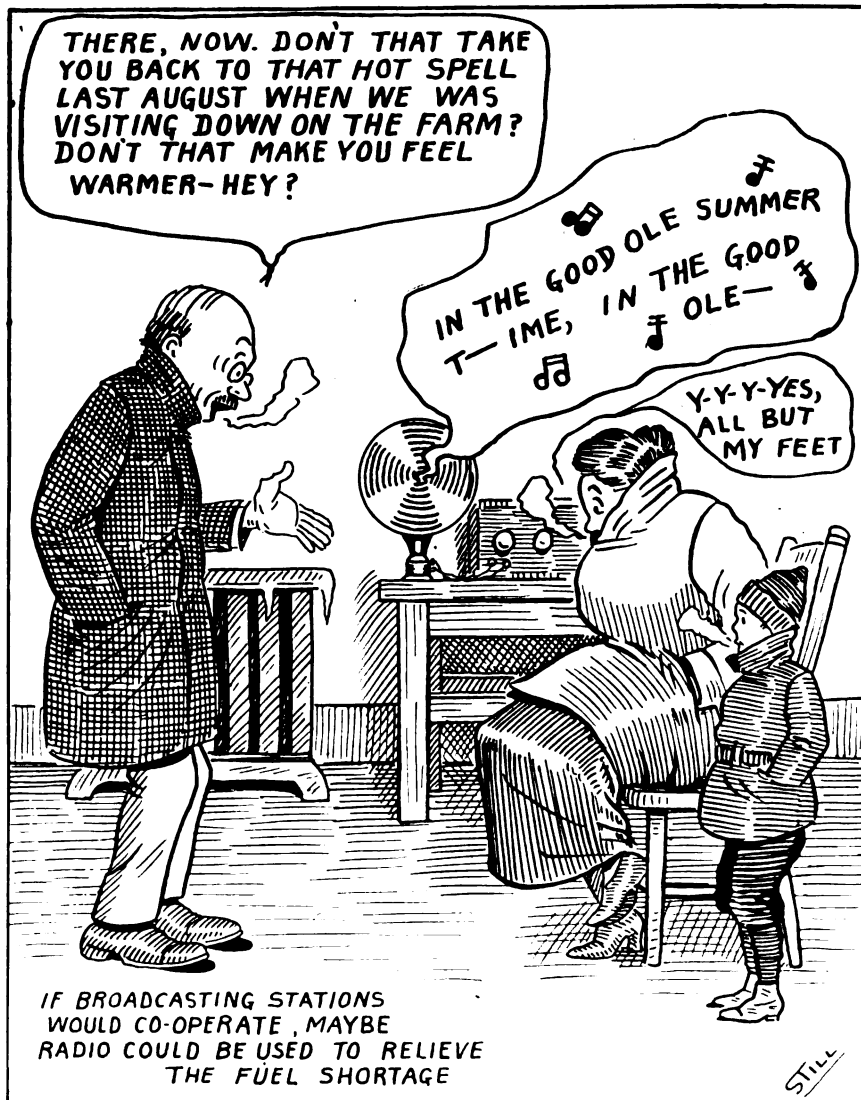
Please publish a schematic diagram for a two-step audio-frequency amplifier using spider webs—primary, secondary, and tickler—one 43-plate condenser and one 23-plate condenser.—Wendell Weiss, Cranford, N. J.

This circuit was published in RADIO WORLD, No. 24, dated September 9.

One circuit I never found in any radio magazine is the superheterodyne. I would appreciate an article and hook-up of this set.—J. F. Swan, Seneca Falls, N. Y.

An illustrated article showing the panel, front, and back view of this set with a complete hookup was published in RADIO WORLD, No. 28, dated October 7.

In the Good Old Winter Time



(Cartoon by Harry J. Stillman)

Too Late!



From "The Chronicle," San Francisco, Cal.

What Radio Now Offers

SIX months ago any discussion of broadcasting brought up the subject of the quality of the programs which to some seemed below the average. Today the same general subject is widely discussed, but the particular phase on which emphasis is placed is the interference between good programs. Without a doubt the broadcasting stations are putting on features without a parallel in the worlds of art, literature, and sport, says "The Globe," New York.

With the broadcasting of the Chicago opera season called a great success both by listeners-in and the management of the opera, and with the recent broadcasting of the New York Metropolitan stars in the opera "Aida," the American stay-at-home public is being supplied with the finest operatic art in this country, and, perhaps the world. Between the areas covered by the two stations through which the Chicago and New York operas were broadcasted the most famous operas have been made available to two-thirds of the people of the United States and Canada.

From operas to sporting events is a long jump but no feature of broadcasting has been followed by so many fans as the successful broadcasting of the world's series baseball games and the football contests between the big colleges. When a big corporation decides it worth while to tie up two 900-mile long distance telephone lines for three hours while play by play reports of a football game are sent over the wires to a broadcasting station, the radio fans should begin to realize the immense sums of money being expended for their entertainment, and given to them without charge.

As for entertainment and general educational material, practically every program every day will be found to contain more text on subjects near to the home than any two home magazines. Moreover the facts are freshly gathered and as a rule are presented in a manner that cannot be approached by cold type and lifeless illustrations.

If the people of this country could be made to realize what they are missing during these fall days and nights, radio manufacturers would be forced to overtime work to fill the demand for better class receiving sets.

52 Weeks for \$6.00

Complete Your File of RADIO WORLD
Copies of Radio World No. 1

If you did not get a copy of Radio World No. 1, send us \$6.00 and we will send you this paper for one year, and start it with our first issue, which will be mailed you as soon as possible after receipt of order.

RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated
SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE,
1493 BROADWAY, NEW YORK, N. Y.
BY HENNESSY RADIO PUBLICATIONS
CORPORATION
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and Editor
M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
1493 BROADWAY, NEW YORK, N. Y.

ASSOCIATE EDITORS

Robert Mackay Fred. Chas. Ehler

SUBSCRIPTION RATES:

Fifteen cents a copy. \$6.00 a year. \$3.00 for six months. \$1.50 for three months.
Add \$1.00 a year extra for postage to Canada and foreign countries.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their proportional rates.

Advertising rates on request.

ADVERTISING RATES:

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One inch, one time—\$5.00. Per agate line, \$0.40.
On four consecutive issues, 10% discount.
On thirteen consecutive issues, 15% discount.
Cover and preferred-position rates made known on application.
Terms: 30 days Net. 2% 10 days.

CLASSIFIED ADVERTISEMENTS:

Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE:

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.



Pignolet RADIO VOLT-METER ONE INSTRUMENT MAKES ALL TESTS

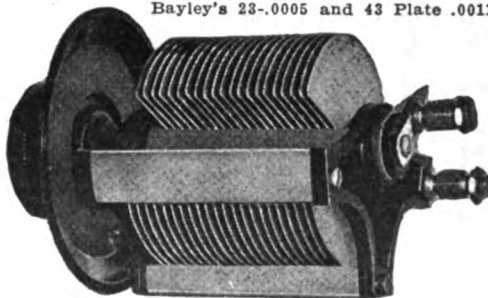
Write for booklet with suggestions for testing and adjusting Radio Sets.
Thousands now in use give absolute satisfaction.

Pignolet Instrument Co., Inc.
114 Liberty Street, New York, N. Y.

Radio World, 52 issues, \$6.00
Subscribe for RADIO WORLD, \$6.00 a year, \$3.00 six months, \$1.50 three months.

RADIO FINDS A BETTER CONDENSER

Bayley's 23-.0005 and 43 Plate .0011.



Its plates spaced close give it the finest tuning qualities.
It is a die-cast product; the stationary plates are cast solid, accurately and permanently spaced, on three upright supports, while the movable plates are cast on the center revolving spindle. Plates cannot loosen, which eliminates shorting.
Each condenser has our money-back guarantee.

Price, 23 Plates \$3.25 each
43 Plates \$3.75 each

TO JOBBERS AND DEALERS
A SPLENDID PROPOSITION

Bayley Condenser Co.
105-109 Vanderveer St., Brooklyn, N. Y.

FILL OUT AND MAIL NOW
SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD

1493 Broadway, New York City.

Please send me RADIO WORLD for months, for which

please find enclosed \$

SUBSCRIPTION RATES:

Single Copy \$.15
Three Months \$ 1.50
Six Months \$ 3.00
One Year (52 Issues) \$ 6.00
Add \$1.00 a Year for Foreign and Canadian Postage.

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

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Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

Let Radio World Test Your Goods

MANUFACTURERS, send a sample of your goods to our Technical Editor, Fred Charles Ehlert, 9006 Pleasant Street, Queens, Long Island, New York. It will be carefully tested. If your goods satisfy our experts, RADIO WORLD'S endorsement will be published in our merchandise department without charge or obligation of any kind on your part. When the radio purchaser sees a published test in RADIO WORLD with the seal accompanying this editorial attached, he will know that the product stands for perfection and has the guarantee of RADIO WORLD. RADIO WORLD is rendering a service through its testing department that is prompt, accurate and produces results. All goods will be returned to manufacturers, after testing, provided stamps are sent for that purpose.



Heard at Radio Counter

A Conversation Between Customer and Radio Clerk

(Part VI)

IN building a radio-frequency amplifier, should the panel be shielded for body-capacity effects?"

"In either radio-frequency or audio-frequency amplification, body-capacity effects will be eliminated if the panel is shielded."

"Then you really believe that in an unshielded receiver using radio frequency, there is a loss due to the set being improperly constructed?"

"Absolutely. In every case, shield your panel."

"Can I connect my output from the three-stage radio-frequency amplifier to the input of the audio two-stage amplifier with a detector?"

"Yes. This can be done very nicely and easily with a little patience. Watch carefully each connection you make, taking care of the proper plate-voltages. Another thing: don't forget to use all amplifying vacuum-tubes outside the detector. In this case, of course, we have to use the soft tube, better known to the layman as the detector tube. This, then, will give five amplifying tubes and one detector tube."

"Will my outside antenna work best with such a set; or must I employ a loop aerial?"

"Employ the loop aerial by all means and avoid using the outdoor aerial. The reason for the loop aerial is elimination of interference from stations, making the loop a practical compass-loop and cutting down static as well as interference."

(To Be Continued)

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31. Colwell & Korbell, Fisk Building, New York City, directors of publicity.

SOUTHEASTERN RADIO EXPOSITION, Auditorium Armory, Atlanta, Georgia, December 4 to 9, inclusive. Co-operative Radio Sales Assn., 205 Peachtree St.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

A Valuable Book

THE third edition of the "Amateur Radio Call Book" has been issued by the publishers, Radio Directory & Publishing Company, 42 Vesey Street, New York City. It contains a complete list of all amateur, special amateur, and telephone broadcasting stations of the United States and Canada, also a large map in two colors showing the location of every broadcasting station. In addition, it contains valuable information on the construction and operation of a honeycomb-coil set, detector and two-stage amplifier. The book is divided into districts in the United States and Canada. The editor and compiler is Walter B. Spiegel, member of A. R. R. L., and H. R. C.

Every fan and amateur, particularly the DX night owls, will find this a valuable book. It contains just the information such radioists are constantly seeking. Price \$1, complete.

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

A. Schochet, Bronx, phonographs and radio sets, \$40,000; A. Schochet, A. Mintz, D. Lerman. (Attorney, P. Lerman, 110 West 42d St., New York, N. Y.)

CAPITAL INCREASE

The Orange and Rockland Electric Co. has increased its capital from \$1,000,000 to \$6,000,000.

Selling Radio to Farmers

IT is said that the farmers did a great deal toward making Henry Ford. They purchased automobiles because the automobile was a convenience that brought the city to their back door, says "The Mail," New York.

Who in radio is going to sell the farmer radio receivers? It is high time that such a campaign started. The rural territory is a potential one. Some business genius is going to hit upon the right plan for selling the farmers, and when he does he is going to make a fortune in a very short time.

Radio can be made indispensable to the farmer. This was proven by a recent case in Pennsylvania. A peculiar form of worm found its way into the corn fields. It was bringing about great destruction in certain localities. Experts of the Department of Agriculture got on the job and used the broadcasting stations of that State to tell the farmers how to effectively eliminate this pest. Great speed was essential; a delay of a day or two would wreck a large crop. The farmers who had receiving sets were out in their fields the next morning, applying the remedy that had been broadcast.

Broadcasting can be made so important to the farmer that the business angle of it should be handled by the various States working through the Department of Agriculture. A State owned and operated broadcasting station used to disseminate not only the information regarding market conditions, but practical talks on scientific farming would be a very good investment, costing only a small amount and bringing a large return. If a farmer loses a crop it may cost him anywhere from seven to eight thousand dollars. The State loses a certain amount of income, not only through tax but through general financial welfare.

RADIO GOODS AS GIFTS

Be sure to be represented in "Holiday Radio Gifts Number," out December 9. Copy for this issue accepted up to November 30, RADIO WORLD, 149 Broadway, New York.

FANS, AMATEURS, DEALERS, BROADCASTERS, MANUFACTURERS, AND THE GENERAL PUBLIC

Are Looking Forward to

NATIONAL RADIO WEEK
DECEMBER 23 TO 30, INCLUSIVE

All Interested in Radio Should Help to Make This Event a Smashing Success.

If you want to know more about it address:

NATIONAL RADIO WEEK EXECUTIVE COMMITTEE

J. ANDREW WHITE, Chairman

326 BROADWAY

NEW YORK

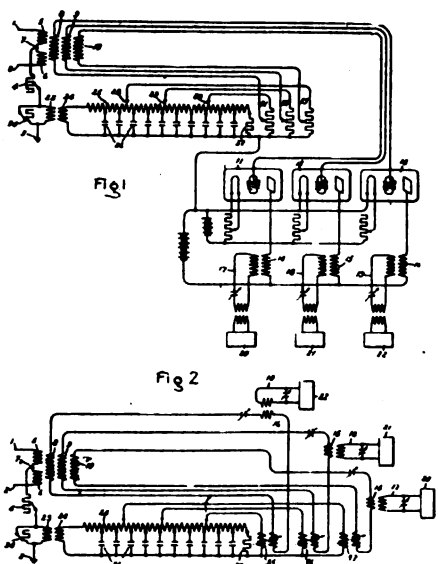
Latest Radio Patents

To Receive a Plurality of Signals

No. 1,435,000. Patented, November 7, 1922. Patents: Edward W. Kellogg and Chester W. Rice, Schemectady, N. Y.

MESSRS. KELLOGG and Rice have been granted letters patent on a device to provide a method of and means for utilizing an antenna for the simultaneous reception of a plurality of signals of different wave lengths. With a long receiving-antenna extending in the general direction of transmission of the signaling waves to be received, signaling currents produced in the antenna by waves coming from any particular transmitting station will be strongest at the end of the antenna farthest from the transmitting station, while currents produced by waves coming from the opposite direction will be a minimum at that point. The antenna is preferably aperiodic, so that the strength of the signaling currents produced therein is substantially independent of the wave length.

In carrying out their invention, Messrs. Kellogg and Rice utilize an antenna of this type and impress from the antenna upon the input circuits of a plurality of electron-discharge amplifiers potentials produced in the antenna at a selected point. In order to improve the recep-



Schematic design of the Kellogg-Rice receiver.

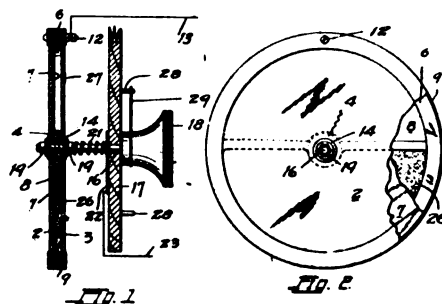
tion, they also provide means for impressing on each of these input circuits a current selected from another point in the antenna which will be of the proper intensity and phase to neutralize in each

receiving set, disturbing currents produced therein either by interference from undesired waves or by strays. Each of the output circuits of the amplifiers employs a resonant circuit which is tuned to the frequency of one of the desired signaling waves, and these resonant circuits are associated with receiving sets.

Low-Priced Condenser

No. 1,443,244. Patented, October 24, 1922. Patented John Parkin, Jr., San Rafael, California.

OWING to the number of persons at present experimenting in radio signaling, there is a great demand for a variable condenser of simple construction and capable of being made and sold at a low price. Mr.



Vertical section and rear elevation.

Parkin's invention is to provide a variable condenser to supply this demand, and in which the elements are reduced to the least possible number and are of the greatest possible simplicity.

The Truth Will Bear Repeating

CHAS. FRESHMAN COMPANY

Incorporated
97 Beekman Street
New York City

November 7th, 1922.

Radio World,
1493 Broadway, New York, N. Y.

Gentlemen:—We wish to thank you for your successful effort in getting additional advertising copy on our Variable Grid Leak and Micon Condenser in your publication to appear in the issue of Saturday, November 11th, 1922.

The reason that we sent you the copy at such a late date was that it has been our policy to advertise only one of our various products in each magazine, and we had an advertisement running on our Noiseless Tested Micon Condenser for your coming issue.

The results that we obtained from our first advertisement of the Variable Grid Leak and Micon Condenser combined were so great that we did not want to miss the opportunity of having it re-appear in the current issue.

It might interest you to know that outside of the general publicity that our Variable Grid Leak and Micon Condenser combined received from the first advertisement in your publication that we have received hundreds of direct orders from individuals and payments enclosed mentioning the fact that they saw the advertisement in RADIO WORLD. These inquiries came from all sections of the country.

We wish to congratulate you on the exceptional distribution of your publication.

Yours very truly,

CHAS. FRESHMAN COMPANY, INC.

(Signed) Myron Goldsoll

Vice-President in Charge of Sales

MG:JJ

Out Next Week!

On Sale Wednesday, December 6—Dated December 9

Remember "This Is a Radio Christmas"

and that millions of dollars will be spent during the holiday time for radio gifts.

Be sure to get your share of this business by advertising in the issue of RADIO WORLD of December 9, which will be

RADIO WORLD'S CHRISTMAS NUMBER

Thru this medium you can reach thousands of readers, who are not only interested in radio themselves, and want new equipment, but who also will give presents to others whom they wish to make radio fans.

ADVERTISING RATES:

Regular advertising rates in force for RADIO WORLD'S HOLIDAY RADIO GIFT (CHRISTMAS) NUMBER, as follows: \$150 a page, \$5 an inch. Discount, 10% four times, 15% thirteen times. Last form closes November 30, A. M.

Take advantage not only of RADIO WORLD'S circulation, but also its cash-thru-the-mail pulling power.

Be represented in RADIO WORLD'S Holiday Radio Gift Number, and reach the many thousands who actually want your goods and are ready and willing to pay for them.

Preferred Positions Must Be Booked Immediately.

Copy for run-of-paper position will be received up to November 30, A. M.

RADIO WORLD, 1493 Broadway, New York

PATENT
Your Radio Ideas.
Call or Write
FREE ADVICE

ASK MANUFACTURERS
PATENT CO.
FOR 520 FIFTH AVE
NEW YORK

INSU-LITE

PANELS

1/8" —.01 per sq. in.
3/16" —.015 per sq. in.
1/4" —.02 per sq. in.

DEALERS: Write for Discour. In.

General Merchandise Co.
140 Market Street, Newark, N. J.

CRYSTAL SET \$4
"THE LITTLE WONDER"
\$2.50 UNMOUNTED

Wonder in name and a wonder in performance. Cannot be equalled for the price. Catches distinctly everything broadcasted within 30 miles.

Send for **FREE** catalog, describing our "Little Wonder" set and listing radio supplies.

GUARANTEED, TESTED CRYSTALS
Galena and Radiocite... **20c.**

Radi-O-Plate Panels. All sizes out to order.

Holloway Electric Supply Co., Inc.
226 Third Avenue New York City

GOODMAN

PATENT PENDING

The Niftiest Short Wave Tuner on the Market
Only \$3.00 & PP on 1 lb. Send for pamphlet.

L. W. GOODMAN
DREXEL HILL, PA.

Major _____, Halifax, N. S., writes: Delighted. Received Schenertz clearly on one tube first time I tried the GOODMAN. Would have saved trouble and money by buying months ago.

NOVO
"B"
BATTERIES FOR RADIO

22½-45 & 105 VOLTS

**NOISELESS
DEPENDABLE
GUARANTEED**

ASK YOUR DEALER

NOVO MANUFACTURING CO.
424-438 W. 33rd ST
NEW YORK

531 SO. DEARBORN ST. CHICAGO.

Erecting SPC, Brazil
On the Summit of Mt. Corcovado, It Is
the Highest in the World

By Patriak Nichols

ENTERING the beautiful city of Rio de Janeiro the most impressive sight is the exquisite mountainous background of the city, and particularly Corcovado, an almost perpendicular mountain, with its summit over 2,000 feet above sea level.

"Why erect radio masts when such a mountain is so near by?" queried the Westinghouse engineers who journeyed there to erect broadcasting station SPC.

"Can we get the location?" This question was answered in the affirmative by F. A. Huntress, General Manager of the Tramway Light & Power Company, who own the cog-wheel railway that climbs Corcovado. He also stated, "We can supply 120-volt or 220-volt, 50 cycles alternating current on the mountain top for the radio outfit."

The party set out to explore the mountain crest. The first 2,000 feet of ascent, or five mile ride from Rio de Janeiro, was made in 30 minutes, and the final climb of 125 feet by following the foot path to the circular observation tower on the top.

A quick survey of the available space on the crest disclosed a narrow path about 125 feet long, leading to a concrete parapet on the edge of the precipice.

The crest of Corcovado had always been used as an observation point, but the radio-telephone engineers saw more than mere scenery—they had a view of the prospective invisible radio audience.

Two 125-foot masts were erected on the verge of the precipice on which are stretched a 153-foot six-wire antenna between two 26-foot spreaders. The counterpoise consists of two sections of five wires each, mounted on two 26-foot spreaders which are balanced on the ends of the 70-foot horizontal pole bolted fast to the mast on the summit. The counterpoise wires are stretched clear of the mountain sides, down about 100 feet to the tops of two poles located near the terminal building of the railway where the wires converging symmetrically form a 10-wire cage which leads into the radio telephone operating room. The hum of the 220-volt alternating-current motor was eliminated by a filter system made up of microfoid condensers and large choke coils.

A single-wire antenna was strung from the mountain top to the operating room about 125 feet below, for receiving messages. A speech amplifier is located in the operating room.

The call letters, SPC, were assigned. SPC has a unique position in the radio-telephony broadcasting field. At various times the station and antennae are in or above the clouds. Rio de Janeiro is practically on the boundary line between the Temperate and Torrid Zones. The climate is varied by the mountain range Serra do Mar which runs along the coast. The dry season will soon change to the warm and wet season and its subsequent tropical storms. Precautions are being taken to prevent electrical interference.

The observances and records of SPC will, therefore, assist in studying the peculiarities of the air as far as radio-telephony is concerned. The experiences of this station in penetrating the Equator and the Torrid Zone, when correlated with the data being compiled by other stations and close students of the new science, will no doubt result in listing peculiarities of the atmosphere unknown to science to-day.

"HOLIDAY RADIO GIFTS NUMBER" of RADIO WORLD will be issued December 9. Last copy will be accepted on this number up to November 30. RADIO WORLD, 1493 Broadway, New York.

Did you see our ad in RADIO WORLD of Nov. 18, Page 27?
Watch for future announcements.

Sidbenel

RADIO EQUIPMENT MFG. CO
Dept. "B," 1668 JEROME AVE.
NEW YORK, N. Y.

MICROSTAT
Vernier Rheostat

The Rheostat with a 1000 Filament Variations.

DEALERS write for full information and trade discounts.

At your dealer or post-paid.

\$1.40

MICROSTAT COMPANY
WILLIAMSPORT, PA.

Do Your Buying At

PERMANENT RADIO FAIR

Hotel Imperial
32nd Street and Broadway
New York City

Buyers — Dealers — Radio Department Managers, Demonstrations of Any of the Products of the Exhibitors. Only Products of Representative Manufacturers Are on Display.

Nearly 100 Manufacturers
Now Exhibiting

FRS
ALL MOLDED
UNIVERSAL COMBINATIONS
5 Units in 3

F. R. S. Molded Variometers..... \$4.00
F. R. S. Molded Variocouplers..... \$5.00
F. R. S. Molded Bank Windings... \$5.00

Bank Windings are interchangeable for direct mounting on either Variometer or Variocoupler.

Universal—Accurate—Interchangeable
A Complete
Two-Stage Long Range Receiver

Set includes two Federal Transformers, Condenser, two-molded variometers, molded variocoupler, three V. T. sockets, filament rheostats, dials. Read 'Em binding posts, switch points; in attractive cabinet and drilled panel; complete, ready to hook up.

A \$125 Radio for..... **\$40**

F. R. S. Radio Corporation
409-D East Fort St. Detroit, Mich.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

DICTOGRAPH Radio HEADSET

Was \$12.00 **NOW** →

A sweeping cut of \$4.00 in the price of the Dictograph Radio Headset! The tremendous endorsement of radio enthusiasts has made possible this sensational reduction. To meet the demand, production has been planned on a new, gigantic scale. Great manufacturing economies establish the new price—only \$8.00.

A wonderful bargain! And above all, a wonderful headset—the world's standard of supreme quality for super-sensitive and accurate sound-transmission.

The same quality, the same guarantee, the same supreme Dictograph headset that has always sold for \$12.00, in every respect but the price. Type R-1, 3,000 ohms, for all types of receiving sets.



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The Perfect Loud Speaker for the Home

Public demand has made possible the Dictograph Loud Speaker at the low price of only \$20.00, complete with 5 ft. flexible cord. A handsome instrument that reproduces every sound in crystal-clear, natural tones, full volume, and free from distortion or noise. Ask for demonstration at reliable radio dealers. Get world-famous DICTOGRAPH quality and still save money.

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DICTOGRAPH PRODUCTS CORPORATION

220 West 42d Street (Branches in all principal cities) New York, N. Y.

Note: Plans are now under way for the production of the new 4,000 ohms Dictograph SUPER-TONE Headset, the most perfect radio head set that can be made. For the most delicate work, the most exacting requirements. A new standard of super-sensitive-ness! List price, \$12.00.

List Price
\$20



Variometers with dial, **\$2.38**
Variocouplers with dial, **\$1.58**
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PHANTOM-CIRCUIT
BUILD YOUR OWN. This marvel of mystery, using no aerial, no loop, no ground, brings in music instead of static showers. We consistently hear concerts on Magnavox, from stations 550 miles distant, audible 100 feet from horn. The simplicity of this set will surprise you. No radio frequency. Complete instructions with photo of circuit sent prepaid for 50c.
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For a limited time only
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Prices F.O.B. Red Bank, N. J.
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Radio Rates from Italy
OFFICIAL reports of new lines of radio communication between Italy and the United States, following the recent suspension of direct radio communication and pending the completion of a new high-power station at Rome, have been made to Washington by Commercial Attache MacLean, at Rome.

Radio traffic from Italy for the Western Hemisphere is now being handled by the high-power stations of Germany, France, and England, according to statements of the Ministry of Posts and Telegraphs at Rome. Full-rate and deferred messages, and press telegrams may be sent by Nauen Transradio and Radio-France, and full-rate and deferred messages by London Marconi.

Messages sent by Nauen are transmitted by radio from Rome and relayed at Nauen. Traffic handled by France or England is sent by land wires from Italy and thence by radio. Messages by France or Germany will carry a rate of twenty centimes, gold, less than the cable rate, in the case of full-rate telegrams. By London, the same messages would be ten centimes, gold, less than the cable rate. Deferred dispatches will be charged half the above rates. Press reports may be sent by France or Germany at the same rate as deferred messages, but will not be handled by London.

Two Danish Radio Clubs
TWO radio clubs, organized and supported by some of the most prominent figures in the Danish field of communications, have recently been formed to promote interest in radiotelegraphy and radiotelephony throughout Denmark. The aim of these clubs is to spread knowledge and create interest in wireless communication through lectures, demonstrations, and other means.

RADIO MAILING LISTS
9270 Retail Radio Dealers, United Statesper M, \$7.50
1134 Radio Manufacturers.....per list, 10.00
1380 Radio Supply Jobbers.....per list, 12.50
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260 Radio Stations.....per list, 4.00
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RUSH your name and address and we will tell you HOW you can get this RADIO SET ABSOLUTELY FREE. RADIO SET comes to you complete, with single sliding tuning coil, crystal detector and phone condenser. AND DOUBLE HEAD PHONES. No batteries required; no experience.
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Quality, Design + Workmanship + Material = RELIABILITY
RADIO-A RE-CHARGER
Simple to Use
Just plug in at any 110 v. A. C. lamp socket—attach clips to battery—turn on current and you have your own charging plant.
A compact portable Recharging unit that will fully charge a 100 AH battery overnight for 5c. to 10c.
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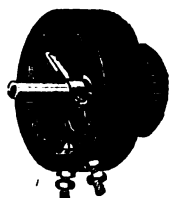
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Send for our bulletin A21 and see what SANTA has to offer you, in RADIO SETS COMPLETE. Also in parts, "A" and "B" Batteries. We handle the best money can buy in Radio, and we are giving you a wonderful Christmas treat so all can enjoy Radio this year.

These offers last till December 25th. Drop us a card and receive this Surprise.

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Broadcasting in Brazil

Centennial Celebration Stirred Up Interest and Promising Market for Receiving Sets Is Predicted

CONSUL General Alphonse Gaulin, Rio de Janeiro, reports to the Department of Commerce that preliminary steps have been taken for the introducing of radio broadcasting in Brazil, that indications point to a promising future market for receiving apparatus. Until recently radio broadcasting was practically unknown, but the Centennial Celebration being held at Rio de Janeiro has served to stimulate interest in radio and various concerns in Brazil have been active in taking it up.

The Rio de Janeiro Light and Power Company has recently finished a broadcasting station on the heights of Corcovada, using a wave length of 483. Music from the Municipal Theatre is sent to Corcovada summit by telephone and after amplification is sent out by radio. A studio near the summit also furnishes concerts and other entertainments which are heard locally. Additional broadcasting stations are now located at Monroe Palace (Congressional Building) and at the offices of the Marconi Wireless Telegraph Company. A number of receiving sets have been installed in the exposition buildings.

Imports of wireless apparatus have been received both from the United States and Germany for sale during the exposition. The requirements of the Brazilian law, however, make it obligatory for any person wishing to install a receiving set to secure a special permit from the Department of Transportation and Public Works. Only such receiving sets as have been approved may be sold by importers especially licensed to make such sales. The restriction and that limiting the sale to persons who have received a license to install and use wireless apparatus have hindered the exploitation of this important product. It is hoped, however, that by the beginning of the year a more definite policy will be established by the Brazilian Government and the markets for radio apparatus thrown open to importers.

A Broadcasting Problem

Should Manufacturers Contribute to Stations Sending Out Programs? Asks Bel Canto Corporation

EDITOR, RADIO WORLD:—Broadcasting has been under discussion for some time and much has been said pro and con; but I have something to say which I think is of paramount importance.

The Radio Corporation of America was the pioneer in broadcasting radio concerts and has not only kept up the fine quality of these concerts but has improved on them from time to time, giving radio fans the best quality of talent procurable. Without this broadcasting, there would be practically no market for radio parts,

and it is my opinion that each and every manufacturer of radio parts—whether it be a loud-speaker, a complete set, a hundred feet of antenna wire, or any of the other numerous parts that go into the making of a complete set—should be willing to contribute a certain portion of his net profits towards the maintenance of such a station.

Each and every manufacturer of radio parts is indebted to the broadcasting stations. Without them the manufacturer might just as well put the key in the door and hang up a sign, "TO LET." Why should a corporation, such as the Radio Corporation of America, spending millions of dollars to make radio a permanent, sound and healthy institution, which in time is destined to become one of the greatest industries of the world; or, in fact, any other organization maintaining broadcasting stations throughout the United States, bear the entire expense of maintaining these stations?

A certain percentage of the net profits of all the manufacturers, in my opinion, should be set aside to be paid over to the proper organizations conducting broadcasting stations throughout the United States, and that all unnecessary broadcasting of concerts, lectures, etc., should be abandoned. There is no necessity of having numerous broadcasting stations in one vicinity, for it only causes interference, which the average radio fan cannot tune out.

Proper broadcasting is the only thing that can make radio a real success; and I say again that each and every manufacturer who is now conducting a profitable business owes every cent of profit he is making to broadcasting. We are willing, ourselves, to set aside a certain portion of our profits for the purpose above mentioned. We feel that all other manufacturers will be in accord when they give it due consideration.—Duryea Benschel, secretary-treasurer, Bel-Canto Corporation, 417 East 34th Street, New York, N. Y.

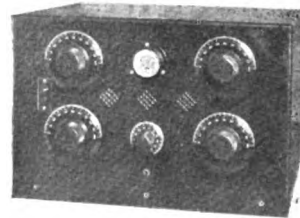
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Dealers and jobbers write.

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This "Acme of Perfection" radiophone set has been proven better than the best! We have received innumerable compliments and have become convinced that there is none better. This set has an exceptionally long distance range; has the loudest tone of any set on the market; eliminates all distortion; reproduces the human voice and other sounds perfectly; and is operated simply and easily. We furnish artistically designed cabinets for it on demand. We can show customer's testimonials on the wonderful performance of this set. All our sets are sold on Money-Back Guarantee.

Write for "Acme of Perfection" Folder on Sets from \$45 Up

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RADIO COMPANY**

Show Rooms, 131 W. 37th St., N. Y.

Subscribe for RADIO WORLD. \$6.00 a year, \$3.00 six months, \$1.50 three months.

Broadcast Bill's Radiolays

By William E. Douglass

THERE ain't no use in talkin', I've had troubles of my own, an' lately they've been pilin' in, they never come alone. First off I lost my chickens, dern near all died with the pip, an' then my dog keeled over without lettin' out a yip. The bay mare's got a collar-sore from plowin' here this fall; the other one is spavin'd—luck's deserted me, that's all. On Sunday I got all dolled up to take



Min in to church, an' when I cranked our Lizzy, she just up an' gives a lurch, an' knocks me down, blacks both my eyes an' tears my Sunday pants. Sometimes a flivver's pesky if you give 'em half a chance. I called old Lizzy some hard names, not knowin' why or which; to even up, on our way in, she runs off in the ditch. We got to church in time to hear our friend the parson say, "— give thanks for the blessings Providence may send your way." When old misfor-

tune comes my way, she does the thing up brown, but all the same it takes a heap to keep my spirits down. I've noticed too, most every cloud that dims our path so bright, has got a silver lining an' most things work out all right. Just last week, for example, Min got out my winter suit, an' found that it was stained a bit with plums and other fruit. She worked with it for quite a while an' got it good an' clean, I guess she must have used about two quarts of gasoline. Then in the kitchen by the stove, she hung it up to dry—the "Hook and Ladder" boys will tell you now I'm one suit shy. Likewise the house where I was born ain't what it used to be, we're shy about eight rooms or so, as far as I can see. We saved 'bout all the furniture an' grand-ma's feather bed, the only thing she thought of, though, was that there fancy spread that won first prize four years ago down at the Country Fair, an' after she had got it out she didn't seem to care a rap about the other stuff. But, like I said before, though trials and tribulations congregate about my door, there's bound to be a rosy side. My trouble's I'll forget, because I rescued first of all my good ol' wireless set.

—Copyright, 1922, Westinghouse Electric & Manufacturing Company.

Radio Don'ts

- DON'T** transmit without a government license. Don't be careless about your set.
- Don't let the aerial wires touch roofs, buildings, or trees.
- Don't purchase cheap apparatus and expect long-distance results.
- Don't place too many wires in your aerial.
- Don't forget that just as much tuning is required in the secondary as in the primary.
- Don't blame the set on poor reception. Sometimes it is improper tuning due to your own fault.
- Don't light the filaments to exceptional brilliancy and expect loud signals.
- Don't monkey with the works of your set if something goes wrong. Take it to an expert radio-dealer.
- Don't keep on changing connections if signals have been heard at their best. Leave well enough alone.

RADIO BOOKS FOR XMAS

The Most Acceptable Gift
Prices to Suit All

- "Design and Data For Radio Transmitters and Receivers"—Paper cover55c
- "Radio Hook-ups"—Same type cover as above. Never sold less than 75c. Sale price.....55c
- "Radio For Everybody"—The famous book. Heavy cloth bound. Sale price.....\$1.00
- "Radio Phone Receivers"—A practical book for everybody. Cloth bound. Sale price.....\$1.00
- "Radio Experimenter's Handbook"—A book to answer the practical problems of beginners of Radio Experimental Work. Heavy cloth bound. Sale price.....90c
- "Practical Wireless Telegraphy"—Heavy cloth bound. Sale price\$1.60
- "How to Conduct a Radio Club"—Plenty of desired information. Sale price.....55c
- "Practical Wireless Stations"—This tells you how and why. Sale price.....55c
- "A Complete Wireless Course"—Heavy cloth bound. Sale price.....90c
- "How to Make Wireless Receiving Apparatus"—Paper cover. Sale price.....25c
- "Wireless Construction and Installation For Beginners"—Paper cover. Sale price.....25c
- "Experimental Wireless Construction"—Paper cover. Sale price25c
- "Complete Radio Receiver"—How to make your own. Paper cover. Sale price.....20c
- "Armstrong's Super-Regenerative Circuit"—A book complete in its line. Sale price....70c

DIAGRAMS

- Detector and Two Stage—Complete with instructions. Sale price35c
- Short-Wave Regenerative Receiver—Wonderful opportunities with this circuit. Sale price.....35c
- Armstrong Super-Regenerative—With full instructions. Sale price.....35c

BLUE PRINTS

- Armstrong Super-Regenerative Hook-up—With list of material needed. Sale price.....25c

We have any and all the PARTS to make the best apparatus at a very low price, and invite your inquiries and trade. The books listed as paper covered or the diagrams will be given FREE with purchases of parts for any set.

We have in stock the new Spider Web Inductance for Rheinhartz Tuner—A wonderful new idea, sure to prove satisfactory, full instructions\$2.40

Tubular Glass Grid Leak Resistances at the special low price of 35c; elsewhere 75c.

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- DL-25, 35 and 50...25c
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- DL-1250\$1.35
- DL-1500\$1.48

Jones Licensed Regenerative Receiver...\$55.00
Detector and two stage amplification included with above outfit. Bulbs and batteries extra. This set has a wave length range of 150-2500 metres.

All sales prices in November issues of RADIO WORLD are good until Xmas. Postage must be included with order. Checks must include 10c exchange and please have them certified. All goods are shipped P. P. insured.

RADIO DISTRIBUTING & AUTO SUPPLY COMPANY
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BUT DOWN TO A PRICE

\$135.00 Grobe C. R. 9—150 to 3000 meters	\$98.00	\$40.00 Turney Detector Set.	\$20.00
\$132.00 Westinghouse R. C.	\$7.00	35.00 De Forest Detector Set, complete with tubes and battery	25.00
Paragon R. A. 10	60.00	35.00 De Forest 2-Stage Amplifier	18.00
De Forest M. R. 6	84.00	125.00 General Electric 2-Stage Amplifier	90.00
25.00 Federal J. Set—complete with phone	12.50	40.00 Clapp Eastham Tuner and Detector	25.00
35.00 Tuska Detector Set.	25.00		
Tubes —U. V. 200	\$3.90	TUBES	
U. V. 201	4.90	Navy V. T. 2	\$7.00
Navy V. T. 1	5.00	W. D. 11	4.95
		U. V. 202	5.90
PHONES			
Baldwin Type C.....\$11.50		King Horn	5.50
Baldwin, single	6.25	Dictograph	15.75
Helzar Cabinet	5.50	Autovox	17.50
Murdock 3000 ohm	4.50	Western Electric	112.50
Murdock 3000 ohm, single	2.00	Baldwin Clarophone	16.25
Murdock 2000 ohm	3.50		
Murdock 2000 ohm, single	1.50	VARIOMETERS	
Brandes	6.00	Patho	\$3.50
Federal 2200 ohm	4.95	Emco	5.25
Federal 3000 ohm	7.50	Baldwin	3.69
Western Electric	7.50	Atwater-Kent	6.40
French Brunett, 4000 ohm	7.75		
		TRANSFORMERS	
VARIABLE CONDENSERS		Jefferson	\$3.00
23-Plate Vernier.....\$3.25		U. V. 712	5.50
43-Plate Vernier	5.75	Acme	3.75
.001 Balanced De Forest	4.75	Atwater-Kent	4.50
23-Plate, moulded ends	1.25	Federal	5.25
23-Plate, plain	1.00	Paragon	4.00
		Meyers Coil	3.00
VARIOCOUPERS		De Forest	3.00
Baldwin.....\$4.50		Marion	3.00
All Range	6.00	Thorburn	2.50
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Atwater-Kent	6.40	RADIO FREQUENCY TRANSFORMERS	
Emco	4.75	U. V. 1716	\$7.60
Tuska	3.50	U. V. 1714	5.50
		Radio Service	4.75
		Baldwin	2.25
		Acme	4.00
		STORAGE & B BATTERIES	
		60-Hour Exide	\$17.00
		120-Hour Westinghouse	19.00
		Westinghouse Storage B.	5.75
		22 1/2 V. France Variable	1.75
		45 V. France Variable	3.50
		22 1/2 Burgess Var	2.25
		80-Hour Westinghouse	14.00
		BATTERY CHARGERS	
		Hemphers	\$13.50
		Westinghouse	14.40
		Westinghouse (large)	22.00
		RHEOSTATS	
		Radio Corp.	\$2.40
		Rembler	.80
		Star	.80
		Cuttler Hammer	.80
		Murdock	.75
		Paragon	1.20
		Kloener	.55
		POTENTIOMETERS	
		Radio Corp.	\$1.50
		Paragon	1.50
		Graphite	1.20
		Amso	1.05
		LOUD SPEAKERS	
		Magnavox	\$32.50
		Federal Horn	9.00

Prices Good for December, 1922. Orders Must include Postage and Money Order.

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GITHENS TRUTONE RADIO HORN—LOUD SPEAKER



First one to sell
on ten day trial
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Guarantee

Retail Price
\$21.00
Includes
Loud Speaker

Trutone has been pronounced the best on the market by experts. It has a clear, true tone. Every radio fan should try Trutone and compare it with others. If YOU don't find Trutone the best, your money will be refunded. It is sold on a ten-day trial money-back guarantee. If not carried by your dealer write us.

Distributors and Dealers, write!

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1815 Trombly Ave., Detroit, Mich.

That Armstrong Circuit

So much interest has been displayed in the special article, "TESTED INVENTION OF MAJOR ARMSTRONG AMPLIFIES SET 100,000 TIMES," by John Kent, that appeared in RADIO WORLD No. 13, dated June 24, 1922, the publisher decided to put aside a number of copies for those who were not able to get this issue when published. Copies will be sent, postpaid, on receipt of 15c, or send in your subscription, \$6.00, for one year (52 issues), \$3.00 six months, or \$1.50 three months, and subscription will be started with the issue containing the article about Major Armstrong's Amplifier.—RADIO WORLD, 1493 Broadway.

YOUR NEWSDEALER

will deliver RADIO WORLD to your home. In order to be sure of getting RADIO WORLD regularly, and of not missing a single issue, we suggest that you either subscribe direct or through your newsdealer at \$6.00 a year (52 issues), \$3.00 six months, and \$1.50 three months. Or instruct your newsdealer to deliver RADIO WORLD regularly to your home each week. Dealers will take standing orders and make deliveries of paper whenever requested. Radio World, 1493 Broadway, New York.

Talk by Radio from Coal-Mine Depths

British Colliery Tests Prove Successful and Valuable Data Are Obtained

INTERESTING results were obtained by experimenters at the Baggeridge Colliery in Birmingham, England, a few days ago, says "Wireless World." Efforts were made to transmit messages from a depth of 700 yards to the surface. A three-tube set was used. The aerial was erected by slinging a wire from a steel hoisting gear 100 feet high to a girder of a railway bridge.

The ground wire was clamped to the lower part of a railroad rail. At first the transmitter and its aerial were installed in the steel cage, but considerable screening effect was experienced.

Tests were made at various distances down the shaft, and reception was found to be clearer when transmission was made at the lower points. This was thought to be due to presence of structural steel-work, which might have caused screening higher up.

Another experiment was made by taking the transmitter along the workings and groundings were effected by bringing a length of cable along the floor. The aerial was slung between pit props. Signals were clearly received at the pit mouth, although, owing to limited power of the transmitter, telephony was weak. It was suggested that the carbon in suspension in the air was having an absorbing effect on the signals.

Likes Mr. Miller's Set

Result of Trying Out Hook-Up in Radio World, No. 30, dated October 21

EDITOR, RADIO WORLD:—We have been trying out Mr. Miller's H-C hook-up the last few nights and using a U-V-200, but only have been able to get, in less than an hour's time, 2X1, WGY, WSB, and WDAP.

We find, however, that the tuning is extremely sharp and can be materially helped by using an .0008 variable with vernier and a vernier rheostat.

Last night (November 17), we tried out with two stages of amplification and a Western Electric power-amplifier with horn, with excellent results.

It's just about the simplest hook-up we have tried and, while critical, anyone should be able to work it.

In receiving code, however, we do not seem to get the proper increase of signal from amplification when using large coils for high-wave length.

We regard this hook-up as a good winter-time one; that is, for good radio weather, but doubt if it would be as satisfactory in summer time or poor radio weather. This would apply only to long-distance phone broadcasting.

It will also be noted that this hook-up treads on the toes of Major Armstrong.—Smith Novotoy Electric, Inc., Charlotte, North Carolina.

Air Service Radio School

A NEW Army radio school for training Air Service radio operators and electricians has been established at Chanut Field, Illinois. The school was recently removed from Post Field, Oklahoma, and new classes for radio instruction are being formed. Enlistments for training in radio for the Army Air Service are now being accepted at Chanut Field, where a six months' course will soon be started.

IS YOUR TELEPHONE HEAD SET WEAK?

Let meremagnetize it. Guaranteed, in one day good as new. **\$1.50**

Per Set
1 rewind for higher ohmage. All radio telephone repairing at moderate prices. Mail orders attended to. Dealers write.

ROYS, 101 West 42nd St., N. Y.

PATENTS

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Each sale has created new friends and customers with the result that we now announce drastic reductions in our quality lines. All goods prepaid. Send card for complete price list. You'll be surprised. You'll tell your friends. A sample saving follows:

COMPLETE REGENERATIVE		
	Our Price	Others
Panel—Bakelite—7" x 12"	\$1.85	\$2.40
Cabinet of 3-ply wood to fit panel	1.50	2.50
Two dials—each 35c	.70	1.40
Sixteen switch points with nut.		
Each 1c	.16	.48
Four switch stops with nut. Each		
1c	.04	.12
Night binding posts. Nickel plated @ 3c	.24	.48
Two switch levers @ 25c	.50	.90
1 filament rheostat. Highest grade	.65	1.10
1 vario coupler. Fourteen taps	2.25	4.00
1 25 plate variable condenser	1.85	3.00
1 tube socket—knocked down	.45	.85
1 grid condenser and lead	.15	.25
1 phone condenser	.15	.25
1 tube socket support	.15	.25
12 feet spaghetti tubing @ 4c	.48	.84
15 feet tinned copper connecting wire	.80	.45
Blueprints showing details to assemble	.10	.25
	\$11.32	\$20.02

Other articles taken at random from our late price list are—

Detector tubes—Cunningham—NOT rebuilt	\$3.95	\$5.00
Crystal detector of closed type	.08	1.00
Transformer—Audio frequency	2.05	4.50
Double slide tuner—knocked down		
Coil wound	2.50	....
Loose coupler—knocked down. Coils wound	8.75	....
Loose coupler—assembled	7.50	12.50
Variometer—Hardwood stators 4 1/2" Assembled	2.25	4.00
Foot Fuse—2000 ohms	3.95	5.00
Kollmer—2400 ohms	8.75	12.00
Western Electric 2400 ohms	9.25	12.00
Blueprints giving detail of 2 stop amplifier	.10	.25
Two stop amplifier—knocked down Panel drilled	12.95	23.50
Two stop amplifier assembled. In cabinet	13.95	35.00
Vacuum tube set in cabinet 7 1/2" x 12". Wired	17.95	35.00

Send for list today or order direct from above. Goods sold subject to return for rebate or exchange. YOU MUST BE PLEASED.

Radio Parts Manufacturing Co.
15 Park Place West Detroit, Mich.

Subscribe for RADIO WORLD. \$6.00 a year, \$3.00 six months, \$1.50 three months.

By Radio Across the Atlantic

How the New Langmuir Tubes Will Send the Human Voice in Both Directions

SENDING radio messages across the ocean by means of the tubes presented a contrast of apparatus. The Alexanderson alternators almost fill the center of the Rocky Point, Long Island, plant, whereas the tubes to be used, invented by Dr. Irving Langmuir, of the General Electric Company, Schenectady, New York, could be put in a suit case.

This does not mean that the alternators will be immediately superseded, because the tubes' superiority has not yet been sufficiently demonstrated to permit the scrapping of the larger machines, although the eventual adoption of the tubes is considered inevitable. Their value, says "The Times," New York, will be even greater to wireless telephone development, than to telegraph efficiency, as they were evolved by application of the same principle that has made the audion tube the most important achievement of those working on the wireless telephone.

The human voice already has been carried across the Atlantic by wireless, but only in one direction. By means of these electron tubes it is expected that the voice may be sent both ways without difficulty, so that extended conversations may be carried on. This is not exactly the same as two voices talking at once, as wireless communication is made at the speed of light and a word would reach Paris from New York so quickly that there would be no interference with the word coming back.

Plans for the development of the new electron tube experimental set were completed in December, 1921, by representatives of the research and engineering departments of the General Electric Company and the Radio Corporation, and the manufacturing of this highly delicate and specialized set was immediately started in Schenectady, New York. So fast did the work progress that in May of this year the temporary installation of the set was started at Radio Central, the Rocky Point station, and when Marconi visited the station in July preliminary tests were in progress under the direction of W. R. C. Baker of the General Electric and C. W. Hansell of the Radio Corporation.

The set at present consists of three fifty-kilowatt, 15,000-volt, water-cooled, metal vacuum tubes, known in the engineering world as kenetrons, and used as rectifiers; and six 15,000-volt, twenty-kilowatt, water-cooled metal plotrons, used as high-frequency converters. For the experiment with the tube set one of the new mile-and-a-half-long antennae, suspended from six towers, 420 feet high, was used, and the tube set succeeded in developing and sustaining in the antenna a current of the strength of 350 amperes. About 600 amperes has been used with the Alexanderson alternators, but it has been found that with the development of wireless apparatus a lower amperage may be used.

The most interesting feature about the experiment to the engineers conducting it was that the receivers and senders did not know that the change from alternators to tubes had taken place. There is little difference in the tone, the tube tone having a sort of companion wave sound, a kind of wireless echo, which, however, proved to

be almost indistinguishable until it was pointed out to the receiver. The switch from alternators to tubes was made without notifying the senders or receivers at 64 Broad Street, and although the man receiving messages from abroad sits on the other side of a table from the man sending, the receiver did not notice the change in the New York plant signals.

R-C CABINETS

Mahogany Photo Quality Finish. No Drilling of panels for attaching required. Hinged top.

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THE R-C MILLS

Executive Offices, 30 E. 23d St., New York, N. Y.
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BETTER LOUD SPEAKERS

AT HALF THE USUAL PRICE

REAL CABINET TYPE—set just as enclosed here.

Powerful—Beautiful—TONE INCOMPARABLE

We make a complete line—of the highest class construction throughout, with fine hand-rubbed finishes. All SPIROLAS are sold under absolute money-back guarantee to equal in volume and far surpass in beauty and tone any other at twice their price.

SPIROLA CONCERT—complete with built-in unit and cord ready to attach in place of phones. Finish: oak (Model CO) or mahogany (CM), bronzed \$12.50 throat

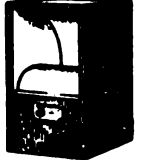
SPIROLA DUPLEX—for use with a headset. Improved type with separate tone chamber for each phone, eliminating interference. Finish: oak (Model DO) or mahogany (DM), bronzed throat..... \$4.85 \$3.85

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At dealers or postpaid, carefully packed (C. O. D. if preferred).
SPIROLAS for CHRISTMAS! Nothing adds so much to a two-stage set as a high-grade loud speaker. If preferred we will send direct, in holiday packing, carefully following your instructions.

DEALERS! We can fill holiday rush orders!

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"All Wave" Coupler

TRADE MARK

(FLAT AND BANK WOUND) Wave Length, 150 to 3,000 meters.

Eliminates the use of all Variometers, Variocouplers and Loading Coils, inasmuch as it performs in one compact unit the functions of all of these devices combined.

For the Novice—The six efficient hook-ups given free with each "All Wave" Coupler enable the greenest novice to attain the same results attained by the expert in building the simplest, most compact and most efficient radio receiving set possible.

Be Prepared—For the higher wave lengths that have been and will be allotted to broadcasting stations because of their ever-increasing number. BUILD a set that cannot become obsolete.

Unusual Results Attained—Individual users of the "All Wave" Coupler have written us that in New Jersey they have listened in as far west as the University of Wisconsin and Chicago, whereas in Montreal, Canada, it is nothing unusual to bring in Schenectady, Detroit, Chicago, Pittsburgh, Newark and the Arlington time signals, direct, and in Mobile, Ala., Newark, N. J., is brought in daily.

Beware of Imitations—of the "All Wave" Coupler, which is guaranteed with a money back to operate as advertised. Look for the trademark, "All Wave," on the rotor, also the six efficient hook-ups in the box.

\$9.00 Six efficient Hook-ups sent upon receipt of 10c. stamps or Free with each "All Wave" Coupler

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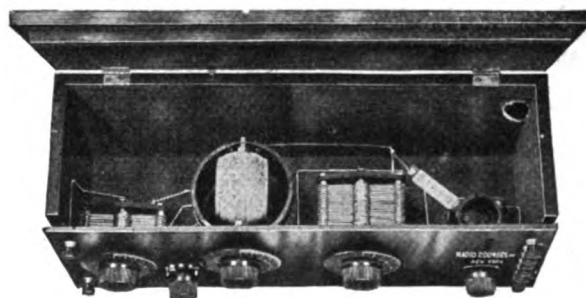
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Give This Set for Christmas

A Real Tube Set \$27.50



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With 2-Stage Amplifier \$54

A Real Tube Set For the Price of a Good Crystal Set

A high-grade tube set that costs less than price of parts used. Super-sharp tuning through double circuit and Litz-wound rotor.

All the fun of assembling—but correct assembling made absolutely certain and simple by means of concise and easily understood instructions.

The set is supplied with the 7-inch x 18-inch hard rubber panel, drilled and engraved and fastened to the handsome mahogany-finished cabinet; all parts are packed in the cabinet and include all connecting wires cut, bent, and turned ready for soldering; instructions for assembling are supplied. Securely packed in shipping carton.

A set that gets the highest results at the lowest price.

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If you did not get a copy of Radio World No. 1, send us \$6.00 and we will send you this paper for one year, and start it with our first issue, which will be mailed you as soon as possible after receipt of order.

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DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 15% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified advs., if copy is received at this office ten days before publication, RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4764.)

AT LAST! Your chance to learn to fly and get into aviation. Write to Varney Aircraft Co., Peoria, Ill., for particulars of this great opportunity.

RADIO FANS: Have you read of the wonderful new all-wave Radio Frequency Amplifier invented by Doctor Miller of the Naval Radio Research Laboratory, Bureau of Standards, Washington, D. C.? We manufacture this device under license. May be added to your present set, giving wonderful results on distant stations, or may be made up into loop receiver sets with extreme range and beautifully clear reception, for home or automobile use. Besides being the best amplifier on the market, the Miller covers all waves at equal efficiency. Price, \$6.50 per unit. Details free. Coast Radio, Inc., El Monte, Los Angeles, Calif.

WE PASS samples or circulars, 1c. each, to houses direct. Lady Canvassers. We mail your circulars, 25c. a hundred. Guaranteed names of our mail order customers. 75,000 up-to-date lists, \$2.00 thousand; 7,000, \$10.00. C. H. Davis & Son News Agency and Mail Order Distributors, 614 W. Jefferson, Greenfield, Ohio.

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MILLER AUDIO FREQUENCY transformer eliminates howling. Entirely satisfactory on three stages. Price \$5.00 postpaid anywhere in U. S. RADIO SALES CO., Box 1144, Bethlehem, Pa.

RADIO MAN with two years' experience desires position. Herbert Listerville, New Brunswick, Canada.

MAKE LONG RANGE INDOOR AERIAL. Instructions with small working model, fifty cents. RADIO SPECIALTIES CO., Box 34, Medford Hills, Mass.

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THREE STAGE AMPLIFIER—Mounted in Handsome Cabinet. In A-1 condition. Big BARGAIN at \$40.00. Write for particulars. Earl Wright, Cole Camp, Mo.

No More "Distant" Places
Even to the Remote Lumber Camps,
Radio Brings Tidings of the Busy
World.

RADIO may be helpful in many ways to the city-dweller, but it can never have for him the real meaning that attaches to radio in the wilderness, says Henry Smith Williams in "The American," New York.

Imagine yourself spending the winter in a lumber camp a hundred miles or so from any permanent habitation. Better yet, imagine yourself a lumberjack working month in and month out in a northern logging camp, which you leave

Attention, Newsdealers

You should keep a good supply of back numbers of RADIO WORLD on hand all the time. It has been the experience of many dealers that a purchaser of RADIO WORLD for the first time will almost immediately want the back numbers, some of which are already out of print and some of which are difficult to get. THE PUBLISHER WILL FURNISH BACK NUMBERS TO DEALERS DIRECT OR THROUGH THE AMERICAN NEWS CO. AND ITS BRANCHES. Dealers should hold their unsold copies for a reasonable length of time. RADIO WORLD of October 28 contained a full page of contents of back numbers to that date. 15 cents per copy; any seven numbers for \$1.00. RADIO WORLD, 1493 Broadway, New York.

ATTENTION! You invent it. Let us make it. Models, dies, manufacturing. Sheldon Tool Co., Rosedale Station, Kansas City.

SALESMEN that have been or are calling on electric or radio trade, see Mr. Rice, 6311 N. Clark St., Chicago.

EXCHANGE letters with new friends everywhere. Pleasant pastime. Information for stamp. Smith, Box 3125-M, Portland, Ore.

ISSUES OF RADIO WORLD from April 1 to Oct. 7 (7 numbers) for 15c a copy, or the whole lot for \$3.15. Or send us \$6.00 for one year and start with the first number. RADIO WORLD, 1493 Broadway, New York.

EDISON B. BATTERY UNITS—One positive and one negative plate for 10c. 18 sets will make a 24-volt battery. Wilkinsburg Wireless Shop, 711 Penn Avenue, Wilkinsburg, Pa.

BOOST RADIO. Wear a pin or button. It shows you are progressive. Designs and estimates furnished by official club jewelers. The Rankin Co., Radio Dept., 1118-20 Chestnut St., Philadelphia, Pa.

HELP WANTED—MALE
EARN \$116 to \$250 Monthly, expenses paid, as Railway Traffic Inspector. Position guaranteed after 3 months' spare time study or money refunded. Excellent opportunities. Write for Free Booklet G-151. Stand. Business Training Inst., Buffalo, N. Y.

DIALS, 3-inch, genuine hard rubber, raised or depressed scale, white or gilt lettering. Drilled for 1/4 and 3/8 inch shafts. 60c. each. 3 for \$1.50, postpaid. No stamps. RADIO SALES CO., Box 1144, Bethlehem, Pa.

OLD MONEY WANTED—\$2.00 to \$500.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. Clarke Coin Company, Ave. 83, Le Roy, N. Y.

ACT QUICK SALE. Oak Cabinet, 6x6 1/2 x 18, with genuine 3/16 Celoron panel, \$3.75. Haupt Radio Supply Co., 2332 Ogden Ave., Chicago, Ill.

MEN WANTED for detective work. Experience unnecessary. Write for details explaining guaranteed position. J. GANOR, former Gov't Detective, St. Louis, Mo.

PARAGON, RA-10 receiving set for sale with three steps of amplification, in a neat cabinet; three power tubes, three amplifying tubes, six volt Eveready storage battery, four 22 1/2 Burgess B batteries, brand new 3000-ohm phones, three dollar lightning switch, microphone and a complete charging outfit. Will sacrifice at \$300. Write Edward Hoffman, 1719 E. Washington, Ft. Wayne, Indiana.

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Exchange jolly interesting letters through our Club! Stamp appreciated. Betty Lee, Inc., 4254 Broadway, New York City.

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WE NEED RADIO WORLD, dated April 23 and August 5. If you have copies you don't require, mail to this office and current issues will be sent you for them. RADIO WORLD, 1493 Broadway, New York.

Are you familiar with all the radio symbols used in the various hook-ups published in Radio World? If not, secure a copy of Radio World No. 26, dated Sept. 23. In this issue was a complete table of all important symbols used in radio construction and testing. Send 15 cents for a copy, or \$6.00 per year, and have subscription start with that issue. RADIO WORLD, 1493 Broadway, New York City, N. Y.

at most twice in the year—on Christmas and on the Fourth of July. For months together you are shut out from all physical contact with what we ordinarily speak of as "the world." No newspapers, no letters, no rumors even of what is going on a hundred miles away.

And then imagine that someone installs a radio outfit, so that you can listen nightly to the news of what is happening all over the world, and to concerts and lectures. You are no longer isolated. You are up to the minute in your knowledge of affairs.

This is just what has happened in many lumber communities. Away out in the forests of the Coast Range in Oregon and Washington, the Hammond Lumber Company has installed powerful receiving sets in more than twenty of the logging camps. The lumberjacks listen in on San Francisco and Portland and Seattle, and never lack for entertainment.

A highly interesting feature of the installation of these radio-receiving sets is the preparation of a pair of poles to support the antenna wire. Trees about 300 feet high and, perhaps, six or seven feet in diameter are selected. The lumberjack, with the aid of a rope and a pair of climbing irons, runs up one of these trees like a squirrel, lopping off the limbs on every side until the tree is like

a telegraph pole. Then a wire, perhaps a thousand feet long, is strung between two trees at a great elevation. A lead-in wire connects with the radio apparatus in tent or cabin; and after tuning difficulties are overcome, everything is in readiness to receive messages.

At Your Service!

There appeared in RADIO WORLD, dated April 1, 15, and 29, the following articles.

April 1—A 500-Mile Radiophone Employing a 5-Watt Tube, by Frank A. Hahnel. "Tell Me, Please, How Will This Set Receive?" by E. L. Bragdon. Short Cuts in Receiver-Circuit Design, by O. C. Roos. Making a Short-Wave Regenerator, by Fred. Chas. Ehler.

April 15—First Principles of Electricity as Applied to Radio, by John P. Miles. Your Storage Battery, by E. L. Bragdon. What Makes Radio Possible, by Edward Linwood. Ground Connection as Vital as Antenna, by Fred. Chas. Ehler.

April 29—Valuable Pointers on Aerial Construction, by Edward Linwood. What Is Meant by Tuning, by E. L. Bragdon. Radio-Frequency Amplification and Regeneration, by Frank Armstrong. Honey-Comb Coils and Condensers, by Edward Linwood. Charging the Storage Battery, by E. L. Bragdon. How to Construct the Variocoupler, by Frederick I. Rumford.

Each copy sent on receipt of 15c. per copy, or the three copies for 45c.; or better still, send your subscription beginning with any one of these numbers, and we will send this paper for 52 issues, and you will then have a complete file for ready and constant reference. RADIO WORLD, 1493 Broadway, New York.

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you're missing something Big.

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RADIO FREQUENCY SET

175 to 500 Meters

3 Radio Frequency

3 Audio Frequency and Detector
All on 4 Tubes

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A Rare Selling Opportunity
For Live Wire Men

Handle Grewol Detectors in
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Write for full particulars

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**AETACO
CRYSTAL SETS**

\$225.00 Wireless Specialty—Crystal and
Audion, 150 to 3,000 meters. Our Price
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\$5.00 Queens Variometers.....\$2.50

\$5.00 Polak-Green Variometers.....\$2.50

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\$5.50 Baldwin Coupler, Super Type.....\$3.50

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235 FULTON STREET
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New Device Stops Static

Functions on an Antenna at Any Wave-
Length, Declares the Inventor,
Dr. B. G. McCaa.

PREVENTION of static interference in radio reception has been solved, according to Dr. B. G. McCaa, of Ephrata, Pennsylvania. Dr. McCaa, who has been working on static problems for over four years, is not a doctor of radio or any other science, but a "simple M. D.," he says. He took up X-ray and high-frequency work in medicine and became a radio "bug" ten years ago. In a communication to RADIO WORLD, he describes his invention for the killing of static as follows:

"The antistatic work was taken up early in 1918, and, in the course of four and a half years of search and testing, three systems only, out of many studied, have shown any merit. Let us designate them as A, B, and C.

"During July of this year, tests were made of systems A and B, in combination, on the commercial-telegraph channels of the Federal Telegraph Company in California. Repeated observations made by many engineers showed signal to static ratios of 200 to 1. Static of 3,000 to 6,000 times audibility was reduced to audibilities of 10 to 50, and signals 200 to 250 times the strength of the static received at the same time.

"System A reduced static to a one-to-one ratio, and system B improved the ratio as given above.

"From the practical result, i. e., readability of signals, operators could take solid copy on 'stuff' that could not be copied on standard receivers.

"System C is a more recent development and replaces system A, as it has proven far superior to A in many respects. Combining C and B, absolutely static-free signals have been obtained in the presence of nearby electrical storms.

"All the systems are designed to function on an antenna and do not depend for their operation on the vagaries of directional propagation or some mysterious 'origin' of static. They may be used on closed coil or loop reception as well as on ground or water wires.

"Systems A and B in combination are adapted solely to radiotelegraphy and may be used at any wave-length.

"System C operates at any wave-length and possesses the decided advantage of being applicable to radiophone work at any wave-length. It has been proved to function at 360 meters. The device is simple; it has but one adjustment, which, when made, remains fixed for all time like any other tuning adjustment."

Radio Goods Active

HOLIDAY business is taking on more life in electrical goods and some cities report shortages of certain stocks of heaters and ironers. "Electrical World" will say tomorrow: "Central station activity in making line extensions is taking much high tension equipment. Motors in all sizes are moving well."

Radio jobbers report better sales, saying that a lot of the business is going to parts and head sets. Vacuum cleaners are also in demand and washers are more active. The mild weather and improvement in the coal situation has slowed down the sales of heaters but purchases are frequent.—"The World."

Do You Like Clear Tone—Sharp
and Distinct? If so try

MARSH'S

**Vernier Variable Condenser
AT LAST**

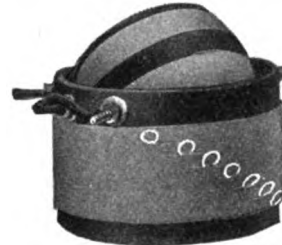
Made in Three Styles. Dial Knob
and Screws Complete. Fully Guaranteed.

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23-Plate\$4.75
11-Plate\$4.25

Mail orders promptly filled.

F. P. Marsh, 145 Nicoll St.
NEW HAVEN, CONN.

VARIO COUPLERS



**GEM
\$1.25
List**

We also make 6 other styles

That List \$2.50 up

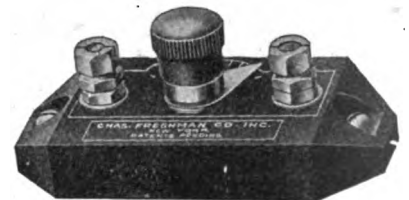
Jobbers—Dealers—Agents

Write for Discounts

Jewell Radio Sales Co.

90 West St. New York City
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*The Latest and Most Essential
Part of an Efficient Tube Set*



**Variable Grid Leak
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Obtainable in an unbroken range from
zero to 5 megohms—all intermediate
points. Fixed capacity—.00025 M. F.
Improves your set wonderfully by

*Clarifying Signals
Lowering Filament Current
Increasing Battery Life
Eliminating Hissing*

Price Only \$1.00

At your dealers—otherwise send us purchase price and you will be supplied without further charge.

Manufactured by

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97 Beekman St. New York City

Home of Micon & Antenella

SEND US THE NAME

OF YOUR RADIO CLUB

Also the names of your president and other officers. We want to add these to a list of radio clubs and officers we are preparing for publication in an early issue. RADIO WORLD, 1493 Broadway, New York.

RADIO STORES CORP.
RS

"Famous for the Perfect Straight Line Test"

Laboratory and Service Work Prove the Superiority of the

RADIO STORES VARIABLE CONDENSER

A Few Distinctive and Exclusive Features

Concealed Counter Weight Under Dial
Brass Studs Through Aluminum Plates and Die Cast Shaft Held in True Center Through Brass Bushings
Binding Posts Mounted on Separate Metal Straps
In No Instance Is Insulating Material Tapped—Metal Inserts Throughout
Precision Workmanship—Best Engineering Design

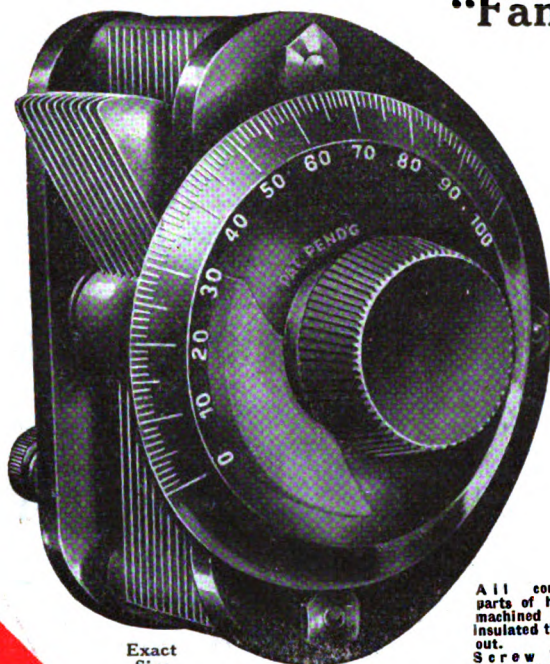
23 Plate, .0005 Mfd. Max. to Min. Cap. Ratio 28-1 **\$4.25** | 43 Plate, .001 Mfd. Max. to Min. Cap. Ratio 46-1 **\$4.75**

RADIO STORES TORPEDO PLUG ALWAYS DEPENDABLE!

The Radio Stores Torpedo Plug is one of the series of their products, designed and constructed to meet the requirements of the critical user, at the right price.



All conductive parts of heavy machined brass, insulated throughout. Screw binding post terminals, with separate anchor for tail of cord. Designed to insure rigidity, durability, strength and lightness.



Exact Size

\$1.25 List

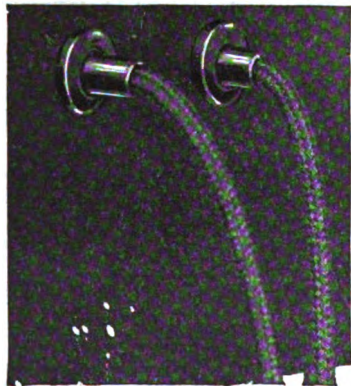
222 West 34th St. New York City

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UNION-RADIO PHONE TIP JACKS

(Patent Applied For)



FRONT (Outside) VIEW

They are valuable wherever head phones are to be used. Especially convenient in connection with CW circuits. Countless uses have been found for them.

The use of binding posts to connect phone tips has always been unsatisfactory. It is difficult to keep the tips from falling out of the binding posts.

These Union Radio Jacks will accommodate any telephone cord-tips manufactured. To mount them on any panel, just drill a hole, using a

7/64 drill, insert the bushing, and screw on the lock nut which holds the combination tension spring and soldering lug in place.

The tip when inserted is firmly held. And a good electrical connection is assured at all times. These Jacks eliminate the buying of an expensive telephone plug and Jack.

Ideal for experimental circuits or in any part of a set where quick changes are needed. They accommodate wire up to the thickness of telephone tips.

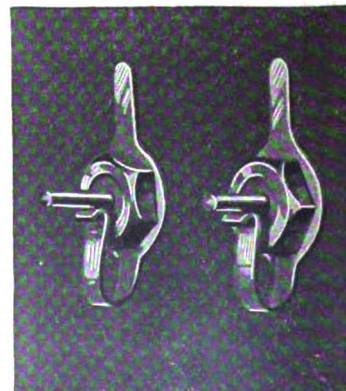
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REAR (Inside) VIEW

CHRISTMAS NUMBER

DECEMBER 9—15c

RADIO (Trade Mark) WORLD

ILLUSTRATED

WEEKLY

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Amplifies Signals

More Records by the
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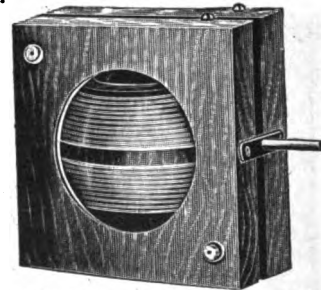
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VOLUME TWO OF
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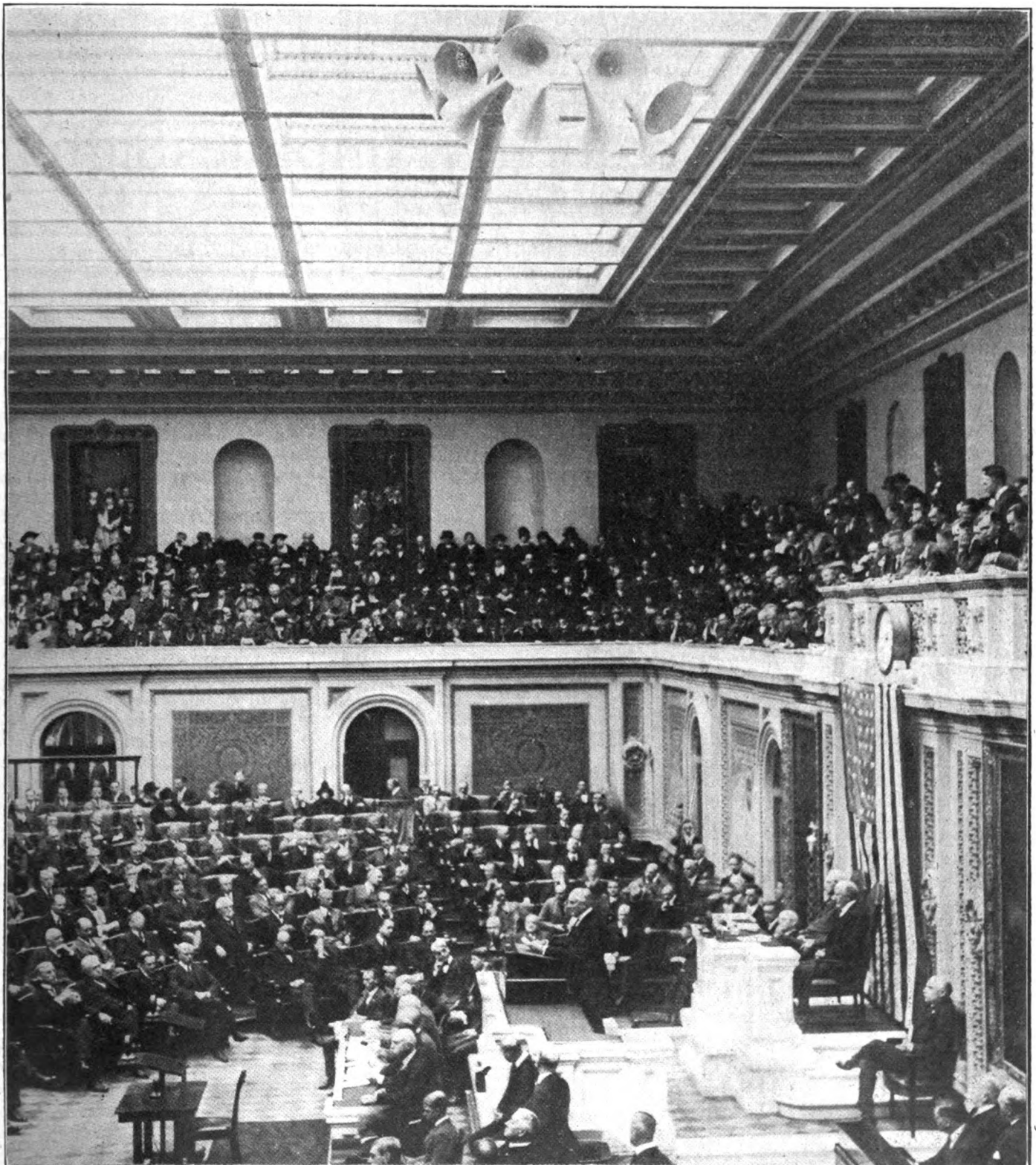
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Vol. II, No. 11. Whole No. 37

December 9, 1922

15c. per copy, \$6.00 a year

Radio Now Used in the United States Congress



(C. International News Reel)

President Harding delivering his recent message to Congress. The bell-like apparatus suspended from the ceiling are microphones which catch his words for broadcasting. The square discs in front of the reporters are also microphones to catch their orders.

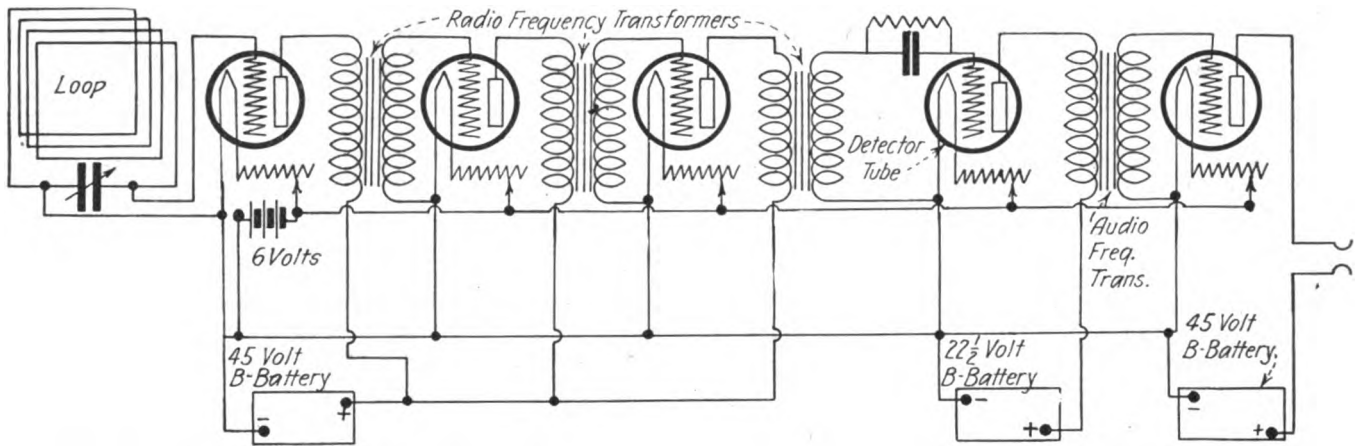


Figure 1—Schematic diagram of a five-tube radio-frequency receiver. The first three tubes and transformers are the radio-frequency amplifiers, the next tube is the detector, and the last tube is a one-stage of audio-frequency amplification. A loop aerial is used. Suggested by George W. May. Drawn by S. Newman.

Why Radio-Frequency Amplifies Signals

By Donald Van Wyck

RADIO-FREQUENCY amplifiers are attracting considerable attention. Radio fans who are unable to erect a satisfactory antenna may improve the strength of incoming concert music, or increase hearing range, by means of radio-frequency amplification, audio-frequency amplification, or a combination of both. In cases where the receiving station is near the transmitting station, the energy received is usually sufficient to reproduce sounds without radio-frequency amplification. When the receiving station is more remote, the signal must be built up, or amplified, before it passes through the detector and the stages of audio-amplification. If radio amplification is not used, audio-frequency amplification in such cases is frequently of little use. In the first place, the fundamental difference between radio-frequency and audio-frequency amplification is far from clear to many of the amateur operators of to-day. As the names imply, both instruments amplify the signals received from distant broadcasting stations; but they do it in a widely different manner. The audio-

frequency method, for instance, amplifies whatever the detector delivers to it and, therefore, increases the volume of sound in the head telephones. It is obvious that if a certain signal is too weak, by the time it reaches the receiving antenna to operate on the detector, no amount of audio-frequency amplification will make it audible in the head phones. Radio-frequency amplification, on the other hand, goes straight to the root of the trouble. The radio-frequency tubes precede the detector in the circuit and confine their work to the radio impulses in their original form. In accordance with the natural action of the vacuum tube, these impulses are successively strengthened by as many tubes as desired. When they are deemed sufficiently strong they are passed to the vacuum-tube detector for conversion into currents of audible frequency. Once audible sounds are produced, audio-frequency amplification may be relied on to obtain the desired volume.

The connection between the amplifying vacuum-tubes may be merely a wire or, possibly, a very high resistance; or it may be some form of a

transformer. The first method, that of a direct connection, is unsatisfactory and is never used in actual practice. The second is fair and has received more or less recognition. The third method of using transformers is the most satisfactory and is most generally used. The transformers may be of the air-core type or of the iron-core type, which has two independent coils known as primary and secondary, respectively, mounted on laminated legs. The iron-core amplifying transformers give the best results and, paradoxically, also give most trouble to the uninitiated.

The amount of iron in any transformer is dependent on the frequency of the current which is passed through the windings, and the higher the frequency the less the iron used. Since the iron must reverse its polarity with each reversal of the current, this indirect ratio may be explained easily.

With audio frequencies, such as are encountered in signals after they leave the detector, the design of the transformer is not difficult. But when it is remembered that the radio-frequency of a 200-meter wave runs into the millions of cycles per second, the complexity of the task which confronts the designer of radio-frequency amplifying transformers is realized at a glance.

The design of the radio-frequency amplifying transformer would not prove a thorn in the sides of the manufacturers if the commercial phase of the question could be side-stepped. It is not much of a problem to construct a transformer which will function very well in a narrow band of wave lengths: say from 200 to 300 meters. But such a device would not meet the sanction of most amateurs because they do not wish to be put to the task of changing transformers for the various wave lengths. Beware of all-wave radio-

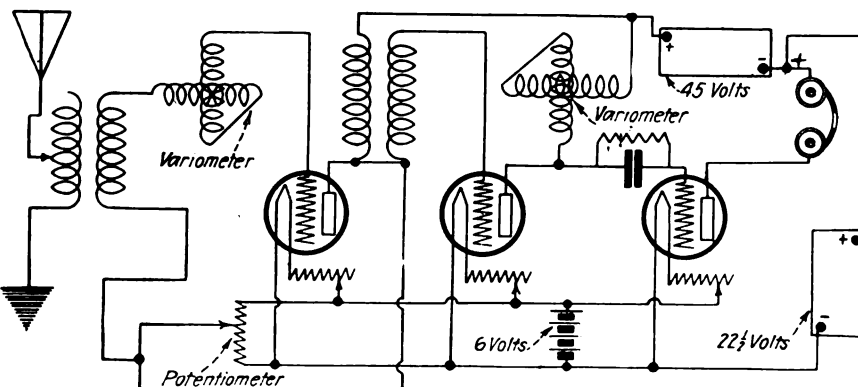


Figure 2—Another schematic sketch of a radio-frequency receiver. This diagram shows two radio-frequency tubes and one detector-tube in operation. This circuit should produce unusual results on DX work. Suggested by George W. May. Drawn by S. Newman.

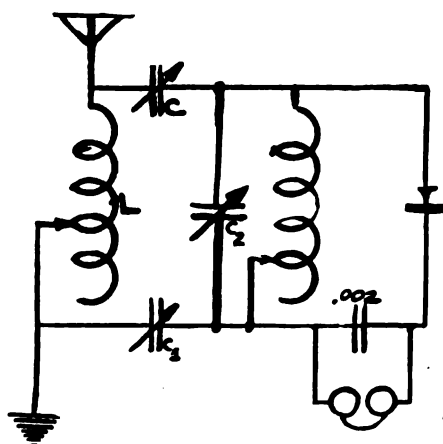
Capacitively Coupled Receiver for DX Work

By Arthur O. Curtis

CAPACITIVELY coupled circuits are those in which condensers are used to connect primary and secondary circuits. By varying their values, a set may be placed in tune with a transmitting station. This type of coupling is said to be electrostatic, since condensers function only by reason of their electrostatic field. A simple circuit shown accompanies this article. This diagram, when used with such a receiver, will operate successfully on short waves. It is seen that the primary circuit is essentially a parallel resonant circuit, as distinguished from the series of resonant circuits that are common to the direct and inductively coupled

circuits. Sharp tuning is accomplished more successfully with this type coupled affair than with any other, and it is somewhat more efficient than other types. Adjustments may be said to be more critical and, generally, there are more adjustments to be made with this type set than with any other. The

three variable condensers C, C1, and C2 are of .0005 micro-farad capacity. L1 is the primary inductance coil and L2 is the secondary inductance coil. The tuning is controlled by C2, while C and C1 act as the coupling control. The primary (which is L) consists of forty turns of No. 24 cotton-covered wire wound on a tube $3\frac{1}{2}$ inches in diameter. L1 has 30 turns of No. 22 cotton-covered magnet wire wound on a tube $3\frac{1}{2}$ inches in diameter. The coils, when in operation, should be placed at least four inches apart. The degree of coupling is determined by the amount of capacity of C and C1. Broad tuning can be had by increasing the capacity. Small capacity affords sharper tuning and minimizes interferences. The secondary coil in the detector circuit is of standard type and is used to obtain satisfactory results. Changing the capacity settings for these coupling condensers does not change the resonant frequency of the circuit, but merely changes the amount of energy transmitted from the primary to the secondary through the condensers.



Condensers may be used to a great advantage by employing a capacitively coupled receiver. The above schematic diagram shows such a circuit. The condensers act in this circuit as a coupling between the two coils. Drawn by Arthur O. Curtis.

(Continued from preceding page)
frequency transformers. They will not function. Several schemes have been tried for circumventing the natural limitations of the radio-frequency transformer. One has the division of the windings in sections with suitable taps brought to the surface. By means of either binding posts, or a movable contact-arm, the transformer is tuned to the particular band of wave lengths to be received, and, therefore, the loss incident to using a transformer designed for one frequency on a vastly different one is partially avoided. The other scheme provides a series of transformer units to be plugged in and out in accordance with the tuning.

The most common radio-frequency transformer on market resembles the audio-frequency type and is designed to function on a band of wave lengths from 200 meters to 450 meters.

Accompanying this article are two schematic diagrams of practical radio-frequency circuits which consist of three stages of radio-frequency and detector; also, one stage of audio amplification. For the antenna with this particular set, I used the loop aerial as explained by me in RADIO WORLD, No. 33, dated November 11. The loop aerial (Figure 1) gives the marked advantage of eliminating interference and practically makes a directive antenna a compass loop. The loop aerial will function satisfactorily if used with this three-stage amplifier. Figure 2 shows a two-stage amplifier of the radio-frequency type with vacuum-tube detector. Any one contemplating the building of this set will find that it works far better than some others.

Take Care of Your Storage Battery



(C. Kadel & Herbert, N. Y.)

The storage battery—these cells of electrical energy are of vast importance. Most of the receiving outfits, to-day, using vacuum tubes need such a storage battery. The storage battery is rather a delicate affair, even if it does weigh a lot. Care must be taken that it does not deteriorate quickly. With good care a battery for radio work should last several years. The above photograph shows how to keep a battery clean. A clean battery will prevent short circuits.

Efficient Crystal Set at Small Cost

By Charles H. Plath

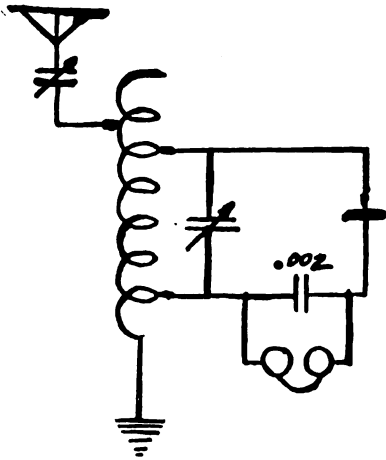


Figure 1—Simple circuit with a slide tuner. This will receive phone reception up to a certain limit. Both sketches drawn by Charles H. Plath.

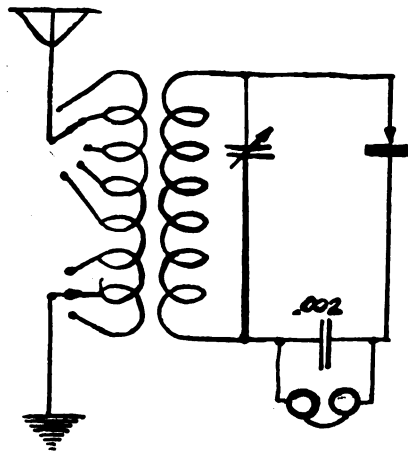


Figure 2—When taps are used, two switches are necessary in a circuit—one for the large steps of inductance and the other for the small steps.

WITH radio broadcasting becoming more popular, many people are willing to spend a small amount of money in order to break into the radio game. For such people, the crystal set still holds its own. There is practically no upkeep of expense as its cost is low. At any rate, those who break into the game, if it does nothing else it will turn the most disinterested radio prospect into a "bug." Radio waves are passing through and about us all the time. We cannot hear radio waves without the aid of instruments. No matter what type of apparatus one decides to purchase, it is worth while to purchase the parts, or units, that may be added to from time to time as one's interest increases.

For any type of receiver, we must have some sort of an aerial. My experience has taught me that, for receiving purposes only, nothing can equal a single-wire aerial about 75 or 100 feet long. This wire must be about No. 14 B and S gauge. When erecting it, insulators must be used to prevent the wire from losing its energy and, possibly, becoming grounded. Once it becomes grounded, all radio waves, or energy, will be grounded and no sounds will be heard. This mistake must be avoided, and a careful examination should be made when erecting the aerial. Insulators should be placed at all points where the wire may come in contact with some metallic, or conducting object, such as a metal roof, damp surfaces, and metal stays or guy wires. There should be provided also sufficient wire to reach from the instruments to the nearest cold-water pipe. Next secure a single-slide, or two-slide tuner. With this piece of apparatus you will be able to tune in the stations you desire up to 600 meters.

By adding a crystal you will have the simplest possible apparatus for reception. This is shown in Figure 1. A pair of phones, or a single phone, is a requisite for sets both large and small and care should be taken for selection. They should be rated at from 2000- to 3000-ohm phones. Phones should be of the best materials and most carefully made; therefore, if your means are limited it is better to buy a single phone of known quality.

Two sliders on the coil will produce greater selectivity. They operate similar to an autotransformer—the turns between the aerial slider and the ground end of the coil may be considered as the primary, and the turns from the ground end of the coil to the other slider may be considered as the secondary. A variable condenser may be connected across the coil to sharpen the tuning.

Still greater selectivity may be obtained by employing a loose coupler as shown in Figure 2. Here there are two circuits. They must be tuned to resonance with each other and the incoming wave. The circuit in which the aerial, ground, and one of the coils is connected is called the primary, or open cir-

cuit and the circuit that contains the detector and phones is called the secondary circuit, or closed circuit. This also takes in the other coil. Loose couplers are so constructed that the secondary may slide out of the primary. This relationship between the two coils is known as the degree of coupling.

Radio Is the Biggest Show on Earth

The performance: Complete grand operas, baseball and football—play by play; we can even hear the bat strike the ball, hear the crowd cheer. In an instant, we are at the ringside! There is a prize fight on. We can almost hear the knockout wallop—get the thrill of things as they happen. And, on Sunday, the entire service at one of the leading churches.

News, amusement, the most interesting things of the world, are brought instantly into our own home by radio.

Let every owner of a radio-receiving set who knows the joys of this, the greatest of all amusement devices, invite some friends into his home during National Radio Week, December 23 to 30, inclusive, and so bring joy and happiness into another's life during the joyous Christmas season. That's what Christmas is for—to bring happiness to others.

The object of National Radio Week is to double the number of radio fans. Let every radio enthusiast make it his business during this week to enthrone another—to bring a radio-receiving set into a home that now lacks the thrill of being in constant, instantaneous touch with the great actors on the world's stage.

A radio receiving-set costs less than a good phonograph; also, the upkeep is much less. There are no records to buy, nothing to wind up—and an entirely new program every hour.

Radio amuses and interests every member of the family with scientific lectures on psychology, to bedtime stories for the kiddies—grand opera to jazz—one gets what one likes the best. By the slightest turn of a dial, we turn in to the broadcaster that most interests us, for radio service and amusement, today, is almost unlimited.

Radio keeps a home together. It makes one's home the center of the universe.

A Christmas Thought for National Radio Week

THOUSANDS of readers of RADIO WORLD will be purchasing new radio sets or replenishing their present equipment between this date and Christmas Day. Why not share your joy of ownership by taking advantage of the special opportunity offered during National Radio Week and set aside one or two evenings during that week for the entertainment of less fortunate friends by letting them listen-in on your set?

National Radio Week is from December 23 to December 30, inclusive. Each reader of RADIO WORLD can help radio along its merry and interesting way by getting up a Radio Party and, by so doing, increase the ever-growing army of radio enthusiasts.

Remember, the National Radio Week dates are from December 23 to December 30. Make your plans in advance and then write and tell us, briefly, what you have accomplished to help make those closing days of December memorable in the history of radio in this country.

Radio, This Christmas of 1922

A YEAR ago, when radio had not progressed to its present high place in the world of science and entertainment, the question asked by everybody interested was: "What will the Christmas of 1922 bring forth? The proper results of reasonable development or merely the chaos that so often follows tremendous interest in something new?"

Well, the now holiday season is here and with it comes the answer.

Radio has justified itself both as a science and as the amusement of millions. Great changes have come. Scientists have given of their best in adding definite expression to the potentialities of radio. While formerly there was confusion as to certain technical angles there has come the solution of many difficulties. Where tens of thousands formerly were interested, millions now pay the tribute of earnest interest and enthusiastic attention to these solutions of problems that have been offered by some of the keenest minds in science.

TO be sure, there came an apparent lull in interest last summer. Merchandising conditions became confused. Static, that imp of the ether, took a hand in confusing the minds of many and adding to the difficulties of the great national sport, "listening in." These difficulties are being framed out. The business of manufacturing, distributing, and selling are becoming standardized as the demand becomes fixed and the business elements of radio better understand what is expected of them. Static trouble has been minimized by new inventions until, finally, it seems agreed that by next summer, this trouble may be compelled to hide its diminished head, and, perhaps, disappear entirely.

Radio has become something more than a fad. It is now one of the world's greatest natural utilities. Nations depend upon it for enlightenment and the interchange of diplomatic, scientific and business messages. Armies and navies, whether they continue to exist in a menacing or a protective measure, find radio an adjunct of marvelous power and usefulness. Great human problems of transmission are being solved through this wonderful agency. In fact, every activity of life, whether commercial, artistic, or even spiritual, is being affected in varying degrees by this new marvel. And so far as religion is concerned, people are listening to sermons who never listened to them before.

AS for the public itself, there is not the slightest doubt that radio has left a deep impression on the universal mind. Many millions, comprising the enthusiast with the "makings" and the owner of expensive receiving sets, all along the line to the modest listener-in who takes his place at the great guest board and is delighted by the wonders borne to his willing ears—all are steadfast admirers of the new science and help to swell the world-wide army of radioists.

And to the big broadcasters, those pioneers who bring the world into closer communion, who afford equal joy to the millions in crowded centers as well as those on the outposts of civilization, the thanks of the world are due. For, in the final analysis, it is to successful and ever-improving broadcasting that the whole craft must look for continued interest and consequently continued success.

—THE EDITOR.

What Leading Radioists Tell the World

Progress Due to Close Cooperation

By S. W. Stratton

Director, United States Bureau of Standards

THE past year has shown a remarkable development in the use of radio as a method of communication, especially in cases where the ordinary methods are not available.

This progress has been brought about by a close co-operation between manufacturers, commercial companies, amateurs and government officials. This problem has been a very difficult one owing to the nature of the principles involved and our lack of more definite knowledge in regard to them.

Scientific laboratories throughout the country have concentrated on these fundamental problems of radio; their contributions to the subject have been eagerly sought for and immediately applied, a fact which has been of vital importance in these astonishing developments.

A Message from New York's Police

By M. R. Brennan

Superintendent of Police Telegraph, Police Department of the City of New York

AS the Christmas of 1922 approaches the Police Department of the City of New York feels an especial pride in the fact that the public will be furnished with a service that will add to their protection by broadcasting police information for the apprehension of criminals and the recovery of stolen property. The Police Commissioner also expects to be able to furnish an entertainment program which will be highly instructive and enjoyable...

Earth Spanned by Radio Peace

By Alfred N. Goldsmith

Head of the Department of Electrical Engineering of the College of the City of New York

PEACE on an earth spanned by the radio waves carrying the message of good will from man to man.

Let Us Rejoice and Be Glad

By Lee de Forest

Inventor of Many Important Radio Devices

LET us rejoice and be glad in this idea of a Radio Christmas! Not only for this year but for all years to come! Indeed, why not? Not alone for the immediate joy that it will bring to the heart of the individual boy or girl. Not alone for the further encouragement it will bring to the men who are giving time and thought to the development of the industry itself; but for the greatest of all reasons: namely, that with the radio art we of the industry are installing the most marvelous of all

instruments for spreading the tidings of peace on earth and good will toward men.

Radio Has Come to Stay

By H. Gernsback
Editor "Radio News"

THERE have been many Christmas celebrations in which radio has played a part, during the past ten or twelve years, but this is really the first Radio Christmas. It is the first time that radio has penetrated into the homes of a very great proportion of the population of the United States, and for that reason it should be celebrated by every one interested in radio with this in mind. Radio has come to stay, and the writer trusts that it will be the means of bringing good will and cheer to every one connected with radio.

Broadcasting, a Public Utility

By Jack Binns

Radio Editor, "The Tribune," New York City

BROADCASTING is rapidly assuming the status of a public utility. Any plan which will foster its development along right lines is a contribution to human progress. The idea back of National Radio Week constitutes such a plan and, I hope, will materially aid in placing broadcasting where it rightfully belongs in the public esteem.

Awestruck at the Future

By Elmer E. Bucher

Manager, Sales Department, Radio Corporation of America

IF radio broadcasting accomplished nothing else, it would be well worth while for the splendid entertainment and contact with the outer world which it brings to the isolated community or individual and to the sick and the feeble. But already has this great facility demonstrated a hundred worthy uses, from the amusement of tots in their nurseries to the dissemination of important information to business men and farmers the country over. With such impetus as radio broadcasting has gathered in its short existence, even we in the industry are awestruck at the future possibilities of this institution in which we are workmen.

A Mighty "Yes," the Answer

By Charles E. Fay

Tufts College, Boston, Massachusetts

DOES not the marvelous invention of radio offer the best means devised since the first Christmas for broadcasting the message of "Peace, good will to men?"

The Aerial Press of America

By *Washington R. Service*

PERHAPS, at last, there is something new under the sun. Whoever thought of an aerial newspaper before a few pioneer mentors of public opinion began broadcasting their news items that all who "listened in" might hear—free?

Among 582 radio stations broadcasting in the United States, today, there are 83 representing publications—most of them daily newspapers. Nine of these etherial news sheets are super, or Class B, stations especially licensed to broadcast on a 400-meter wave. All told, these news broadcasts of the air reach millions who do not subscribe to the publications but who are most enthusiastic aerial "hearers" none the less loyal to their favorite papers because they are unknown to the editors. There is an "Aerial Press of America" even though there are no aerial subscription lists and no advertising accounts.

It is certainly something new, this broadcasting of the news and sports of the world, gratis. It is a service highly valued by the hearers. Many predict that it has come to stay. Some Canadian newspapers have also taken up the scheme of news broadcasting, as well as publications in Porto Rico and Hawaii.

George Schubel, secretary of the Radio Broadcasting Society of

America, a publisher, has made a study of aerial news distributing, with the result that he advocates the broadcasting of news matter by publishers. Paralleling the printed news, he claims, broadcasted news serves both national and local fields and provides for a versatility of free expression of public opinion. Radio can be used in the gathering of news as well as in its dissemination, especially in country districts, and tends to broaden the scope and circulation of a newspaper. There are several known instances where radio carried daily news reports when other lines of communication failed, and, in some instances, amateurs aided. An SOS story has been covered by wireless and aid rendered by means of radio as well on land as at sea. Instances where the wires and regular channels were beaten are recorded.

Government weather, crop and market reports are now carried by radio in advance of press releases. The only way by which a newspaper can hope to compete is through the same medium.

"Why give away material?" may be asked. This is answered by citing the case of the Boston "American's" experiments in broadcasting bulletins from its news before they were printed. The news is transmitted from WGI,

Medford Hillside, and the service to thousands is reported to have brought most valuable publicity to the Boston sheet. All who listen in to brief news items want to know more of the details and, naturally, purchase a copy of the "mother" sheet as soon as it is available. Out of over eighty papers licensed to broadcast, only about half a dozen have stopped this service. A few have combined with other organizations in the use of a single broadcasting-station.

The following United States newspapers operate broadcasting services:

KDYU—"Telegram," Salt Lake City, Utah.

KDYR—"Star-News," Pasadena, California.

KDYS—"Tribune," Great Falls, Montana.

KDYU—"Herald," Klamath Falls, Oregon.

KDYX—"Star-Bulletin," Honolulu, Hawaii.

KDZA—"Daily Star," Tucson, Arizona.

KDZH—"Evening Herald," Fresno, California.

KDZR—Bellingham Publishing Company, Bellingham, Washington.

KFAC—"Daily Press," Glendale, California.

KGW—Oregonian Publishing Company, Portland, Oregon.

KLX—"The Tribune," Oakland, California.

KSD—"Post-Dispatch," St. Louis, California.

KUO—"The Examiner," San Francisco, California.

KWH—"The Examiner," Los Angeles, California.

KXD—"The Herald," Modesto, California.

KZN—"Salt Lake Deseret News," Salt Lake City, Utah.

WAAF—Chicago Daily Drovers Journal, Chicago.

WAAL—"Tribune," Minneapolis, Ohio.

WBAD—"Journal," Minneapolis, Texas.

WBAT—"Star-Telegram," Fort Worth, Texas.

WBAU—"The Republican," Hamilton, Ohio.

WCAB—"The News," Newburgh, New York.

WCAG—"The States," New Orleans, Louisiana.

WCAW—"The Herald," Quincy, Massachusetts.

WCX—"Free Press," Detroit, Michigan.

WDAE—"The Times," Tampa, Florida.

WDAF—"Kansas City Star," Kansas City, Missouri.

WDAK—"The Courant," Hartford, Connecticut.

WDAL—"Times-Union," Jacksonville, Florida.

WDAV—"Muskogee Daily Phoenix," Phoenix, Arizona.

WEAR—"Baltimore American," Baltimore, Maryland.

WFL—"The Chronicle," Houston, Texas.

WFAM—"The Times," St. Cloud, Minnesota.

WFAT—"Sioux Falls Daily," Sioux Falls, South Dakota.

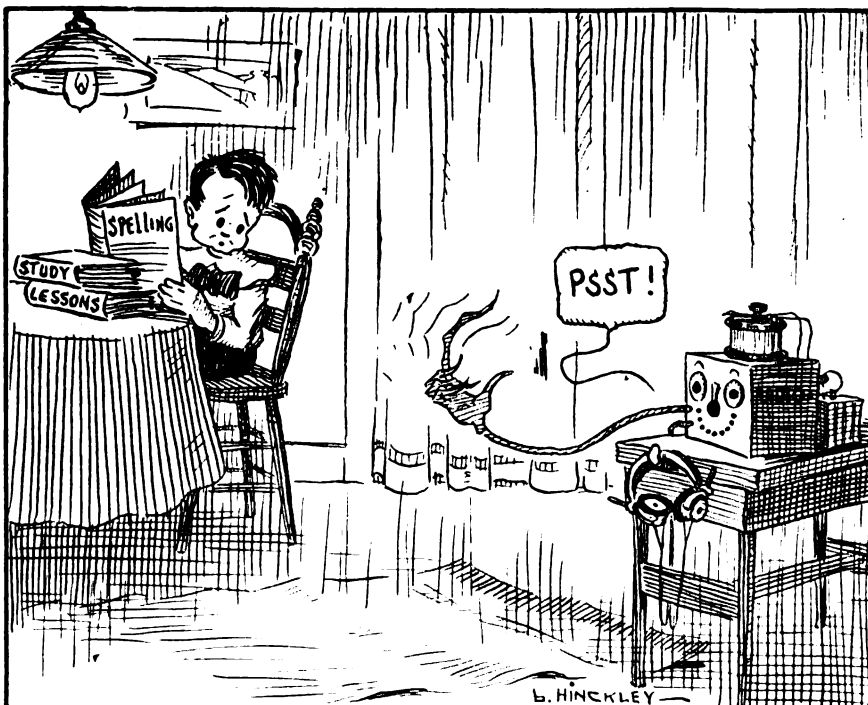
WFAW—"Daily Metropolis," Miami, Florida.

WGAR—"Fort Smith American," Fort Smith, Arkansas.

WGAZ—"The Tribune," South Bend, Indiana.

(Continued on the following page)

The Latest Vamp!



(Cartoon by Lawrence B. Hinckley)

How to Prepare Hard Sheet-Rubber for Your Radio Apparatus

By *W. S. Standiford*

THE experimenter in all kinds of electrical apparatus finds it necessary to cut hard sheet-rubber into round discs for making Wims-hurst machines, or for parts of wireless-telegraph and telephone sets now used extensively. The amateur radio-telephone-maker uses wood for his panels and large diameter cardboard tubes for his vario-coupler, tuner and other parts.

While wood may be used for a panel, it is not nearly as effective as hard

rubber. Factory-made appliances are constructed of the latter or of an insulator equally as good. Cardboard is a fragile substance and does not give continuous service as a vario-coupler. On account of hard rubber, in its dry state, being difficult to cut and bend into cylinders for radio parts, amateurs use wood and cardboard. The writer, after some experimenting, found an easy way to cut and bend hard sheet-rubber 5/16 inch thick. Mark an outline on the place to be

cut, using a scribe or knife. Then plunge the sheet into very hot water until it is of the pliability of leather. Cut along the mark with scissors, or tinsmiths snips, according to the thickness of the material. As it becomes cooler it will be more difficult to cut. If any further cutting is to be done, place the sheet-rubber in hot water again and continue as I have described. Next place a sheet of glass on a newspaper on your work-table. Dip the rubber in hot water again, place it on the glass, put another sheet of glass on top of the rubber and weight it down. When cold, the piece will be found to be straight, the cutting having thrown it out of shape.

To bend the hard sheet-rubber into cylinders for tuning coils and other parts, make a wooden mandrel of the desired diameter, measure its surface with a tape measure, and cut the material the desired length. Heat the rubber in hot water. Place two wooden blocks on a smooth surface sufficiently far apart to be even with the edges of the rubber to be bent. Put the hot sheet in position on the blocks and press down the mandrel on its center, gradually curling it into cylindrical shape to fit the mandrel. With thick plates, reheating them several times may be necessary to produce the desired shape. When cold, fill the crack between the two edges with automobile-tire cement. There is a rubber putty-composition for mending tire cuts which is excellent for joining edges. It is best to tie the cylinder tight, with string, until either the cement, or putty, has set.

Polishing hard rubber is a poser for electrical experimenters, as they do not understand how to make the edges of the sheets as smooth as their sides. Therefore, they generally smooth the edges with a file and let it go at that. This mars the appearance of the instruments. By the following process an even polish will result: Fasten a piece of fine-grained sandpaper to the top of your work-table and run the piece of rubber across the sandpaper in a series of smooth strokes, taking care to keep the grain straight. Continue this operation on a second sheet of the finest sandpaper that can be obtained. Wipe off all dust and give the edge a coat of shellac in order to fill the pores. When dry, rub with a piece of felt tacked to a wooden block—the felt to be dampened with oil and FF grade of powdered pumice-stone as an abrasive.

(Continued from preceding page)

WGF—"Register and Tribune," Des Moines, Iowa.

WHN—"Ridgewood Times," Ridgewood, Long Island, New York.

WOZ—"The Palladium," Richmond, Indiana.

WPA—"The Record," Forth Worth, Texas.

WSB—"The Journal," Atlanta, Georgia.

WWB—"Daily News," Canton, Ohio.

WWJ—"The News," Detroit, Michigan.

KFAP—"Standard," Butte, Montana.

WHAS—"Courier Journal and Times," Louisville, Kentucky.

WHAT—"Democrat," Yale, Oklahoma.

WHAY—"The Press," Huntington, Indiana.

WIAC—"The Tribune," Galveston, Texas.

WIAK—Journal-Stockmen Company, Omaha, Nebraska.

WIAN—"Chronicle and News," Allentown, Pennsylvania.

WIAQ—"The Chronicle," Marion, Indiana.

WIAS—"The Hawkeye," Burlington, Iowa.

WJAF—"The Press," Munsey, Indiana.

WJAG—"Daily News," Norfolk, Nebraska.

WKAA—"Republican-Times," Cedar Rapids, Michigan.

WKAC—"The Star," Lincoln, Nebraska.

WJAN—"Peoria Star," Peoria, Illinois.

WJAO—"Copper Publications," Topeka, Kansas.

WKAK—"Okfuskee County News," Okemah, Oklahoma.

WKAM—"Daily Tribune," Hastings, Nebraska.

WKAT—"Morning Times," Frankfort, Indiana.

WMAJ—"Kansas Drivers Telegram," Kansas, Missouri.

WMAQ—"Daily News," Chicago.

WNAB—"Park City Daily News," Boiling Green, Kentucky.

WRAU—"Daily News," Amarillo, Texas.

KFBS—"Chronicle News," Trinidad, Colorado.

WGM—"Constitution," Atlanta, Georgia.

WNAS—"The Statesman," Austin, Texas.

WHAL—"Capitol News," Lansing, Michigan.

KHJ—"Times-Mirror," Los Angeles, California.

KYI—"Bakersfield-Californian," Bakersfield, California.

WFAA—"Dallas News," Dallas, Texas.

KVQ—"The Bee," Sacramento, California.

There are students of the problem who believe that press broadcasting stations should handle all news, since the news is really owned by members of the press and is received, first, by them; besides which, the publishers know how to handle the news better than any other agency. Newspapers, usually in the lead of progressive developments, are apt to find it necessary to follow the lead of the aerial pioneers and, in future, carry radio-news bulletins for their clients. Radio is a household contact with the world.

Of the newspaper broadcasters, nine have secured the Class B license permitting them to broadcast on 400-meter wave; they follow: Atlanta "Journal," Atlanta "Constitution," Dallas "News," Detroit "News," Detroit "Free Press," St. Louis "Post-Dispatch," Kansas City "Star," Fort Worth "Star-Telegram," and Los Angeles "Times-Mirror."

The Seattle "Post Intelligencer" now uses the broadcasting station KFC; the Philadelphia "Record" broadcasts through WCAU; "The Ensenada News," Yauco, Porto Rico, uses WGAD; the Indianapolis "Star's" news is released through WOH; the Tacoma "Times" co-operates with KMO; the "Oklahoman" "speaks" its news over station WKY; the Boston "American" uses WGI, and the Memphis "News-Scimitar" announces over WPO. In Canada, two news broadcasters are the Toronto "Daily Star," operating CFCA, and the Winnipeg "Tribune," CJNC.

Among other daily papers said to be planning to use news broadcasting are "The Courier," Grant's Pass, Oregon; "The Gazette," Billings, Montana; "Raleigh Register," Beckley, West Virginia; "Daily Telegram," Adrian, Michigan; "News Herald," Litchfield, Illinois, and the "Pilot," San Pedro, California.

The Radio Primer

For Thousands of Beginners Who
Are Coming into Radio Circles

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

HOW are electrons moved about? The chemical action of electrons we have described, although it is not called by that name. You light a cigarette—chemical action changes the tobacco into smoke. An apple decays—chemical action has caused this change. Light a fire—chemical action creates the heat. So it has been found that, under certain conditions, chemical action will feed electrons on one hand and destroy them on the other.

* * *

How can chemical action be started?

Fill a glass jar with an acid. Put into this acid a piece of copper and a piece of zinc, allowing both copper and zinc to stick out of the acid. We have made then what is called a voltaic cell. Usually we just call it a cell. A group of cells together is called a battery. The accompanying sketch shows what we have done. Chemical action will remove electrons from the copper and give electrons to the zinc, so that B has more than the usual number of electrons and A has less than its usual number. B is called the negative terminal; A the positive terminal. Connect A and B by a wire and the electrons will flow through a wire from B to A. They will flow continuously because the chemical action keeps the zinc supplied with them. Connect the two terminals by a wire and show the direction in which the electrons flow and the direction of the current.

* * *

Now that we have electrons flowing, what have we accomplished?

We have produced all the conditions necessary for an electric current. An electric current will result if we keep a voltage between two terminals, as with the voltaic cell, and connect these terminals by a conductor. To study electricity further, we must study the electric current.

* * *

What makes a current?

A flow of electrons makes a current. If we measure the number of electrons flowing, we must state a definite time in which to count them. The definite time is a second. Then, also, we must confine our

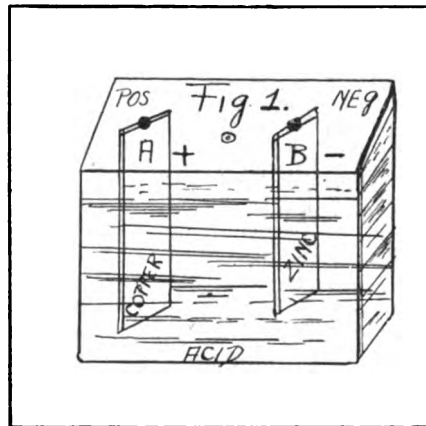


Figure 1—Showing the battery where chemical action takes place to produce electricity.

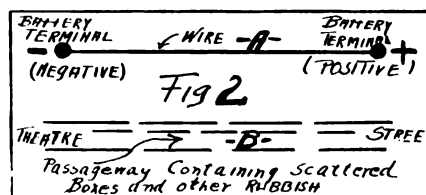


Figure 2—Showing how the electrons travel from the negative to the positive terminals.

measurement to one place in the path of electrons so that we measure current by counting the number of electrons which pass a given point in a second of time.

* * *

What is unity of measurement?

The unit of measurement of electric current is the ampere, just as the measurement of weight is the pound. We say that an object weighs 13 pounds. In the same ratio, we say that a wire carries a current of 15 amperes. Thus you see an ampere means a definite number of electrons passing a point in a second of time. There is an instrument known as an ammeter. It is used to measure the number of amperes. In electricity you will find the word "meter" affixed to various words.

* * *

How can we secure as many amperes as we want? In other words, how can we control the number of electrons passing a given point in a second?

In Figure 2, electrons are shown trying to journey from the negative to the positive terminal. They act like a crowd of people trying to rush out of a building the entrance to which is blocked.

Radio Facts

By Charles H. Plath

ONE thing we must guard against in radio-receiving sets is dust and dampness. The set should be kept, preferably, in a dry room, otherwise moisture will gather in the interior of the works and, probably, form contacts which may lead to the short circuit of the set or give leakage of current. The B batteries should be kept in a dry place, preferably a box, otherwise they will get weak and become "dead." A handy thing around a station is a small long-handled brush. This is used to keep the dust away from switches and parts. Care should be taken to keep the switches and condenser terminals clean, also any other place where dust may collect. It would be a good scheme to clean and dust the set once an evening. This would prevent the dust from collecting in quantity, thereby preventing any leakage to the set. Care and attention should be given to the set as it is delicate. If this is accomplished the set will function.

* * *

AN TENNA insulators should be kept in good condition and wiped off occasionally; because they collect a certain amount of dirt and carbon, especially when near any smokestacks. A film of carbon or dirt over the surface of the antenna insulator will cause leakage and an improperly poor-range set will be the answer. Sometimes other developments happen in the aerial, so it is best to be certain that the aerial is well insulated from the lead-in to the set. The lead-in may be touching some metal near the house, or in the room where it connects with the instruments.

* * *

WHEN a dry cell is run down a very good way to get some extra life out of the battery is to work as follows: Remove the wrapper from the cell and place it in a can 5 or 6 inches high and about an inch wider in diameter than the cell. Fill the can with vinegar and a little salt. The salt should be shaken into the can and stirred well. Let this mixture stand overnight. Next morning, on inspecting the old battery, you will find that it has as much pep as if it were a new one. The battery should be left in this solution until it becomes exhausted. It has given many hours of life beyond the period when it was thought "dead" by the amateur. This is quite an experiment, and every radioman who uses dry cells should give it a trial and watch the results. The scheme comes in handy when in a pinch for some voltage.

Some of the Leading Daily-Newspaper Radio Editors of the United States



(Reading from left to right) Top Row—Raymond Francis Yates, "The Mail," New York City; S. F. Owen, "The Atlanta Journal," Atlanta, Georgia; Everett A. Rudloff, "Asbury Park Press," Asbury Park, New Jersey.

Second Row—G. C. Condon, Jr., "The Atlanta Constitution," Atlanta, Georgia; Frank J. Moles, "The Gazette," Schenectady, New York; Raymond C. E. Pryde, "The Enquirer," Buffalo, New York; E. L. Bragdon, "The Globe," New York City; John H. Clymer "Jacksonville Journal," Jacksonville, Florida.

Directly under Mr. Clymer's photograph—Jack Binns, "The Tribune," New York City.

Bottom Row—Charles D. Kelley, editor and supervisor Detroit "News" Broadcasting Department, Detroit, Michigan; John E. Hersam, "New Canaan Advertiser," New Canaan, Connecticut; Arthur F. Hardwick, "The Republican," Springfield, Massachusetts; Jack Turner, "The Age-Herald," Birmingham, Alabama; Miss Marion Stowe, "Hartford Times," Hartford, Connecticut.

Receiving and Denoting Direction of Radio Signals with a Coil of Wire

By *S. R. Winters*



A fine photograph of a "loop," or "coil," antenna, or vertical conductor of electricity. The antenna is shown in place with a complete receiving-set. When supported by a six-stage amplifier, signals are received from France and Germany.

WHEN one or more turns of wire form a square, or rectangular frame it constitutes a coil. A rope, not in use, when forming a series of rings, or a snake gathering itself preparatory to springing toward an object, are common illustrations of a coil. Speaking in electrical terms, however, copper wire wound around a wooden frame—the strands of which wire are spaced one-half of an inch, or one inch, apart—constitutes an antenna for the reception of wireless communications. The "coil," or "loop," antenna and the "overhead," or vertical conductor of electricity are well-nigh household terms emblazoned on the crest of popularity of radiotelephone broadcasting.

Experiments That Lead to Success

A coil of wire as an electrical inductance, other than being the most compact form of antenna, is as versatile as the proverbial Jack-of-all-trades. It may be enclosed completely in a suit-case—or, when rigged-up in a wilderness for the reception of wireless signals, it may determine the direction of the transmitting station from which the communications are coming in. The photograph illustrates a portable radio-direction finder employed by the United States. The coil of wire, forming an antenna, is mounted on a vertical axis on which the frame supporting the strands of wire may revolve freely. Meanwhile, as the coil is rotated about its axis,

a curve is plotted indicating the variations in the strength of the electric current received for the electromagnetic wave approaching from a particular direction. The coil of wire, when employed in this capacity, may be dubbed correctly a direction finder or radio compass.

The electron-tube amplifier, with its score of other triumphs, has been a boon in the use of coils of wire as antennae. In the absence of substantial amplification of the feeble electric-current received in the coil antenna, the few turns of wire on a square wooden frame would be as powerless to produce audible signals as a pyramid. The Radiocommunication Section of the Bureau of Standards, United States Department of Commerce, has conducted extensive experiments with strands of wire wound about a frame as an antenna, and recommends the use of six stages of amplification for satisfactory results. However, with two stages of audio-frequency amplification, wireless signals may be received from nearby stations.

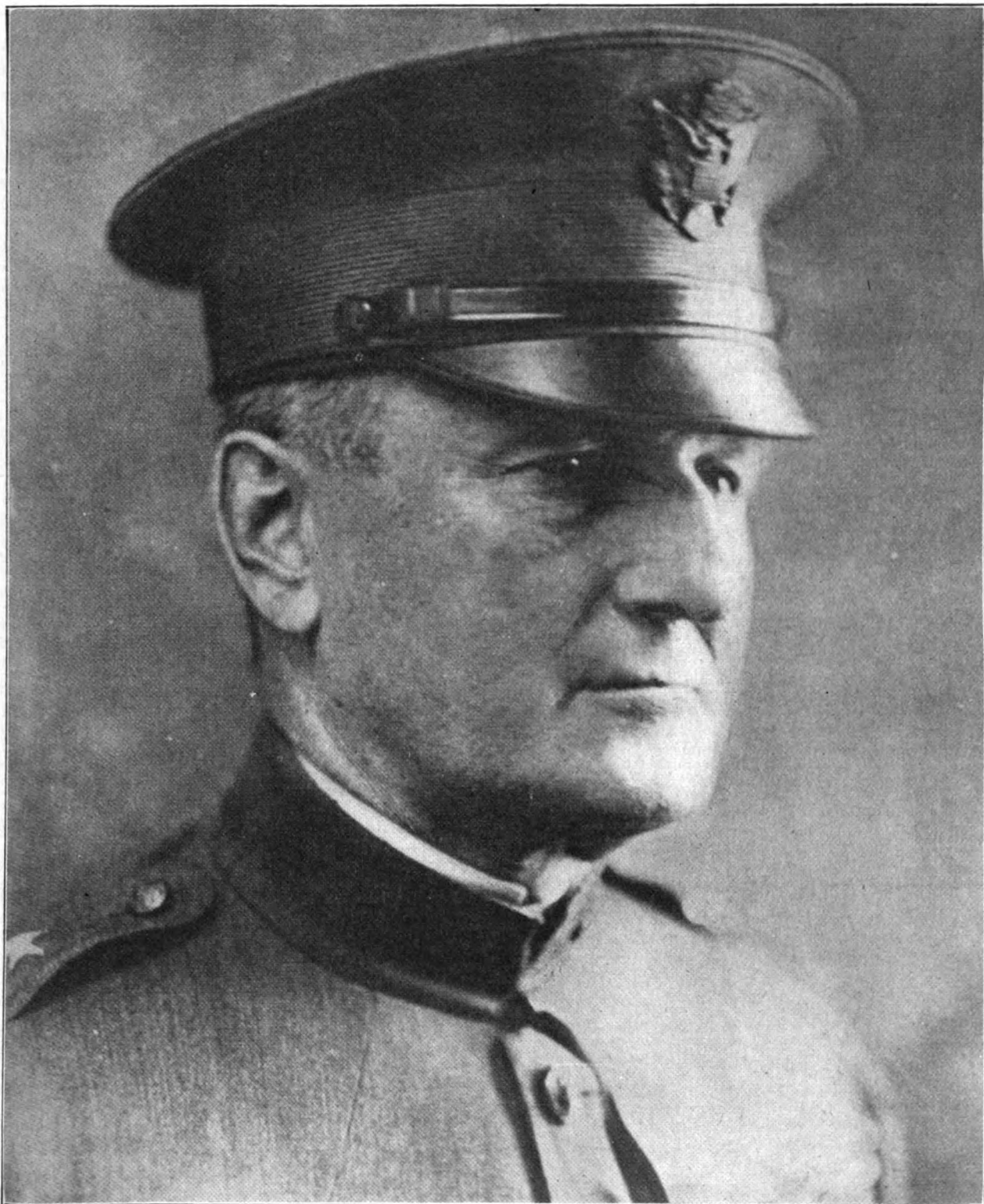
Versatility of the Coil Antenna

If supported by six stages of amplifications, a coil antenna located in Washington, D. C., may record wireless signals from the high-power radiotelegraph stations in France and Germany: An exceptional instance of the capacity of a coil antenna is noted where all the big European stations were received in France by use of a frame containing 200 turns of wire, only eighteen centimeters square. The radiotelegraph signals emanating from the high-power station of the United States Navy Department at Annapolis or Greenbury Point, Maryland, have been recorded in Paris, France, by the use of a coil only ten inches in diameter. The versatility of the coil antenna is suggested by the development of a complete radiotelephone receiving set in an ordinary suit-case with the form of antenna snugly encased in the covers of the traveling bag. It was developed by the Bureau of Standards, the coil antenna and half a dozen audion bulbs encased in a container only 7 by 11 by 18 inches in dimensions.

The coil antenna, other than serving as a direction-finder afield, lends itself to use in locating the direction of wireless signals when installed on seafaring vessels. A system of radio direction-finding for navigation purposes in fog and thick weather has been developed by F. A. Kolster, formerly in the service of the federal government, and F. W. Dunmore, of the Bureau of Standards. The striking directional characteristics of the coil antenna suggest its fitting application on radio-equipped airplanes, especially when flying is to be done in foggy weather or at night. Such a form of antenna is of a discriminating caliber. Its directional tendencies are such that strong signals may be recorded from a particular point of the compass and feeble wireless signals from other directions. Thus, by capitalizing the directional qualities of the coil antenna, interference from transmitting stations whose offerings are not desired, may be curtailed.

Radio amateurs have reported their experiences receiving signals by use of a sensitive receiving-set even when their antennae were altogether discontinued. This phenomenon is explained by the fact that the wiring of the radiotelephone receiving outfit assumed the form of a coil antenna.

New Chief of Radio Corporation Chosen from United States Army



(Courtesy of Radio Corporation of America)

· Major-General John C. Harbord, U. S. A.

MAJOR-GENERAL JOHN C. HARBORD, one of the distinguished officers of the United States Army, ranking only below General Pershing, as Deputy Chief of Staff, will retire, on December 29, to become president of the Radio Corporation of America. The Secretary of War approved his application for retirement. Both Mr. Weeks and General Pershing stated publicly that General Harbord had served in the Army in a highly distinguished and loyal manner, and that his unusual experience as an organizer and executive would insure his success in the business world. The post for which General Harbord has been chosen is regarded of vital importance to the Government as well as the public, since the Radio Corporation of America was formed at the suggestion of representatives of the United States Navy in order that powerful world-wide radio communication, free from foreign domination, might be built up.

Radiograms

The Latest Christmas Radio News Briefly Told for the Growing Army of Radio Fans

THE plan, recently adopted by the police of the country of broadcasting fingerprints of captured criminals to ascertain if they are wanted elsewhere, resulted in the return to New York from Los Angeles of Harold J. Burns, of New York City. Burns, who is said to have used the alias "Darcey," is wanted here in connection with an alleged homicide and two burglaries. He jumped a bail bond of \$12,500 to avoid standing trial on the former charge. The broadcasting of his fingerprints and his apprehension chalk up a new record for radio as a crime deterrent.

* * *

An epidemic of influenza occurred among the officers and crew of the American steamer, "President Roosevelt." The chief officer of the vessel and the purser were among those ill. Supplies of brandy were ordered by radio for the invalids. These were sent on board on the arrival of the steamer at Plymouth and quickly administered. The Volstead act may mean one thing, but radio is ever ready in time of need not only to uphold American liberty, but to protect the sick and forestall epidemics.

* * *

Reports from Croydon, Surrey, England, that a radio engineer had heard parts of the musical concert broadcast from WJZ, of the Westinghouse Electric Company, proved the success of an experiment they were making in increased power. J. H.

Ridley, of Croydon, said he heard the WJZ call and then the strains of a familiar overture. He stated the time was 1.15 o'clock Monday morning, November 27 (8.15 o'clock Sunday night, New York time). Westinghouse radio engineers said they had doubled the power of the broadcasting plant two weeks ago and that on Sunday night atmospheric conditions were at best.

* * *

A system of pilotless airplane control in France has passed a two-day test satisfactorily, according to experts who supervised the trials with a 300 horse-power passenger carrying government biplane that flew over Etampes aviation field. The plane, going aloft with no one aboard, responded to control by radio from the ground, performed all the customary evolutions, and then landed safely. During the tests the machine was frequently lost from sight in haze and clouds, but it was always under radio control.

* * *

Construction of a huge radio transmitting and receiving station in Miami, Florida, for handling South American, Central American and West Indian business to be relayed direct to New York, will be undertaken by the Tropical Radio Telegraph Company, of Boston, a subsidiary of the United Fruit Company, it was announced by George S. Davis, general manager of the radio company. The towers of the sending station will be 437 feet high, higher than any in America, except those at the Arlington Naval Station.

* * *

For the First Time Santa Claus is Delayed

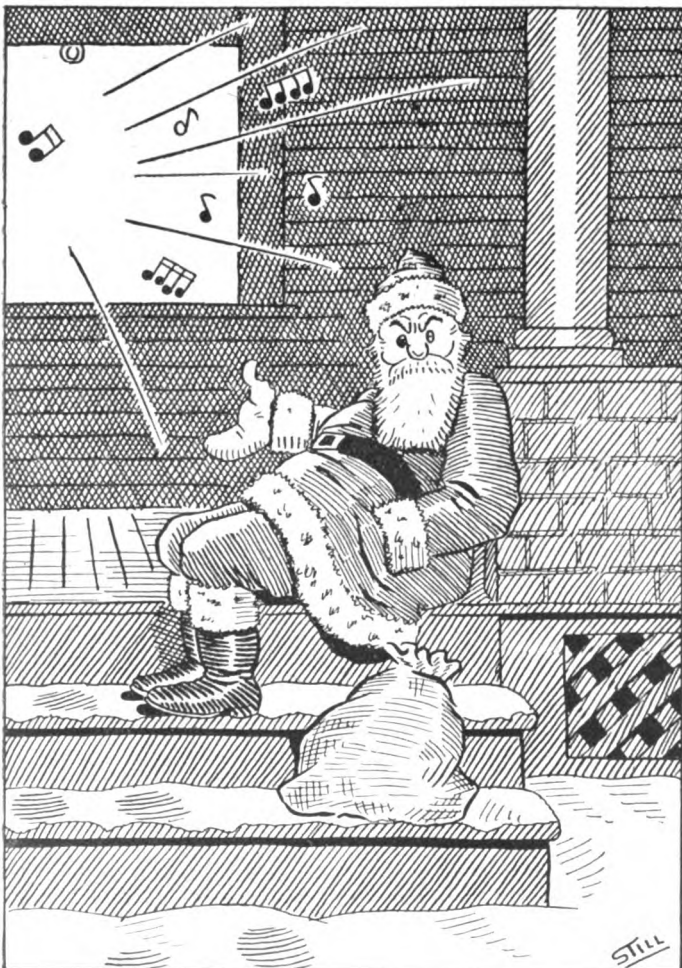
The Capitol Theatre, New York, musical program, broadcast direct from the theatre, proved another big radio success. This radio-engineering feat, by the American Telephone & Telegraph Company, was accomplished by means of a highly sensitized microphone suspended twenty feet from the roof and thirty feet from the stage. The sounds of the music were caught by the amplifiers and then carried over specially equalized telephone wires to station WEAJ and broadcast from there. This is the first time in radio and musical history that symphonic music by a large orchestra was broadcast direct from the theatre during a performance. It is estimated that over 600,000 radio sets caught the concert, reaching a probable audience of over a million persons. Telegrams and letters from stations reporting the success of the concert were received from points in Ohio, Michigan, Minnesota, Nebraska, Ontario, Toronto, the New England States, Kentucky, Virginia, Georgia, and one thousand miles out at sea.

* * *

The great improvement in the power, clarity, and brilliancy of WJZ, Newark, New Jersey, has startled many who have been accustomed to receive this station at the full power of their sets. Listeners in have been compelled to reduce their amplification materially to prevent the signals from being intolerably loud. The explanation of this improvement is that WJZ has a new transmitter. Though the old one was generally regarded as one of the finest in the country, recent developments by the Westinghouse engineers rendered it obsolete, and that it was removed and a new one, up to date in every respect, installed in its place. This new transmitter is rated at double the power of its predecessor. It has 1,000 watts and is greatly superior in the details of its transmitting, modulating, and generating system. It is about three times more effective than the old transmitter. While listeners with electron-tube receivers all over the country have been quick to notice the change, it has been especially pleasing to local owners of either crystal detectors or loud speakers, who are now able to get highly satisfactory results from their instruments.

* * *

Millions have enjoyed the Chicago operas, broadcast by radio. A large audience in and around New York listened to the music of "Aida," played in Chicago and broadcast on the 400-meter wave length of station KYW. The voice of Rosa Raisa was heard as clearly in New York as in the Middle West. Since the opening of Chicago's opera season the radio audiences have heard "Carmen," with Mary Garden singing the leading role, "La Boheme" and "Parsifal." Two operas will be broadcast each week from 8 p. m. to 11 p. m., central standard time.



(Cartoon by Harry B. Stilman)

Santa Claus:—How do they expect me to make my rounds with this radio music to detain me.

Be a National Radio Week Booster

Radio and the Woman

Crystal D. Tector Sends a Goodly Radio Measure of Christmas Cheer and Some Pertinent Advice

DURING the past few weeks, I have received an unusual number of technical questions to answer—and, singular as it may seem, all but a very few sent to me by men. If I should attempt to answer so many questions in my department, I wouldn't have space for half the necessary replies; so I have turned over all these communications to the technical editor of RADIO WORLD and he will answer them in the regular department, "Answers to Readers," from week to week. I deeply appreciate the confidence that so many men place in my ability to help them; but, and I am sure they will agree with me, I have so much else to write about that devoting my allotted space to answers of a technical nature would deprive me of my customary weekly chatter.

THIS is the Christmas Number of RADIO WORLD—a number that goes forth to all of you with a hearty message of gladness and cheer. In a way, it is the forerunner of the National Radio Week Number which will be published the week before Christmas—dated December 23, to be exact—as on that evening the festivities that will mark the celebration of the first big week set aside for radio and the first Radio Christmas, will begin. I believe that every radioist at heart will do something during this week to increase the interest in radio—to bring at least one new fan into the fold. While the great army of radioists is growing faster than the most sanguine of us anticipated, there are millions who, as yet, are uninitiated. And the larger the radio family, the more healthy it will be. The more people enrolled as radio enthusiasts, the faster will perfection in radio development be attained. We pioneers are looking to a day when radio will be declared the most vital, necessary, and important family element in this country.

I SUPPOSE that I have written over a hundred letters to as many women, in the past week, giving all sorts of information regarding the formation of committees, menus for suppers, suggestions for window decorating, banners, signs and what not. I hustled these answers by post because by the time the replies would reach you through this page, the information would be too late for practical use. From the letters received, I feel that the spirit of radio week has become deep-rooted in the heart of the feminine radioist. I felt all along that we women would do our part. And, why not? Radio will interest women just as keenly as it will interest men. I was not at all surprised at the many letters that I have received from mothers whose sons are begging them for sets for Christmas.

THESSE mothers have besieged me with all sorts of queries as to what is the best set to buy, what is needed to comprise a set, how will they know that the apparatus will work after it has been purchased—and all that sort of thing. Now, you cannot blame a mother when her young hopeful demands such an outlay for Christmas. She wants to know that her money will not be wasted; she wants to be sure that she is going to be advised correctly. It has been the greatest pleasure to me to devote my time to these mothers—and it will be a greater pleasure if they will write me when their boys' sets are in operation. If any mistakes occur, I will feel duty bound to help set them right.

"WHEN my little boy came to me the other day," writes one dear mother in Texas, "and told me, so plaintively, that this is to be 'a radio Christmas,' and he didn't want to be

behind the times, I simply couldn't refuse him. We live far from a town of any size—and I must ask you to help me. Tell me what to do and what to buy." Only a stony-hearted woman could refuse an appeal like that—and I am not, My heart goes out to the little ones—especially at Christmas.

DO you know that one of the most wonderful bits of broadcasting was the services of the St. Thomas Church, Fifth avenue, several Sundays ago, and so well described by Peter Gray in RADIO WORLD. I had invited a score of neighbors to my house to hear it. The solemnity of it all, the sacred music, the sermon by Dr. Stires, possessed all the wonderful potentiality and had more effect, if I do say it, than if we had been seated in the great edifice. There was Friend Husband, who hasn't seen the inside of a church since—oh, I'm ashamed to tell—and others equally as guilty, listening in with all the eagerness and interest of the most devoted parishioners. One man who hadn't heard a sermon preached since he was a little boy, remarked that Dr. Stires's words filled him with real inspiration. Others were equally as impressed. It was a soul-satisfying, impressive service. And, let me add, radio is going to bring about the long-looked for return to religious devotion. I don't say it may, I repeat that it will.

FOR many years, and the ministers have admitted it from time to time, the great majority of us have not taken kindly to religion and we have not attended divine worship as did our forebears. Radio will bring religion to the masses as no other element can or will. Some have scoffed that it is not a thing to be broadcast, that nobody wants to hear a sermon. Well, I can truthfully state here that my friends who have asked when they may hear another St. Thomas service will more than fill my radio-reception room. Dr. Stires has done a big thing. He and other ministers who have made the microphone as important as any other phase of divine worship deserve our thanks.

PERHAPS The Saviour himself might have foreseen—in his great human vision—just this present-day occurrence when he said that he could destroy the temple and rebuild it in three days. Perhaps He meant that one did not have to go to church to hear the word of God. Perhaps He foresaw that this mighty and mysterious power of the air would carry His thoughts and teachings to all parts of the earth even unto the remotest hamlet and the humblest home. Don't miss hearing such a service as I have described oh, ye of little faith, for some mysterious element that surrounds it all will awaken in you the belief that a Greater Power is giving unto all mankind the things that mankind is inclined to receive with clouded vision.

AND so it is fitting at this time of the year that we realize at least one great good to the credit of radio. This is the first Radio Christmas. Radio will spread the gospel of Peace and Good Will this Christmas as it has never been spread before—and, in years to come, we will look for our Christmas service by radio just as we will look for every other glad feature of this happy time.

So, here's to a Happy, Joyous, Radio Christmas for 1922.

May we have a bigger one in 1923!

—CRYSTAL D. TECTOR.

Radio Don'ts

DON'T place your battery on charge without making the correct polarity connections.

Don't charge your battery without knowing the density of the acid.

Don't allow the storage battery to get low, due to neglect of attention.

Don't let the water get low in your battery. Always add distilled water from time to time.

Don't fill your batteries on carpet. The acid will eat holes in it.

Don't try to hear signals when the polarities of the B battery are wrong.

Don't light your tubes up to brilliancy. It is not necessary.

Don't try to look for all-wave radio-frequency transformers. There are none.

Don't try to use WD-11 vacuum tubes for radio-frequency work.

Don't try to use WD-11 tubes for super-regeneration. They will not hold out.

Don't try to tune a set by guessing at it. Have someone teach you. You will see a vast difference.

Don't load up the primary of your vario-coupler without loading the secondary.

Don't expect to know how to tune a regenerative receiver the first time you get one.

Don't forget that with a two-variometer type receiver the wave length cannot be had over 500 meters. 2500 meters is not obtainable.

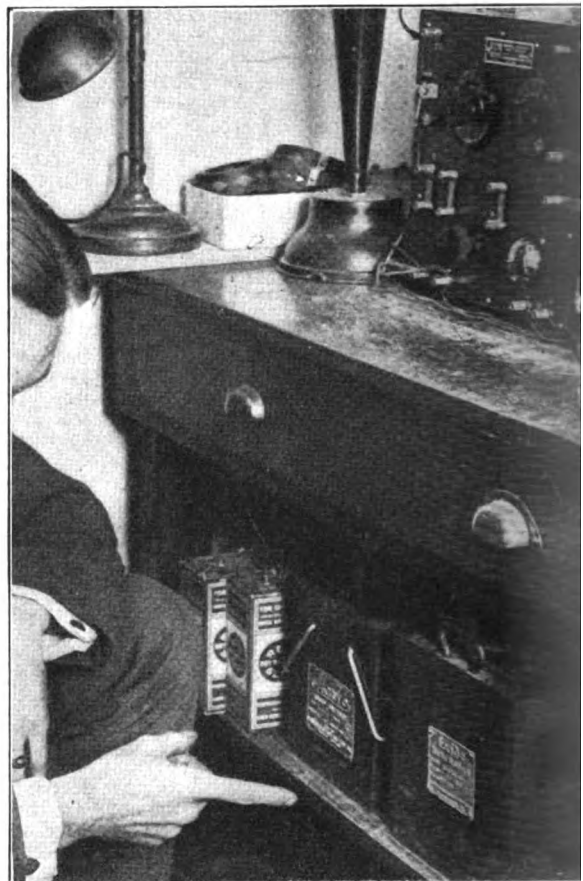
Don't try to hear long-distance stations with a crystal detector.

Don't try to employ 1½-volt tubes in a radio-frequency or superregenerative set. They cannot be used.

Radio's First Big O'er with Gla

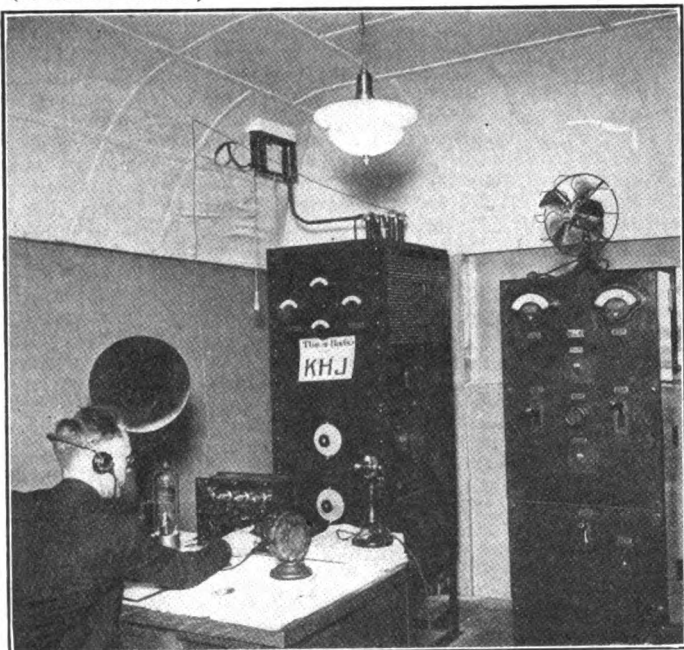


(C. Kadel & Herbert)



(C. Kadel & Herbert)

(Above) One important element of a vacuum tube receiving set is the storage battery. The only test one can give this battery to insure life is the hydrometer test. This instrument may be purchased for a reasonable sum. It comprises a rubber bulb at one end. The end of the tube is placed in the liquid and inside the battery containing the acid.



(Left) This is KHJ, "The Times," Los Angeles, California, in operation. Input panel, transmitter panel, power panel, and reading room from left to right. KHJ, on 500 watts, has done a great deal for radio in the Southwest since November 1. One can almost see the millimeter readings. The antenna ammeter reads "8 5/10 amps." "Uncle John," the bedtime story-telling genius, and "Cousin Bill," the humorous-news reader, are "on the job" in the studio, a handsomely furnished room with correct broadcast acoustics. The photograph shows only the instrument room.



(C. Kadel & Herbert)

(Left) That radio broadcasting is useful as well as entertaining is proved by Miss Emily Exner, who keeps a typewritten record of all lectures on cooking and other branches of housekeeping that come to her by radio. She is an ardent radio fan and spent so much time experimenting with her radio set that her mother admonished her and told her it would be more to her credit if she would "learn something about cooking instead of fooling around that old radio machine." Then Miss Exner, unknown to her mother, started to keep a record of the domestic science lectures and, after a time, presented this valuable radiold information to her mother. Now her mother thinks radio "just wonderful."

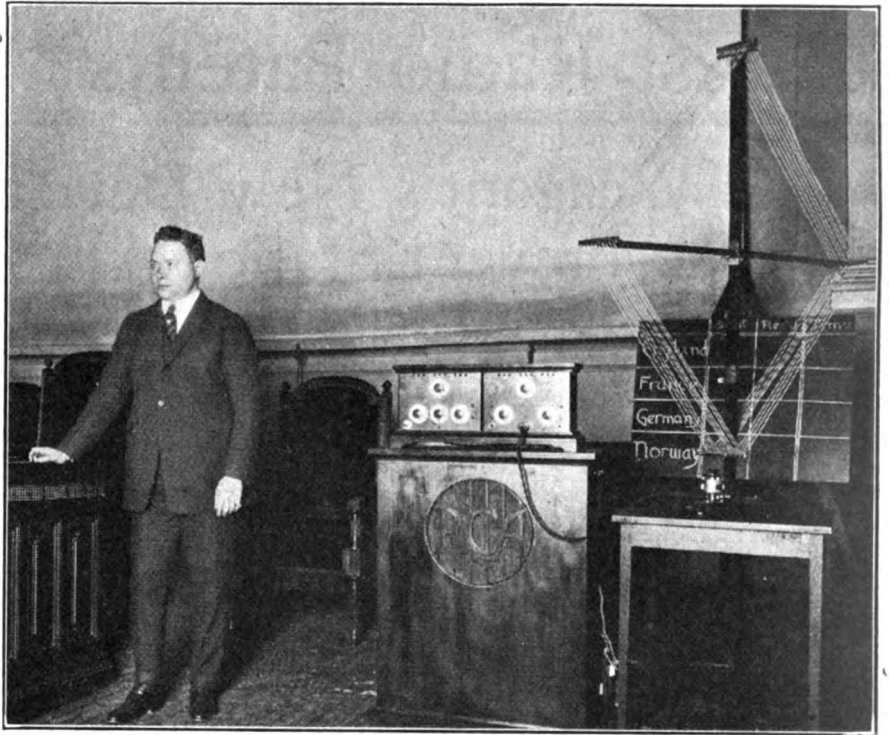
(Right) William M. Priess, of Belmont, Massachusetts, for many years a resident of New York City, former Army officer, inventor of front-line radio communication sets and other apparatus used by both the Army and Navy during the World War, is fighting in the courts of Massachusetts to retain control of his inventions, for which patents are pending. The battle promises to become one of the bitterest ever fought over radio patents. The courts have just issued an injunction restraining others from revealing the secret operating and processes of manufacture, from experimenting or otherwise interfering with certain inventions which Mr. Priess claims. All the radio manufacturing corporations in the United States are marking time pending the decision of this important suit.

(C. Keystone V)

Christmas Brims Some News



(Left) The storage battery used with vacuum-tube receivers, today, becomes a problem to many radio fans who break into the game with such apparatus. Due to their size, weight, and the care required, some means must be adopted to keep them near the set yet where they may easily be reached. The accompanying photograph shows a suitable shelf which makes a convenient place on which to keep A and B batteries. By following this plan, the batteries are out of sight and the spilling of acid and water on the carpet is avoided.



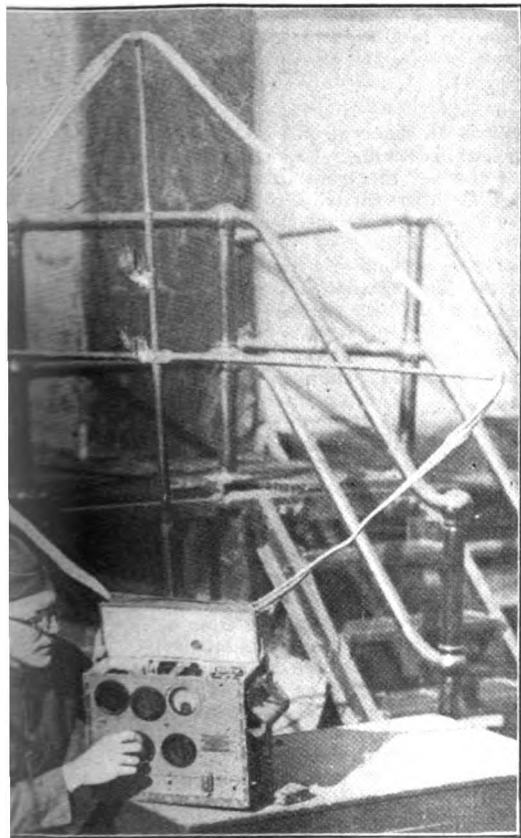
(Courtesy, Radio Corporation of America)

(Above) David Saranoff, vice-president of the Radio Corporation of America, delivering his famous address on radio before the New York Electrical Engineers Society, which he supplemented by demonstrating to the audience actual radio transmission and reception with England, France, Germany, and Norway.

(Right) Lord and Lady Mountbatten, distinguished British visitors, inspecting the apparatus room of Station WEAF, of the American Telegraph and Telephone Co., New York City. Lord Mountbatten is partly hidden, at right, by Mr. L. S. Ross, music director of WEAF.



(C. Central News Photo Service)



(C.)

Separation in Signaling

No. 1,433,500. Patented October 31, 1922. Patentee: Ralph Brown, East Orange, N. J.

SIGNALING circuits in radio are the basis of this invention, letters of patent on which have been granted to Ralph Brown. Where it is desired to simultaneously send and receive in a radio system, as is necessary in the case of radiotelephony, it has been customary to separate the oppositely directed transmission by employing some or all of the following principles: (a) separation by selectivity—that is, the

Latest Radio Patents

Roy A. Weagant's New Device to Prevent Static

No. 1,426,133. Patented August 15, 1922. Patentee: Roy A. Weagant, New York, N. Y.

ROY A. WEAGANT, one of the leading radioists of the United States, has been granted letters of patent on a device to prevent static in radiosignaling. Its purposes are best described in Mr. Weagant's own words, taken from the Patent Office specification.

"I have found by experiment that atmospheric disturbances act as if propagated in a vertical direction only, whereas commercial radio signal waves travel horizontally, or have a large horizontal component of motion. Consequently static disturbances act simultaneously on the parts of a collector system which may be at the same height, while commercial radio waves act simultaneously on those portions of a collector or antenna system which lie in a plane at right angles to the line of travel of the waves.

"I have shown means whereby the effects of the atmospheric disturbances upon two parts of a collector or antenna system may be caused to neutralize each other, while the effects of the signal waves act cumulatively on the receiving instrument, owing

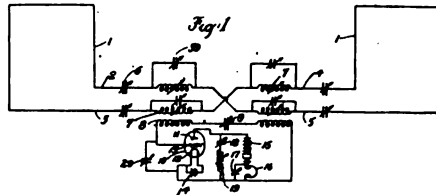


Figure 1—Diagrammatic view of a receiving station showing one form of apparatus embodying Mr. Weagant's invention. A divided collector of the general type is shown associated with receiving and detecting apparatus.

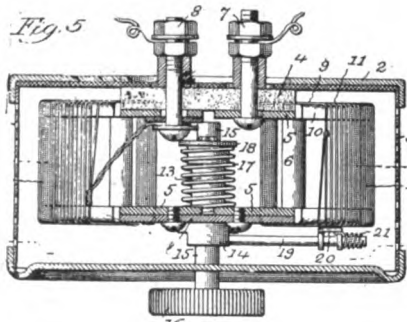
largely to the fact that the antenna or collector system comprises portions which are spaced apart along the line joining the receiving instruments with the source of the signal waves.

"My present invention is an improvement providing a more simple arrangement in which the ends of a plurality of parts of an antenna or collector system are conductively connected in such manner as to greatly reduce the effect of the atmospheric disturbances on the receiving instruments."

For Rheostats

No. 1,433,948. Patented October 31, 1922. Patentee: Joseph Granz, Duluth, Minn.

THIS invention relates more particularly to that type of rheostat used in connection with the smaller forms of electric motors and similar devices. It provides a structural formation and association of the rheostat parts whereby the resistance wire, or filament, having an extended or lengthy nature is effectively supported in a small



The inner and main supporting member or core of the resistance member which is of an open skeleton construction and consists of a pair of flat plate metal sections of split-ring shape secured in properly separated relation by a series of connecting posts with the inner plate metal section attached to the insulating bar or strip 4 to afford the sole supporting means for the resistance member and associated parts.

and compact compass with a very efficient exposure to permit the escape of heat from such resistance wire during actual use; also a simple and efficient construction and arrangement of parts whereby the frictional stress of the adjustable contact shoe upon the resistance winding during an adjusting operation can be materially relieved while electric contact is still maintained.

Novel Battery Container

No. 1,425,721. Patented August 15, 1922. Patentee: Roy William Taylor, Chicago.

MR. TAYLOR'S invention relates to improvements in battery containers. It provides a battery container adapted to house a plurality of dry cells and having means for connecting up such cells in either series or multiple in such a manner that

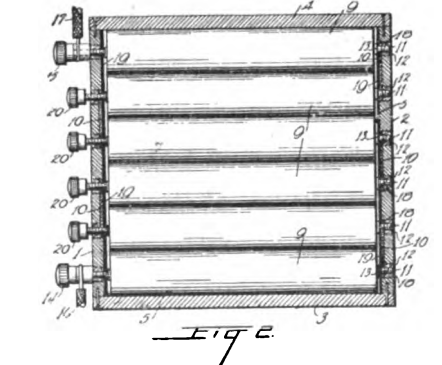
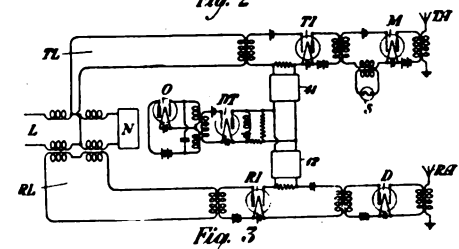
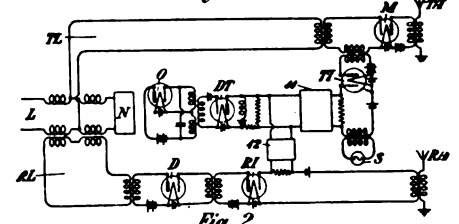
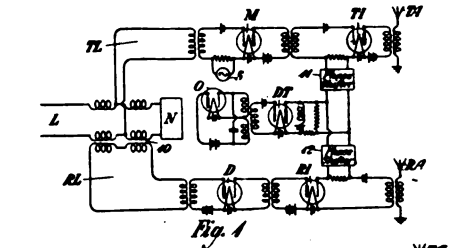


Figure 1—End view. Figure 2—Section along the line 2-2 of Figure 1.

any cell therein may be replaced at will. It provides, also, a device that can be used with a battery composed of ordinary flashlight cells, suitable for use in wireless telegraph outfits and in apparatus used in electrotherapeutics. It is light in weight, compact, and adapted to be carried about, as in a small handbag. It is simple in construction and operation.



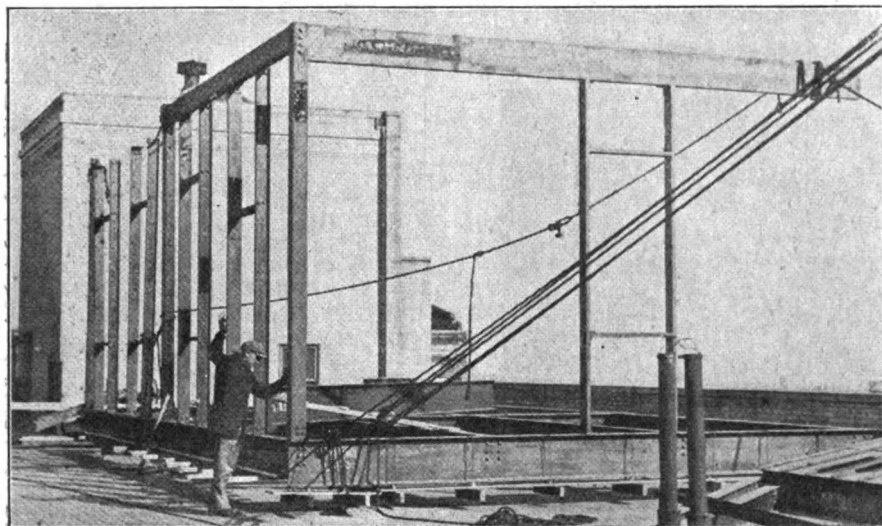
The commutating or switching operation may take place at three different points, (a) in the audio-frequency part of the system before modulation in the transmitting channel and after demodulation in the receiving channel; (b) in the radio-frequency part of the system, and (c) in the circuits leading to the carrier frequency source.

employment of different carriers for transmitting and receiving; (b) separation by balance—that is, the transmitting circuit is rendered at least partially conjugate with respect to the receiving circuit; (c) by geographically separating the transmitting and receiving antenna of a particular station, so that the sending energy from the transmitting antenna will produce a minimum effect upon the receiving antenna.

For the most efficient operation all three of these principles should be employed simultaneously. This is usually possible in the case of a shore station. In the case of a ship set, however, geographical separation of the sending and receiving antenna is impossible, and it has been customary, therefore, to rely entirely upon separation by selectivity and balance.

Mr. Brown proposes to introduce another method of separation in which differentiation between the sending and receiving channels will be obtained upon a time basis by associating the sending and receiving radio channels alternately with the local low frequency line or other type of signaling circuit. Preferably, this switching may take place at a frequency higher than the signaling frequencies and lower than the radio frequencies involved. As a means for controlling the commutating or switching operation advantage is taken of the switching function of a vacuum tube.

At Work on the New Broadcasting Station in Heart of New York City



(C. Underwood & Underwood, N. Y.)

Framework of the radio room of the new broadcasting station now under construction on the roof of Aeolian Building, 42nd street between Fifth and Sixth avenues, New York City. It is expected that this important broadcaster will be completed in about a month. It will be one of the finest and most up-to-date stations in the world.

How the Wind Blows Shown by Radio

A NEW aid to aviators is offered by the Bureau of Aeronautics of the Navy Department by the installation on the 700-foot radio tower at Arlington, across the Potomac River from the Arlington Cemetery, Washington, D. C., of wind-recording devices.

A mast has been erected on the tallest of the three towers, on which is a six-foot wind vane, which, by electrical connections records in the office every vagary of the wind currents at that altitude. The records, it is said, will be of exceptional value to airmen in showing the more constant currents of the upper air. The recording device not only shows the direction of the wind and keeps continuous record of its velocity at all hours, but indicates the velocity on pressing a button. By counting the number of buzzes per minute the velocity can be read at any time.

The continuous record of wind velocities at 700 feet above the ground will be of material aid to aerial navigation over this territory, especially when rigid and non-rigid airships are in flight. Formerly, in order to get the wind velocity and direction, small rubber balloons, hydrogen filled, were liberated, and bearings taken on them at intervals of one minute with a theolite. The angles, when plotted, showed the speed and directions of the winds that drifted the balloons at each altitude. The height of the balloons at the termination of each minute of flight was predetermined by the weight of

the rubber and the amount of ballast lifted. The balloons were usually inflated so that they would rise at the rate of 200 metres per minute. When the sky was clear and cloudless they were often followed, through the instrument, to heights of 10,000 feet or more.

There are often times when the fog, low clouds, rain or snow interferes with the observation of the balloons, so that the advantage of having wind instruments on high towers is apparent. While the pilot balloon method is still widely used elsewhere, in the near vicinity of Washington prospective fliers need only telephone to the recording office to receive the readings at any moment.

The triple register, as it is called, also makes a continuous record of sunshine. The transmitter, placed near the wind mast, indicates on the register every minute of bright sunshine that strikes the tower. The purpose of the instrument is to show whether there is sunshine or cloud above any low hanging clouds or fogs that may prevail near the ground.

Continuous records at 700 feet above the ground level will be compared with those taken at various stations at the ground level, one of which is at the foot of Arlington tower, and will be useful in determining the increase of wind with altitude. The data will also be of value to engineers, the department says, in using the readings for the determination of wind pressures on structures.

Why Magnavox is the Reproducer Supreme

OFFICIAL tests with the oscillograph prove that the Magnavox electro-dynamic receiver reproduces incoming wave forms with maximum accuracy.

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R2 Magnavox Radio
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(as illustrated)

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The Next Big National Event Is National Radio Week,
December 23 to 30, inclusive.

Why I'm Proud of My Home-Made Set

By A. J. Weis

373 East 204th Street, New York, N. Y.



"Close-up" of Mr. A. J. Weis and his home-made receiving set.

IN response to the request in RADIO WORLD for pictured information, I am enclosing a photograph of the receiver which I built and with which I am getting what I consider remarkable results. I regret that I have nothing to offer in the way of new wrinkles or phenomenal hook-ups, but I feel that I have succeeded in finding a better way of doing one thing at least, and that is obtaining a well-balanced panel lay-out. This, I find, has been sadly overlooked in most home-made sets and in many commercial sets as well. I have also, I think, succeeded in arranging the accessories that make up a

receiver, in an orderly and convenient manner. The table on which my set appears, in the picture, is home-made. It contains a compartment in the rear for the B batteries, four in number. The cover of the table is hinged, permitting ready access to the batteries at any time while the set is in operation. On the lower part of the table is a shelf, placed at a convenient height, which holds the A battery. The leads are brought out at the top, through holes drilled in the cover. The battery binding-posts are all in the rear of the cabinet. This gives the panel a neat appearance and keeps the

Over the Top! (Radio Version)



(Cartoon by Lawrence B. Hinckley)

conglomeration of wires away from one's hands when manipulating the dials. The loud-speaker is placed in the rear, on a small shelf. This keeps it out of the way and at the proper height. Notice that the amplifier is built into one cabinet with the receiver proper. This cuts down the length of the cabinet by one half.

The receiver is an ordinary regenerative one, using a coupler with a condenser tuned secondary, and a plate variometer for regeneration. V-T 1 and V-T 2 tubes are used exclusively and respectively for detection and amplification. Other parts of the set are as follows: home-made 180 coupler, Mignon condenser, Atwater Kent variometer, Paragon rheostats, Radio Corporation transformers, General Radio Corporation dials, switch points and levers, also a Radio Corporation potentiometer.

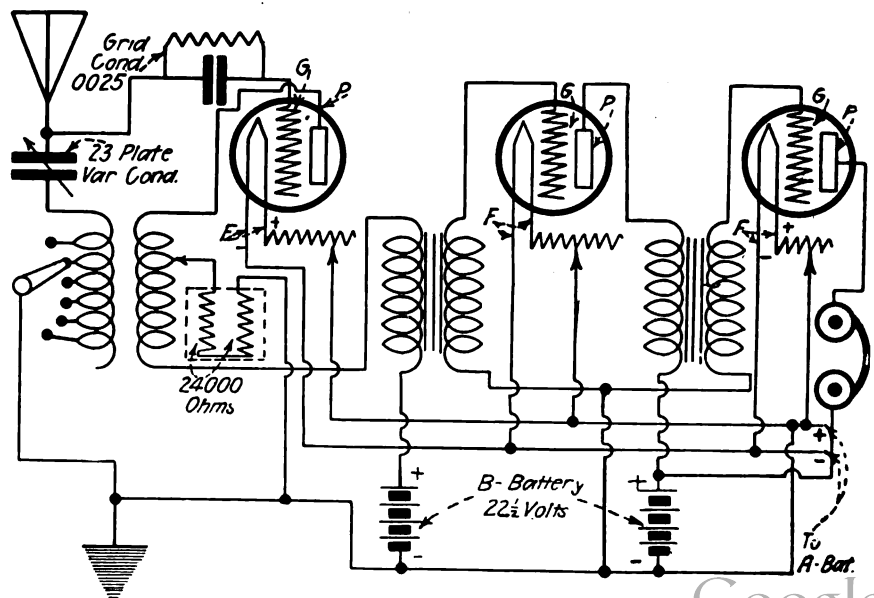
The following is a list of stations I have copied to date: WJZ, WWZ, WHN, WOR, WEA, WAAM, WBS, WLAW, WGY, WHAZ, WBZ, WNAC, NOF, WOO, WHAS, KDKA, WOC, WFI, WMAK, WRW, WNAQ, WSB, WIP, WWJ, KYW, WGM, WHB.

I have letters from most of the above stations, proving that I have actually received their programs.

While this may not seem such a remarkable record to many radio fans who have covered a still greater distance with their outfits, it does mean a great deal to me, since I built the set myself.

Uses Miniature Resistances in Plate of Single-Circuit

EDITOR, RADIO WORLD:—Enclosed is a wiring diagram for a single-circuit receiving set with which I have derived exceptional results. With this circuit and a one-step amplifier, I have heard the following stations: KDKA, WWJ, WSB, PWX, WGY, KFAF, NOF, WHB, WOC, WBAP, and others too numerous to mention. If you will notice the diagram, I am using non-inductive resistances in my plate circuit which seem to hold my tube steady and prevent it from going into oscillations, for which the single circuit set is noted. On several occasions, I have adjusted my set to such a fine degree that I could hear violin music from the lowest to the highest notes without the bulbs going into oscillations. This also makes it very selective. When you adjust your set you do not seem to have other high-power stations breaking through.—Fred Gretsch, 1311 East Condit Street, Decatur, Illinois.



Hook-up of Mr. Gretsch's set as described in his letter to Radio World.

Inductance and Resistance

I DON'T quite know what this title means, but for all of that it seems to me rather good. I came upon it in the radio section of a metropolitan newspaper with which I happen to be familiar, says Robert L. Duffus in "The Globe," New York. It was part of a discussion of Oscillations, The Damping Constant, Filter Tuning, Microhenries, Microfarads, and other subjects connected with the miracle of sending a jazz concert or a bed-time story through the air from Newark to Oyster Bay. The miracle was impressive, but it seemed that no one without a passionate affection for logarithms and diagrams could have made head or tail of the explanations.

I pointed this out to a representative of the circulation department. The man in the street wouldn't read such stuff, I said, and if he did read it he wouldn't understand it. What he wanted was simplicity. He couldn't digest anything complex, or—as Noah Webster would say—esoteric.

The circulation man listened to me patiently. He had but one answer. He didn't know what the man in the street thought about these technical subjects, but he did know that he liked to read about them. There was no doubt about this, for he had figures to prove it.

Who read the radio section? Boys and young men very largely. Most boys liked to tinker with scientific toys and many of them knew a lot more about electricity than college professors had known a few years ago. Logarithms and technical jargon were as easy as baseball to these young people.

But the boys didn't have it all to themselves. Every one who was interested in the wireless telephone learned about it, just as they had previously learned about automobiles. Age wasn't a barrier. Men who would have regarded a technical discussion of the economic cycle or European politics as clear beyond them easily got a grasp on the just as difficult subject of electricity.

The explanation is one long known to educators. We all learn more easily when we are interested than when we are not. A boy may go to school for years and make practically no progress. Then he discovers that he has a personal need for mathematics or science, and he soaks it up almost overnight. It was interest that was lacking, not intelligence.

Probably this is true of multitudes whom it pleases the intellectual snobs to regard as hopelessly stupid. Somehow or other, life has failed to engage their interest except at a few points. There is no reason why the schools, and later the newspapers, magazines, and theatres, should not get them excited about a wide variety of subjects. The trouble is that scientists, artistic persons, and others, who regard themselves as out of the ordinary, usually won't take the trouble to tell the man in the street about the thrilling things they know and feel.

Yet it can be done. If "inductance and reactance" can be made comprehensible to the man in the street so can anything else that it is valuable for him to know.

Another Radio Club

THE Highway Radio Club was organized November 23. Applications for membership may be filed with William C. Burns, corresponding secretary, 2655 Mansfield

Any single copy of Radio World, beginning with No. 1, mailed on receipt of 15 cents postpaid. Any seven issues for \$1.00. The full 20 numbers sent for \$2.90. Or send \$3.00 for 6 months (26 numbers) or \$6.00 for 1 year (52 numbers) and have your subscription start from No. 1. Radio World, 1493 Broadway, New York.

Place, Brooklyn, New York; or, Joseph F. Doherty, chairman of the committee on membership, 1117 Quentine Road, Brooklyn, New York. The object of this organization is to promote good fellowship among amateurs and fans, and to promote instruction and experimenting.



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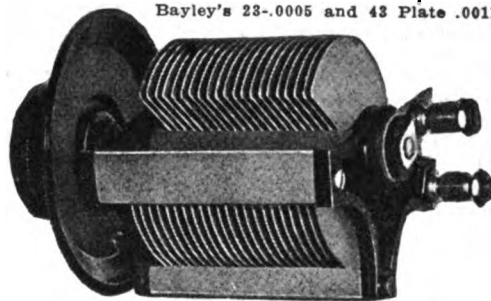
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Rheostat Has Novel Contact Arm

(Manufactured by Sunraid Radio Co., New York, N. Y.)

To overcome the difficulty between the coils of resistance wire and the contact arm, the Sunraid rheostat uses a contact which is maintained by the constant pressure of a spring on a small

brass plunger. The coils are wound in the ordinary way on a strip of heat-resisting compound and then set into a condensite cup so that it forms a ring approximately two inches in diameter. To fit the control knob shaft, a piece of nicked brass is fitted into a clamp at one end and a tube at the other to hold the compression spring and the plunger contact. Either panel or base mounting may be used in adapting this rheostat in the set. The condensite cup is provided with screw holes so it may be fastened to the panel.

National Radio Week Special Number!

Remember "This Is a Radio Christmas"

and that millions of dollars will be spent during the holiday time for radio gifts.

Be sure to get your share of this business by advertising in the issue of RADIO WORLD of December 23, which will be

RADIO WORLD'S NATIONAL RADIO WEEK NUMBER

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EARLY COPY GETS BEST POSITIONS.

RADIO WORLD, 1493 Broadway, New York

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Richman Electric Co., Newark, electrical devices, \$100,000; Max Richman, Daniel Kalisch, Joseph Dalesio, Newark, N. J.

Capital Increase
Electrical Invention and Development Co., Schenectady, \$25,000 to \$75,000.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and exhibitions. Keep us posted by mailing full information.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31, Colwell & Korbell, Fisk Building, New York City, directors of publicity.

SOUTHEASTERN RADIO EXPOSITION, Auditorium Armory, Atlanta, Georgia, December 4 to 9, inclusive. Co-operative Radio Sales Assn., 205 Peachtree St.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

At the Permanent Radio Fair

PERMANENT RADIO FAIR, INC., a centralized exhibit of reliable radio merchandise at the Hotel Imperial, Broadway and 32nd Street, New York City, is attracting considerable interest among radio buyers and dealers. Only the products of representative manufacturers are on display. The exhibits, enclosed in handsome show-cases in the attractive Red Room of the Imperial, offer prospective buyers an opportunity to secure a comprehensive survey of the radio field.

The radio fair is doing everything possible to boost radio and to stimulate favorable public opinion toward radio in general and to exclude all whose product is of such character as to bring radio into public disfavor.

Another very interesting feature of the Permanent Radio Fair is the radio phenomenon, "Madame Radora," the life-sized automaton who bows and talks in human fashion.

No Free List

To many anxious inquirers: RADIO WORLD has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

With the DX Night Owls

Wide Range with One Detector Tube

EDITOR RADIO WORLD:—I have been reading some of the long-distance receiving records published in RADIO WORLD. I would like to submit mine. I do not think they can be heat easily, considering my equipment. I have heard as far east as WBZ, Springfield, Massachusetts; as far south as WIAF, Nola Radio Company, New Orleans, Louisiana; as far west as KHJ, Los Angeles, California, and as far north as CKCK, Regina, CKCK and CJCG, Winnipeg, Canada. I have heard KZN, Salt Lake City, Utah and DD5, DN4, KEAF, and KLZ, Colorado. I have heard broadcasting from twenty-five States and two provinces in Canada. All these stations (75), were heard with only one detector tube, with 22½-volt battery in plate circuit. I use a home-made, three-spider-web regenerative set. On the night of November 21, I heard WLAG, WGY, WSB, KDKA, WJZ, WDAF, WIAO, WEA, WHB, WBZ, WWJ, WCK, WHAS, WOC, WJAP, KSD, KYW, WOS, CJCG, WEAB, DN4, WGM, WBAP, WDAJ, WBL, WFAA, KHJ, WPA, and CKCK using a one-step amplifier with 45 volts on the plate. I use Cunningham tubes and a Thordarson transformer. I don't think this record can be beat with the same equipment.—Arthur Lindstrom, 4th Street, Baraboo, Wisconsin.

* * *

With a Home-Made Crystal Set

EDITOR, RADIO WORLD:—In your issue the record of E. S. Morrison, Ashland, Oregon, with a Westinghouse R-C set, in RADIO WORLD, No. 34, November 18, 1922.

We think we are making records here. With a home-made crystal set we hear WGG, KDKA, WSB, Detroit, Cincinnati, Minneapolis, Fort Worth, Dallas, Denver, etc.

With a home-made one-tube set we pick up Los Angeles, San Diego, San Francisco, Portland, Atlanta, Schenectady, Springfield, Havana, Cuba, and Calgary, Canada. If better records are made, who made them? We will make an affidavit as to ours.—N. R. Brown, Olathe, Kansas.

* * *

A Claim from New Orleans

EDITOR, RADIO WORLD:—I am not trying to claim the record for receiving. I live in New Orleans, Louisiana; but with a single tube and one coil consisting of 60 turns and rotor, I hear regularly Denver, and Colorado Springs, Colorado; Chicago; WWJ, Detroit; KDKA, Pittsburgh; WOC, Davenport, Iowa; Fort Worth and Waco, Texas; Atlanta, Georgia; WSB, WGM, and others. There are three stations in this city. If I do not wish to hear them, I can tune them out. Under favorable conditions I hear Portland, Oregon. How's that?—R Diamond, 413 Royal Street, New Orleans, La.

* * *

On a Crystal Set

EDITOR, RADIO WORLD: I have picked up WOC, WCAL, WWJ, WCX, WHAS, WOI, KSD on my crystal set. I accomplished this all within the past week; for heretofore, believing long-distance reception with crystal sets impossible, I never attempted to "get" any distant stations. On November 19 I attempted to pick up WCAL, Northfield, Minnesota, about fifty miles distant. I not only got

them, but WOC, Davenport, Iowa, as well. Since then not a day has gone by but I have picked up one or two long-distance stations. Although this seems incredible, it is a fact. I have heard these stations very well considering the circumstances. I hope to better this record before long.—Bill Keating, 1516 Second Avenue, South Minneapolis, Minnesota.

* * *

Tuned Out WJZ for WOC

EDITOR, RADIO WORLD: On November 12 at 9:55, eastern time, with WJZ on the air, I tuned him out and received WOC, Davenport, Iowa, on the loud-speaker; just as loud as WJZ or any other local station.—G. F. Olson, 2 Jerome Avenue, Belleville, New Jersey.

Eisemann Magneto Corp.

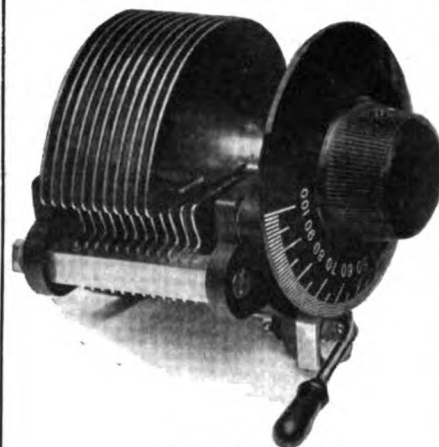


The most scientifically designed and mechanically perfect instrument on the market.

Write for description and prices

CLARK & TILSON
1 EAST 42ND STREET NEW YORK

Hammarlund Vernier Variable Condenser



Patent Applied for

For super-accurate tuning

The Hammarlund patented vernier control moves the rotor patented plates by as little as 1/50th of a degree on the condenser scale and is arranged to eliminate all interference due to body capacity.

Therefore possible to get on the exact wave necessary to receive at maximum efficiency.

- .001 Mfd. \$7.00
- .0005 Mfd. 6.00

3½" Bakelite Dial \$1.00 additional

Distributors Wanted

New Descriptive Circular Sent on Request

Hammarlund Mfg. Co., Inc.

144-146 West Eighteenth Street
NEW YORK CITY

RADIO WORLD as a Christmas Gift

Have You a Friend Who Is Interested in Radio as an Amateur or a Fan?

IF so, you must know that such a friend would welcome a yearly subscription for RADIO WORLD from you. Send us \$6.00 and we will place the name of your friend on our mailing list for the coming year, and also we will send a special notification to your friend to the effect that RADIO WORLD will be sent for 52 weeks to his address with your compliments. Send in a yearly order, so that the first copy and our acknowledgment of your courtesy to your friend will be received before Christmas.

Address: Subscription Department, RADIO WORLD, 1493 Broadway, New York, N. Y.

Christmas Gift Subscription Blank

RADIO WORLD,
1493 Broadway, New York, N. Y.

Enclosed find \$6.00 for which send Radio World (52 numbers) for the coming year, 1923, to the following address:

Name

Address

City and State

My Name

Address

City and State

Send notification to the name given that RADIO WORLD will be sent with my compliments for the coming year.

If you wish to send more than one subscription, write additional names and addresses on a separate paper and add \$6.00 for each additional subscription.

The best SOCKET for the DRY CELL TUBE

60c.

LINCOLN RADIO CORPORATION
116 W. 65th St. Manufacturers New York City

INCREASE YOUR CRYSTAL RANGE
BY USING A "PT" ULTRA-SENSITIVE CONTACT IN YOUR CRYSTAL DETECTOR

1. It locates a sensitive spot instantly.
2. Brings music and code in louder.
3. Withstands hammer jolts without jarring out.

Price, with instructions, twenty-five cents.
"PT" CRYSTAL CONTACT COMPANY
Box 1641 BOSTON 8, MASS.

SPECIAL OFFER

For a limited time only
Paragon RA-10.....\$25 Grobe CR-5.....\$70
Paragon DA-2.....\$5 Grobe RORR.....\$5
Prices F.O.B. Red Bank, N. J.

A. V. GREGORY

42 Broad Street Red Bank, N. J.

PHANTOM-CIRCUIT

BUILD YOUR OWN. This marvel of mystery, using no aerial, no loop, no ground, brings in music instead of static showers. We consistently hear concerts on Macassar, from stations 550 miles distant, audible 100 feet from horn. The simplicity of this set will surprise you. No radio frequency. Complete instructions with photo of circuit sent prepaid for 60c.

VESCO RADIO SHOP, Box W-764, Vauxville, Calif.

Varimeters with dial, \$2.38

Variocouplers with dial, \$1.88

Post Paid

Money Back if not Satisfactory

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Manufacturers

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RADIO MAILING LISTS

9370 Retail Radio Dealers, United States per M, \$7.50
1134 Radio Manufacturers..... per list, 10.00
1330 Radio Supply Jobbers..... per list, 13.50
257 Radio manufacturers of com. plate sets..... per list, 4.00
260 Radio Stations..... per list, 4.00
14000 Radio Amateurs and Managers of Radio Stations... per M, 7.50

Neatly typewritten and ready to send you on receipt of remittance covering the amount.
TRADE CIRCULAR ADDRESSING CO.
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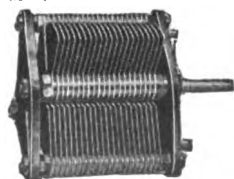
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Take the middleman's profit and selling costs for yourself. We sell you direct. These extremely accurate instruments made by experienced condenser people are minus the decorative frills that add to cost. Price reduced to rock bottom without sacrificing quality in the least. Satisfaction or your money back. Write today for very interesting circular.



PRICES:
21 Plate
\$2.55

43 Plate
\$2.95

Complete with Mounting Screws

Your Order Filled by Return Mail

No checks or money orders needed. Pay postman. Send the order TODAY, enclosing 5 two-cent stamps to cover mailing cost and receive your condenser in a day or two.

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99 East Kinney St. Newark, N. J.

Subscribe for RADIO WORLD. \$6.00 a year, \$3.00 six months, \$1.50 three months.

Answers to Readers

I INTENDED to construct a cabinet 8 x 15 x 30 inches. I will divide this into four compartments so as to hold. 1. a honeycomb coil regenerative receiver; 2. A telephone head set; 3. Battery; 4. My 6-volt A battery. My A battery will be about 12 inches from the receiver. Do you think this will interfere with satisfactory reception?—John Mullenhauer, Poughkeepsie, N. Y.

The length of the A-battery leads make very little difference in the efficiency of a set. The length you mention is all right.

Can I use Westinghouse type WD-11 tubes for amplifiers? If so, what kind of amplifying transformers must I use? Also, what kind of grid condenser and leak will I need for the detector tube?—W. E. Gilbert, Jr., Box 1282, Alliance, Neb.

WD-11 tubes may be used as amplifiers. The regular standard transformers may be used, but the Sleeper transformers work best with this type tube. It is not essential that a grid condenser, or leak be used with this type tube, but we advise you to try it out as an experiment. A .00025 mfd., condenser will answer the purpose and a 1-megohm leak.

I have a two-stage honeycomb outfit with 100 feet of aerial. I was receiving WJZ and WOR wonderfully. I disconnected my tuner and replaced it again exactly the way it was before I removed it. Now my receiving is reduced fifty per cent. in loudness. I have tested my batteries, both A and B, and find them fully charged.—Paul Haffner, Woodcliffe, N. J.

Undoubtedly the trouble is caused by what is known to radiomen as "fading." This is a condition over which we have no control. It sometimes happens during reception, and frequently becomes so loud that the vacuum tubes are paralyzed and reception ceases. Then it is a good plan to disconnect the B battery, let the tubes recover, then replace the B battery with the amount of voltage somewhat reduced during the period of the maximum reception. Try smaller coils on the secondary and the tickler.

I would appreciate a diagram with complete directions regarding the construction of a radio outfit.—Herman Brush, Mt. Carmel, Ill.

RADIO WORLD, No. 33, dated November 11, page 4, will give you a complete diagram and all the necessary data you need.

How can I make a charger for alternating current?—C. E. Chamberlain, Jaffrey, N. H.

Purchase a battery charger from some reputable concern. These chargers are more efficient and compact than most troublesome, noisy, home-made affairs.

I have a regenerative set with one step of radio-frequency amplification. I cannot receive long-distance stuff except the local stations. Will you please publish a good hook-up?—Reader 319, Louisville, Ky.

(Continued on following page)

Quality, Design + Workmanship + Material = **RELIABILITY**

RADIO-A RE-CHARGER

Simple to Use

Just plug in at any 110 v. A. C. lamp socket—attach clips to battery—turn on current and you have your own charging plant.

A compact portable Recharging unit that will fully charge a 100 AH battery overnight for 5c. to 10c.

At your dealers or write
King Electric Mfg. Co., Inc.
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PATENT
Your Radio Ideas:
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FREE ADVICE

ASK MANUFACTURER'S PATENT CO.
FOR 1520 FIFTH AVE
NEW YORK

STANDARD HEADSET
2,500 OHM

Guaranteed to be equal to any phone on the market having a \$5.75
Dealers and jobbers write.

Standard Electric Sales Co.
648 Broad Street Newark, N. J.

FOR CHRISTMAS

"The Little Wonder" CRYSTAL SET \$4

\$2.50 UNMOUNTED

Just the gift for your boy or girl. Sent prepaid. Free catalog on request.

GUARANTEED, TESTED CRYSTALS Galena and Radiocite... 20c.

Radi-O-Plate Panels. All sizes cut to order.

Holloway Electric Supply Co., Inc.
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Do You Like Clear Tone—Sharp and Distinct? If so try

MARSH'S
Vernier Variable Condenser AT LAST

Made in Three Styles. Dial Knob and Screws Complete. Fully Guaranteed.

27-Plate \$3.50
33-Plate \$4.75
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Mail orders promptly filled.

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PERMANENT RADIO FAIR

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Buyers—Dealers—Radio Department Managers, Demonstrations of Any of the Products of the Exhibitors. Only Products of Representative Manufacturers Are on Display.

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RADIO
VOLT-METER
ONE INSTRUMENT
MAKES ALL TESTS**

Write for booklet with suggestions for testing and adjusting Radio Sets. Thousands now in use give absolute satisfaction.

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PRICES SMASHED

Each sale has created new friends and customers with the result that we now announce drastic reductions in our quality lines. All goods prepaid. Send card for complete price list. You'll be surprised. You'll tell your friends. A sample saving follows:

REGENERATIVE VACUUM TUBE SET
Approximate range—1,000 miles.

	Our Price	Others
Panel—Bakelite—7"x12" drilled.	\$1.75	\$2.50
Cabinet of 3-ply wood to fit panel.	1.85	2.50
Two dials—each 35c.	.70	1.00
16 switch points with nut. Ea. 1c.	.16	.48
4 switch stops with nut. Ea. 1c.	.04	.12
3 binding posts. Nickel plated @ 3c.	.24	.48
2 switch levers @ 25c.	.50	.90
1 filament rheostat. Highest grade.	.65	1.15
1 vario coupler. Fourteen taps.	2.25	4.00
1 23 plate variable condenser.	1.95	3.50
1 tube socket—Moulded.	.45	.55
1 grid condenser and leak.	.10	.25
1 phone condenser.	.10	.25
1 tube socket support.	.15	.25
12 feet spaghetti tubing @ 4c.	.40	.84
15 feet copper connecting wire.	.30	.45
Blueprint showing details to assemble	.16	.25
	\$11.42	\$20.12

Other articles taken at random from our late price list are—

Detector tubes—Cunningham—NOT rebuilt	\$3.95	\$5.00
Transformer—Audio frequency	2.98	4.50
Variometer—Hardwood stators 4 1/2"	2.28	4.00
Front Fone—2000 ohms	3.95	5.00
Kelllogg—2400 ohms	5.75	12.00
Western Electric 2200 ohms	9.25	12.00
Blueprints giving detail of 2 step amplifier or regenerative receiving set	.10	.25
Two step amplifier—knocked down	12.95	23.50
Panel drilled	18.95	35.00
Two step amplifier assembled. In cabinet	17.95	35.00
Vacuum tube set in cabinet 7 1/2" 12"	17.95	35.00

Send for list today or order direct from above. Goods sold subject to return for rebate or exchange. YOU MUST BE PLEASED.

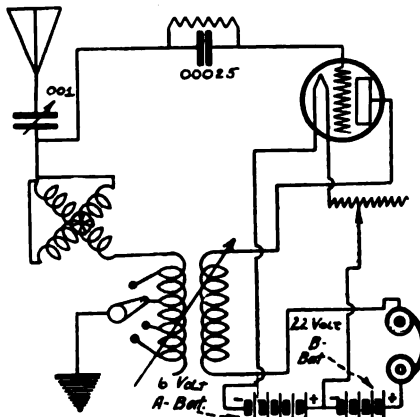
Radio Parts Manufacturing Co.
15 Park Place West Detroit, Mich.

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C. (Adv)

Answers to Readers
(Continued from preceding page)

In this issue there are two good hook-ups of radio-frequency. We advise you to see RADIO WORLD No. 19, dated August 5, in which appeared article on radio-frequency by George W. May. This should set you right in fixing up your set.

Please publish a hook-up with a variometer in series with the primary of the loose coupler?—Harry Homer, Glen Cove, L. I.



Hook-up requested by Mr. Harry Homer, Glen Cove, Long Island.

The above sketch shows the correct hook-up for such an arrangement. Care should be taken in checking up all connections and battery polarities.

I am planning a 1-tube hookup as illustrated in RADIO WORLD, No. 30, dated October 21, page 7, and would like to add one step of amplification. Please send me a wiring diagram.—Richard Burgess, Burlington, Vt.

There appeared in RADIO WORLD, No. 22, dated August 26 an article by Fred. Chas. Ehlert, "My Detector and One-Step Amplifier." This describes the exact receiver you have in mind. A complete diagram is also published.

I am building a honeycomb coil regenerative set. I am told that if I short circuit the tickler coil I will get efficient spark reception. Would there be any advantage in using loading condensers to load the primary and secondary of my set to larger capacities?—Maxwell Murphy, Eastport, Maine.

Do not short circuit the tickler coil or the signals will be very weak. See RADIO WORLD, No. 24, dated September 9, page 9.

VARIO COUPLERS



**GEM
\$1.25
List**

We also make 6 other styles
That List \$2.50 up
Jobbers—Dealers—Agents
Write for Discounts

Jewell Radio Sales Co.
90 West St. New York City
Phone Rector 1625

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RADIO
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**The Official Exposition for
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with the endorsement of the
**NATIONAL RADIO
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Apparatus Section of the

**ASSOCIATED
MANUFACTURERS of
ELECTRICAL SUPPLIES**

**Grand Central Palace
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December 21st to 30th

(Sunday excepted but Christmas Day included)

This first really comprehensive Exposition to be staged in a manner worthy of a great industry includes such representative exhibitors as:

- Western Electric Company, Inc.
- Radio Corporation of America
- National Carbon Company
- C. Brandes, Inc.
- Sleeper Radio Company
- General Insulate Company
- Executive Radio Council
- Coto-Coil Company
- Weston Electrical Instrument Co.
- American Radio Relay League
- Stromberg-Carlson Mfg. Co.
- Holzner-Cabot Company
- Clapp-Kastham Company
- Dublier Condenser Company
- DeForest Radio Telephone & Telegraph Co.

All of the above and other leading manufacturers have contracted for space and many more are at present negotiating for representation. The opportunity to display Radio products to thousands of buyers during the holiday season is an unusual one. The exposition will be one of New York's big features in connection with National Radio Week.

For further particulars write or wire

**AMERICAN RADIO
EXPOSITION COMPANY**
120 BROADWAY, NEW YORK
TELEPHONE JOHN 0000

Special Xmas Radio Offerings to RADIO WORLD Readers

Prices lower than ever before, and, perhaps, lower than they ever will be again. Grasp this opportunity while it lasts. The items listed below are guaranteed, as are all Penn Radio supplies, and are standard, advertised products.

No.	Model	Regular price	Xmas Special	No.	Model	Regular Price	Special Xmas
No. 1	DeForest Everyman consisting of Receiving set Dictograph phones Antenna kit	\$29.25	\$15.50	No. 6	Federal Junior	29.25	15.50
No. 2	DeForest Tube Set (for 1½ volt) No storage battery Receiving set Dictograph phones Antenna kit W D 11 Tube (1½ volt) "A" Battery "B" Battery (Eveready)	58.00	29.50	No. 7	Federal Two Step Amplifier	58.00	29.50
No. 3	DeForest Two Step Amplifier 2 W D 11 Tubes (1½ volt) 2 "A" Batteries 2 "B" Batteries (Eveready) Telephone plug	55.75	29.50	No. 8	Turney Monoplex (1½ volt tube set) Completely equipped same as No. 2	62.00	32.50
No. 4	Consisting of No. 2 and No. 3 complete	113.75	57.00	No. 9	R C Set complete with 3 tubes "A" Battery (Eveready storage 90 A H) 3 "B" Batteries (Eveready 22½ and 90 volts) Antenna kit Dictograph head set Dictograph loud speaker 2 telephone plugs	217.25	175.00
No. 5	Little Wonder Crystal Set Dictograph phones Antenna kit	20.25	10.00	No. 10	DeForest Reflex D 7 Complete with loop (3 steps radio, 2 audio on 3 tubes) "A" Battery (Eveready storage 90 A H) 2 "B" Batteries (Eveready 90 volts) Dictograph head set Dictograph loud speaker 2 telephone plugs	189.50	175.00

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Gentlemen—As offered in your advertisement in Radio World, I enclose money order for \$..... covering items No..... It is understood you guarantee each and will ship at once prepaid.

Very truly yours,
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Please write name and address plainly

PENN RADIO CO.,

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A Complete Success

Radio World Reader So Describes His Tests with Mr. C. White's Radio-Frequency Regenerator

EDITOR, RADIO WORLD:—I believe your readers will be interested to know that the radio-frequency regenerator described by your correspondent, Mr. C. White, in RADIO WORLD No. 28, dated October 7, has proved, in my case, a complete success. Using the new circuit I can hear distinctly, practically all the important broadcasting stations east of the Rockies.

I have made just one change in Mr. White's design, and that is the use of a plate variometer instead of a tickler. The value of the circuit seems to be, however, not so much in long-distance reception, as to the remarkable purity of voice and music, due to the use of a crystal detector between the two bulbs.

I am using Myer bulbs as I find that their stability is a great help in securing good results.—G. L. Michaud, 1020 Hill St., Ann Arbor, Mich.

* * *

Trying Mr. Miller's Hook-Up.

EDITOR, RADIO WORLDS—In your issue No. 30, dated October 21, you publish a novel hook-up by Mr. W. Miller who uses a honeycomb coil for tuning. In your issue No. 34, dated November 18, another of your readers claims that he bettered Mr. Miller's circuit by using a variometer. I claim to have had practically the same circuit in use since April 25. It works better the way Mr. Miller has it hooked up, with the exception that the condenser is across the honeycomb D-L 75 instead of D-L 50. I have tried out both against mine; and, I think that, next to mine, Mr. Miller's works the best. I would like to hear from others. Just a "bug."—Ray Chittenden, 37 Petrel Street, Rochester, N. Y.

DELICATE SOLDERING

Both the manufacturers' and amateurs' problem on all fine work is readily solved by the instrument constructed for this particular purpose.

THE POST SOLDERING IRON

Platinum Heating Unit—Interchangeable Tip—Universal Current



One Half Actual Size

\$6.00

From Your Dealer or Write

Awarded Certificate of Excellency, N. Y. Evening Mail Radio Institute
POST ELECTRIC COMPANY, (Div. 509) 30 E. 42nd St., New York

THE ONLY GENUINE AND GUARANTEED

"All Wave" Coupler

TRADE MARK FLAT AND BANK WOUND

Wave Length, 150 to 3,000 Meters

Eliminates the use of all Variometers, Varicouplers and Loading Coils, inasmuch as it performs in one compact unit the functions of all of these devices combined.

For the Novice—The six efficient hook-ups given free with each "All Wave" Coupler enables the greenest novice to attain the same results attained by the expert in building the simplest, most compact and most efficient radio receiving set possible.

Be Prepared—For the higher wave lengths that have been and will be allotted to broadcasting stations because of their ever-increasing number. BUILD a set that cannot become obsolete.

Unusual Results Attained—Individual users of the "All Wave" Coupler have written us that in Rhode Island it is nothing unusual to bring in stations as far south as Havana, Cuba; while in Mobile, Alabama, Newark, N. J., is brought in daily.

Beware of Imitations—of the "All Wave" Coupler, which is guaranteed with a money back to operate as advertised. Look for the trademark, "All Wave," on the rotor, also the six efficient hook-ups in the box.

\$9.00 Six efficient Hook-ups sent upon receipt of 10c. stamps or Free with each "All Wave" Coupler

GUARANTEED WITH AN ABSOLUTE MONEY-BACK GUARANTEE
THOUSANDS OF SATISFIED USERS

Capitol Phonolier Corporation



Patents Granted and Pending

60 Lafayette Street
New York City

GLASS ENCLOSED GRID LEAK

Guaranteed
35c.

Values are constant. Resistances vary from 1/4 to 5 megohms.

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116 W. 65th St. *Manufacturers* New York City

LOW RADIO PRICES

All new, fresh stock. Satisfaction guaranteed or money promptly refunded. Write for our free MONTHLY BULLETIN giving up-to-minute radio prices. We pay transportation on items listed below (East of Rockies) when order totals \$5.00 or more (except Storage A Batteries and Homecharger sets).

Complete Crystal Receiving Set.....	\$3.75
Frost Fences (Double) 2,000 ohms.....	4.00
Keystone Approved Arrester.....	1.75
.0005 Grid Condensers.....	.22
.001 Phone Condensers.....	.22
Variable Cond. Mounted, 43 plate \$4.00, 21 plate.....	3.00
Variable Cond., no dial or knob, 43 plate \$2.75, 21 plate.....	2.55
Tuning Coil, Range 1,000 Meters.....	2.60
Loose Coupler, Range 200 to 800 Meters.....	6.25
Thordarson, 3 to 1 Ratio.....	3.75
Pur-A-Form, 3 to 1 Ratio.....	3.00
All-American, 10 to 1 Ratio.....	3.80
Vacuum Tubes (New, Not Rebuilt)	
UV-200 Radiotron (Detector).....	4.30
UV-201 Radiotron (Amplifier).....	5.85
Handy Complete Soldering Set.....	1.00
Nickel tube, fibre base.....	.45
Porcelain tube and base.....	.40
Moulded composition.....	.45
"Star" filament rheostat, knob and dial.....	.90
"Magnavox" loud speaker.....	42.00
Pian-O-Phone—A dandy loud speaker.....	3.50
"Air-Way" Variometers.....	3.50
"Air-Way" Vario-Coupler.....	3.50
Nickel binding posts 1/4" high, per doz.....	.40
Spaghetti tubing, rubber 8c. ft., Cambric 10c. ft.	
No. 14 Tinned Busbar Wire, per ft.....	.02
6 V. 60 Amp. Storage A Battery (40 lb.).....	12.00
6 V. 85 Amp. Storage A Battery (45 lb.).....	14.00
"Homecharger" for charging storage batteries at home. Works on any 100-115 volt, 60 cycle, A. C. circuit.....	15.00

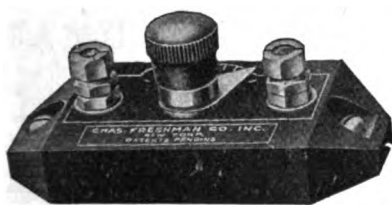
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Holmes Electric Company

LIBERTYVILLE ILLINOIS

(Suburb of Chicago)

The Latest and Most Essential Part of an Efficient Tube Set



Variable Grid Leak and Micon Condenser (Combined)

Obtainable in an unbroken range from zero to 5 megohms—all intermediate points. Fixed capacity—.00015 M. F. Improves your set wonderfully by

*Clarifying Signals
Lowering Filament Current
Increasing Battery Life
Eliminating Hissing*

Price Only \$1.00

At your dealers—otherwise send us purchase price and you will be supplied without further charge.

Manufactured by

CHAS. FRESHMAN COMPANY, Inc.

97 Beekman St. New York City

Home of Micon & Antenella

The Biggest Show on Earth

RADIO played a great part in the football contests of the gridiron season which closed Saturday. The seating capacity of stadiums no longer limits the number of people who can enjoy the plays, the cheers and songs of the collegians, says "The Times," New York. One of the features of the season was the broadcasting of the Princeton-Chicago game by station WEAJ in New York. A long-distance telephone line connected the microphone at the Chicago gridiron direct with radio apparatus in New York, so that the entire country was in tune with the game at Stagg Field. Radio has made it possible for those listening in to hear the songs and clamor of the crowd even before some of those assembled at the gridiron. Sound travels approximately 1,000 a feet a second. Radio travels 186,000 miles a second.

The music of Harvard's band in the Yale Bowl, Saturday, November 18, surged through the bowl at the slow speed of sound, but the radio microphone picked up the music and sent it through space at the speed of sunlight, 186,000 miles a second. By the time people 1,000 feet away from the band heard the Harvard and Yale music, radio had transformed the same music into ether waves, with velocity sufficient to carry it around the world seven and one-half times, while the sound waves were covering 1,000 feet across the Yale Bowl.

Radio provides the biggest show on earth at the present time. The radio audience numbers millions, and consists of people representing every country in the world. The cast of the radio show is unlimited; all the world is the stage. And as all shows hold feature performances so does radio. World series baseball games, play by play, direct from the diamond; prizefights direct from the ringside, blow by blow, mingled with the sound of the gong and the outcries of the crowd; football games direct from the gridiron, yard by yard, backed by the college songs and cheers; track meets, lap by lap, and now the latest feature added to the program is opera.

Radio Times Changed

LAST year at this time radio sales managers were sitting in their offices with the doors locked to prevent the entrance of dealers who wanted to buy apparatus, says "The Mail," New York. The sales managers were very independent. Sometimes they would do a man a favor by booking an order and sometimes they would not. Sometimes they would grant a man the courtesy of an interview, but more often they were inclined to "turn him down cold."

The writer commented on this last spring. These sales managers were told that they would some day change their opinions.

Things are very much different today. The sales manager's office is wide open, but the average office is empty. Frantic dealers are sane, and they are not in the habit of making pilgrimages to the sales managers' sanctums. Instead the sales manager is making frequent calls on the dealer, and the feet that used to rest on the desk-top are now coming in contact with the hard pavement of the streets.

No Free List

RADIO WORLD has no free list. The only copies sent out by the publishers are to fill the ever-increasing orders of the American News Company, the large numbers of subscription orders received at the office of publication, and one voucher copy to each advertiser and advertising agent represented in current issues.

RADIO WORLD, 1493 Broadway, N. Y.

Watch for future announcements.



RADIO EQUIPMENT MFG. CO.
Dept. "B," 1663 JEROME AVE. NEW YORK, N. Y.

WE DEFY COMPETITION

- Dictograph Phones, \$5.50
 - Dictograph Loud Speaker, \$13.50; list, \$20.00
 - Home Charger, DeLuxe Model, \$13.50; list, \$18.50
 - Brach Out Door Lightning Arrester, \$1.50
 - Triple Coil Mounting, \$2.00; list, \$5.00
 - Radio Frequency Transformer, \$1.95; list, \$3.00
- Perfection Radio Corp. of America**
149 W. 23d Street New York City



SPECIALS

- Baldwin Phones\$12.00
- Double filament Audiotrons..... 2.75
- Mahogany Variometers 2.50

Send 10c. for new and complete catalog

EMPIRE RADIO CORPORATION

271 W. 125TH STREET
NEW YORK CITY

KEEPING A DAY AHEAD
of the headlines in tomorrow's newspapers!

That's what radio enthusiasts everywhere want to do! They're not completely satisfied with the regular broadcasted programs! They want to get the most out of radio!

Live Dealers are extending sales by stocking the

FINCH RADIO RELAY

which automatically receives any desired code message and makes a permanent record of it on a paper tape with unerring accuracy.

Send for Booklet No. 4.

FINCH RADIO MFG. CO.
303 FIFTH AVE., N. Y. CITY.

At Your Service!

There appeared in RADIO WORLD, dated April 1, 15, and 29, the following articles:

April 1—A 500-Mile Radiophone Employing a 5-Watt Tube, by Frank A. Hahnel. "Tell Me, Please, How Will This Set Receive?" by E. L. Bragdon. Short Cuts in Receiver-Circuit Design, by O. C. Roos. Making a Short-Wave Regenerator, by Fred. Chas. Ehler.

April 15—First Principles of Electricity as Applied to Radio, by John P. Miles. Your Storage Battery, by E. L. Bragdon. What Makes Radio Possible, by Edward Linwood. Ground Connection as Vital as Antenna, by Fred. Chas. Ehler.

April 29—Valuable Pointers on Aerial Construction, by Edward Linwood. What Is Meant by Tuning, by E. L. Bragdon. Radio-Frequency Amplification and Regeneration, by Frank Armstrong. Honey-Comb Coils and Condensers, by Edward Linwood. Charging the Storage Battery, by E. L. Bragdon. How to Construct the Variocoupler, by Frederick I. Rumford.

Each copy sent on receipt of 15c. per copy, or the three copies for 45c.; or better still, send your subscription beginning with any one of these numbers, and we will send this paper for 52 issue, and you will then have a complete file for ready and constant reference. RADIO WORLD, 1493 Broadway, New York.

R-C CABINETS

Massachusetts Phonograph Quality Finish. No Drilling of panels for attaching required. Hinged top.

RETAIL PRICES

7x6	\$2.50	7x14	\$3.00
7x10	\$2.75	7x18	\$3.50
	7x21		\$4.00

If your dealer cannot supply you, order direct.

THE R-C MILLS

Executive Offices, 30 E. 23d St., New York, N. Y. (Mention RADIO WORLD)

TOBACCO HABIT BANISHED QUICK, SURE, LASTING RESULTS

Tobacco Redeemer banishes the habit completely, almost before you know it. An absolutely scientific, thoroughly reliable treatment. No matter how long the habit, or in what form used, you will have no craving for tobacco after you take this pleasant, inexpensive treatment. This we positively guarantee. Your money returned without argument or question if not satisfied. Write for free explanatory booklet and proof of what *Tobacco Redeemer* has done for men addicted to the tobacco habit. Send post card or letter today.

Bowell Pharmaceutical Co., Dept. 971, St. Louis, Mo.

GITHENS TRUTONE RADIO HORN—LOUD SPEAKER



First one to sell on ten day trial Money back Guarantee

Retail Price \$21.00 Includes Loud Speaker

Trutone has been pronounced the best on the market by experts. It has a clear, true tone. Every radio fan should try Trutone and compare it with others. If YOU don't find Trutone the best, your money will be refunded. It is sold on a ten-day trial money-back guarantee. If not carried by your dealer write us.

Distributors and Dealers, write!

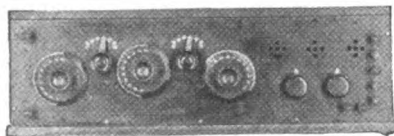
AUTO PARTS MFG. CO.
1815 Trombly Ave., Detroit, Mich.

FRS

ALL MOLDED UNIVERSAL COMBINATIONS 5 Units in 3

- F. R. S. Molded Variometers..... \$2.00
 - F. R. S. Molded Variocouplers..... \$3.00
 - F. R. S. Molded Bank Windings... \$5.00
- Bank Windings are interchangeable for direct connection on either Variometer or Variocoupler.

Universal—Accurate—Interchangeable
A Complete
Two-Stage Long Range Receiver



Set includes two Federal Transformers, Condenser, two-molded variometers, molded variocoupler, three V. T. sockets, filament rheostats, dials. Read 'Em blinding posts, switch points; in attractive cabinet and drilled panel; complete, ready to hook up. A \$125 Radio for..... **\$40**

F. R. S. Radio Corporation

489-D East Fort St. Detroit, Mich.

RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE,
1493 BROADWAY, NEW YORK, N. Y.
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1493 BROADWAY, NEW YORK, N. Y.

ASSOCIATE EDITORS

Robert Mackay. Fred. Chas. Ehlert

SUBSCRIPTION RATES:

Fifteen cents a copy. \$6.00 a year. \$3.00 for six months. \$1.50 for three months.
Add \$1.00 a year extra for postage to Canada and foreign countries.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their proportional rates.

Advertising rates on request.

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Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE:

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

10 More Broadcasters

THE list of commercial broadcasting stations operating on 360 meters was increased by the following ten during the week ending November 25:

- WOAK—Collins Hardware Co., Frankfort, Kentucky.
- WPAC—Donaldson Radio Co., Okmulgee, Oklahoma.
- KFGH—Leland Stanford Junior University, Stanford University, California.
- WOAH—Palmetto Radio Corporation, Charleston, South Carolina.
- WTAC—Penn Traffic Company, Johnstown, Pennsylvania.
- KFDC—Radio Supply Company, Spokane, Washington.
- WRAA—Rice Institute, Houston, Texas.
- WTAU—Ruegy Battery & Elect. Company, Tecumseh, Nebraska.
- WOAN—James D. Vaughn, Lawrenceburg, Tennessee.
- WOAL—William E. Woods, Webster Grove, Montana.

Radiophone in Each Room

ACCORDING to Michael Emmett, the Palace Hip Theatre, in Seattle, Washington, holds out a novel inducement to the artist in the way of a radiophone in each dressing room. Here the artist can sit while making up, or between shows, says "Vaudeville News," and hear lectures, sermons, music, etc. Its effects are marvellous, for the artist keeps out of the wings, being interested in the radio, and happily forgets that evil tendency of "talking shop." This seems to be a new blessing to the theatrical world. Mr. Joseph Muller, manager, and the stage hands do all in their power to bring happiness to the artists while playing in Seattle, according to Mr. Emmett.



The HOMCHARGER

charge your AUTO or RADIO BATTERY for a Nickel. Price, \$18.50. Send for FREE Bulletin. DEALERS—WRITE NOW!
The Automatic Electrical Devices Co., West Third St., Cin., O.

INSU-LITE

PANELS
1/8" —.01 per sq. in.
3/16" —.015 per sq. in.
1/4" —.02 per sq. in.
DEALERS: Write for literature.
General Merchandise Co.
140 Market Street, Newark, N. J.

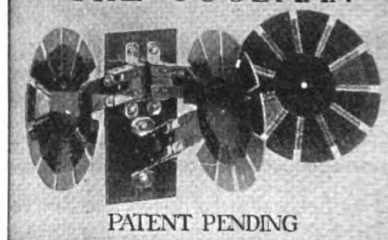
IS YOUR TELEPHONE HEAD SET WEAK?

Let meremagnetize it. Guaranteed, in one day good as new. **\$1.50** Per Set

I rewind for higher ohmage. All radio telephone repairing at moderate prices. Mail orders attended to. Dealers write.

ROYS, 101 West 42nd St., N. Y.

THE GOODMAN



PATENT PENDING

The Niftiest Short Wave Tuner on the Market Only \$6.00 & PP on 1 lb. Send for pamphlet.

L. W. GOODMAN
DREXEL HILL, PA.

Major —, Halifax, N. S., writes: Delighted. Received Schoenstadt clearly on one tube first time I tried the GOODMAN. Would have saved trouble and money by buying months ago.

NOVO "B" BATTERIES FOR RADIO

22 1/2 - 45 & 105 VOLTS

NOISELESS DEPENDABLE GUARANTEED

ASK YOUR DEALER

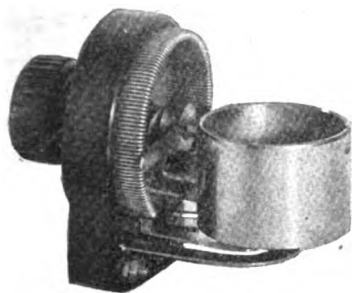
NOVO MANUFACTURING CO.

424-438 W. 33rd ST. NEW YORK

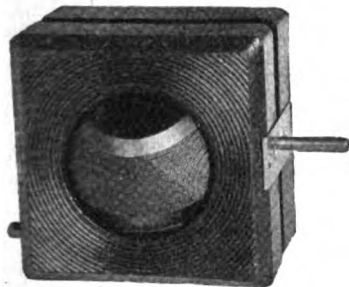
531 SO. DEARBORN ST. CHICAGO

Pruden Reliable Radio Specialties

For Good Results!



Ajax Socket Rheostat
A device for which amateurs and professionals have long been waiting. Eliminates wiring between socket and rheostat. List..... **\$2.00**



Keystone Moulded Variometer
Made of a special composition—extremely light in weight and durable. Wave length ranges from 150 to 580 Meters. Terminals conveniently arranged to afford easy connection and avoid crossing terminal wires. Rotor and Stator windings guaranteed not to loosen. Brush type contacts. List each. **\$5.00**

THE name "Pruden" back of standard Radio Equipment is a guarantee of mechanical excellence, perfection of workmanship and scientific correctness of design.

Now, more than ever, when the market is flooded with inferior goods, it pays to buy standard trade marked products.

You can pin your faith to "Pruden." Money-back unconditionally if you do not get complete satisfaction.

Just a few leaders of Pruden Reliable Products shown here that will give you better radio results at no greater cost.

Dealers write today for our interesting proposition.

FREDERICK H. PRUDEN INC.

993 Bergen Ave.  Jersey City, N. J.



Phono-Phane Permanent Radio Detector

The only fixed radio detector requiring no adjustment. Used in place of crystal or vacuum tube detector. Gives excellent quality of sound without distortion, battery or tube noise. Detects telegraph signals at several thousand miles. Detects broadcast music more clearly than vacuum tube detector, and requires no amplification where the incoming signal has sufficient strength to actuate the sensitive phone. Ideal for use in regenerative circuits. Handsome, substantial, suitable for assembly in the finest radio equipment. Guaranteed against imperfection \$3.50 or faulty operation. List each.. **\$3.50**



Saturn Automatic Plug

The only perfect automatic plug, no need to take apart to make connections. First insert the terminals into the "Saturn" and a perfect connection is made. So constructed that pulling of the cords makes the connection more positive. **\$1.50**
List each

W. J. Burns to Speak on Police Radio

HOW radio is employed, and may be employed, by police and other agencies for the detection of crime will be demonstrated in an intensely interesting manner at the American Radio Exposition, Grand Central Palace, New York City, December 21 to 30, inclusive. William J. Burns, chief of the United States Secret Service, is much interested in radio and is using it in his department. He will speak at the exposition. In accepting the invitation to speak, Mr. Burns said: "It will be interesting to compare the archaic methods of criminal investigation of the past with the methods of the present; also, what we hope to do in the future with radio—which is the last word. I will explain also how we expect to use radio in the next Bureau of Identification which we are at present organizing in my department."

Several demonstrations will be made to show how radio has been employed by police chiefs of European cities.

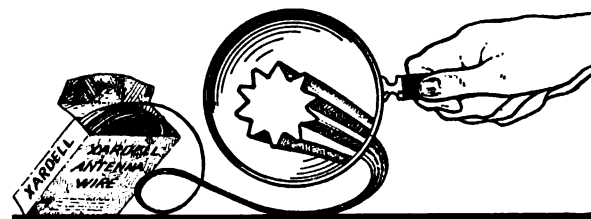
A concentrated effort is being made by the management and the numerous exhibitors participating in this exposition to make it thoroughly representative of what is best in the radio industry. Many unusual "stunts" and demonstrations are planned.

Additional contracts for space were signed by the following concerns: Jewett Manufacturing Corporation, American Radio & Research Corporation, Electric Storage Battery Co., Ackerman Bros. Co., Inc., Electric Record, Feri Radio Manufacturing Co., General Lead Batteries Co., Copper Clad Steel Co.

Point It East!

A MILLION-WATT vacuum tube has been built in Schenectady which is expected to carry radio-telephone conversation across the Atlantic. We sha'nt mind, as long as they keep it pointed east.—"The Plain-Dealer," Cleveland.

Complete Your File of RADIO WORLD
52 Weeks for \$48.00



Something Brand New in Antenna Wire

Jobbers and Dealers—Stock this now for Fall Trade

Here is an Antenna Wire that will at once appeal to the radio enthusiast. It has a real selling argument in that it is different and better than any makeshifts to date.

This new wire, hard drawn from the finest copper, has a corrugated surface with 10 collecting points on its circumference. This gives a greater collective surface and the points give a greater gathering surface.

The result is extreme sensitiveness, and an increase in the range and clearness of any set, from the simplest crystal type to the finest V. T. Receiver.

Packed in neat cartons of 100 feet, 200 feet and 500 feet.

Price **\$2.00** per hundred prepaid

Order direct or from your dealer



YOUR NEWSDEALER

will deliver RADIO WORLD to your home. In order to be sure of getting RADIO WORLD regular and of not missing a single issue, we suggest that you either subscribe direct or through your newsdealer at \$6.00 a year (52 issues), \$3.00 six months, and \$1.50 three months. Or instruct your newsdealer to deliver RADIO WORLD regularly to your home each week. Dealers will take standing orders and make deliveries of paper whenever requested. Radio World, 1493 Broadway, New York.

SEND US THE NAME OF YOUR RADIO CLUB

Also the names of your president and other officers. We want to add these to a list of radio clubs and officers we are preparing for publication in an early issue. RADIO WORLD, 1493 Broadway, New York.

DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS
DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads, if copy is received at this office ten days before publication, RADIO WORLD CO., 1483 Broadway, N. Y. C. (Phone, Bryant 6984.)

ATTENTION! You invent it. Let us make it. Models, dies, manufacturing. Sheldon Tool Co., Rosedale Station, Kansas City.

EDISON B. BATTERY UNITS—One positive and one negative plate for 10c. 18 sets will make a 24-volt battery. Wilkingsburg Wireless Shop, 711 Penn Avenue, Wilkingsburg, Pa.

LOUD SPEAKER FOR ANY CRYSTAL SET. Hear music over entire house. Easily constructed by amateurs. Eliminates Battery. Instructions complete. 25c. Catalogue Free. Representatives wanted. **STEINMETZ WIRELESS MFG. CO., EASTEND, PITTSBURGH, PA.**

OLD MONEY WANTED—\$2.00 to \$500.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. Clarke Coin Company, Ave. 83, Le Roy, N. Y.

HAVE YOU SEEN IT? My unusual, fully illustrated radio catalog is complete. Saves you money. N. E. Ristey, Spring Grove, Minn.

YOUR HOROSCOPE, business, changes, social, matrimonial prospects. Send birthdate and Ten Cents (stamps) for remarkable test reading. ZANYA, 202-J, West 105th St., N. Y.

EXCHANGE JOLLY, INTERESTING LETTERS through our club. Stamp appreciated. Betty Lee, Inc., 4254 Broadway, New York City.

RADIO FANS: Have you read of the wonderful new all-wave Radio Frequency Amplifier invented by Doctor Miller of the Naval Radio Research Laboratory, Bureau of Standards, Washington, D. C.? We manufacture this device under license. May be added to your present set, giving wonderful results on distant stations, or may be made up into loop receiver sets with extreme range and beautifully clear reception, for home or automobile use. Besides being the best amplifier on the market, the Miller covers all waves at equal efficiency. Price, \$6.50 per unit. Details free. Coast Radio, Inc., El Monte, Los Angeles, Calif.

"MUSIC composed" to words. Bauer Bros. (formerly of Sousa's Band), Oshkosh, Wis.

RADIO MAN with two years' experience desires position. Herbert, Listerville. New Brunswick, Canada.

PATENTS

Protect your invention today. Write for 1922 Illustrated Book Free. Radio, Electrical, Chemical and Mechanical experts. Over 30 years' experience. A. M. Wilson, Inc. (Radio 3 ARH), 310-18 Victor Building, Washington, D. C. (Successors to business established 1891 by A. M. Wilson.)

Manufacturers of Rogers Radio Receivers and Rogers Receiving Radiometers. Rogers Radio Company, 5133 Woodworth Street, Pittsburgh, Pa.

EXCHANGE LETTERS with friends everywhere. Pleasant pastime. Information for stamp. Smith, Box 3125, M. Portland, Ore.

NEWS AND GOSSIP OF THE STAGE—Send 10c. for specimen copy of NEW YORK STAR, the great illustrated theatrical weekly. \$4.00 year, \$2.00 six months, \$1.00 three months. New York Star Co., 1493 Broadway, N. Y.

PATENTS—Electrical cases a specialty. Free charges. B. P. Fishburne, Registered Patent Lawyer, 486 McGill Bldg., Washington, D. C.

FREE APPARATUS FOR SECURING SUBSCRIPTIONS FOR "RADIO," Write today for complete list of premiums and our special subscription offer. "RADIO," Pacific Bldg., San Francisco, Cal.

50% MORE RECEIVING POWER with the Harsha 6 volt, 80 ampere hour radio "A" special storage battery, which is guaranteed for two years. \$18.00. Vernier Variable Condensers, 43 plate, \$6.00; 21 plate, \$5.50; 11 plate, \$5.00. Grid leak mounting, 35c. Send money order, but do not add postage or express charge. J. MASCUCH, 74 North 19th St., East Orange, N. J.

BOOST RADIO. Wear a pin or button. It shows you are progressive. Designs and estimates furnished by official club jewelers. The Rankin Co., Radio Dept., 1118-20 Chestnut St., Philadelphia, Pa.

LOOK! ALL NECESSARY PARTS to make V. T. Detector Control, including drilled panel and wire. Price \$3.75. Karnes Radio Shop, Chico, Texas.

LOW RADIO PRICES—Write now for free MONTHLY BULLETIN. Gives up-to-date prices on new merchandise. HOLMES ELECTRIC CO., Libertyville, Illinois.

EISEN Supersensitive tested Crystal. No buzzer test necessary. If not satisfactory, return crystal and money will be refunded with mailing charges. Mounted, 50c.; unmounted, 45c. Special Prices to dealers. Wm. Hafner, 726 New St., Camden, New Jersey.

DIALS, 3-inch, genuine hard rubber, raised or depressed scale, white or gilt lettering. Drilled for 1/4 and 3/8 inch shafts. 60c. each, 3 for \$1.50, postpaid. No stamps. RADIO SALES CO., Box 1144, Bethlehem, Pa.

MILLER AUDIO FREQUENCY transformer eliminates howling. Entirely satisfactory on three stages. Price \$5.00 postpaid anywhere in U. S. RADIO SALES CO., Box 1144, Bethlehem, Pa.

MEN WANTED for detective work. Experience unnecessary. Write for details explaining guaranteed position. J. GANOR, former Gov't Detective, St. Louis, Mo.

EDISON storage "B" Battery Elements, 5c. per pair. 18 will make one 22.5 volt battery. Gilman's Battery Shop, Chelsea Square, Chelsea, Mass.

GET A 1000 MILE RANGE RADIO XMAS PRESENT FOR \$32.50 complete with tube, phones, "B" Battery. \$16.50 down, balance monthly. D. & R. Radio Supply Co., Fort Dodge, Iowa.

INSTANT BATTERY CHARGER! Radio sets demand it. Manufacture at home on royalty. Big Profits. Gold Seal Chemical Company, Syracuse, New York.

ISSUES OF RADIO WORLD from April 1 to Oct. 7 (7 numbers) for 15c a copy, or the whole lot for \$3.15. Or send us \$6.00 for one year and start with the first number. RADIO WORLD, 1483 Broadway, New York.

WE PASS samples or circulars, 1c. each, to houses direct. Lady Canvassers. We mail your circulars, 25c. a hundred. Guaranteed names of our mail order customers. 75,000 up-to-date lists, \$2.00 thousand; 7,000, \$10.00. C. H. Davis & Son News Agency and Mail Order Distributors, 614 W. Jefferson, Greenfield, Ohio.

VACUUM TUBES repaired reasonably. Satisfaction guaranteed or cost nothing. Vacuum Elect., 103, 1621 Derr, Toledo, O.

Radio Club Activities in West Virginia

THE Delta Radio Club has been organized with the following officers: Neil S. Forman, president; Joseph D'Agostino, secretary; Randolph Liston, treasurer. It is located at Morgantown, West Virginia, and its call is 8-BQG.

The West Virginia University Radio Club is another new one. It is authorized by the University College of Engineering. Call, WHD. The officers are: Arthur Price, E.E., president; Joseph D'Agostino, associate member, I. R. E., secretary.

Blessings on 'Em

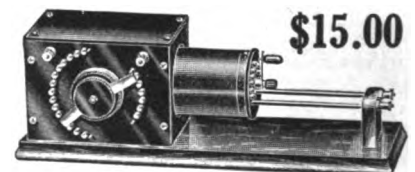
MAY blessings be upon the heads of the gentlemen who invented:

Phonographs,
Player pianos,
Radios,
Slide-trombones,
Clarionets,
Fiddles,
Singing exercises,

And may they always have to lie awake and listen to them.—Roy K. Moulton in "The Mail," New York.

ARNOLD NAVY MODEL LOOSE COUPLER

Back to Pre-War Price



The most consistent piece of apparatus on which to hear the Radio Telephone (Broadcasting) range from 200 to 3,000 meters "WITHOUT DISTORTION." It is a COMPLETE TUNER. Only a mineral detector or Audion Detector required. Send in your order today. Immediate shipment promised or call and hear one and take it away with you.

A 3c stamp will bring my literature showing my complete line.

SPECIAL

Sets built to Order, Repaired or Rewired. Accessories for Sale. Baldwin Phones Repaired. New Diaphragms Put On.

J. F. ARNOLD

2289 THIRD AVE. N. Y. CITY
Established 1910 (Near 125th Street)

WE NEED RADIO WORLD, dated April 5 and August 5. If you have copies you don't require, mail to this office and current issues will be sent you for them. RADIO WORLD, 1483 Broadway, New York.

Spirola
TRADE MARK
as a high-grade

GIVE A SPIROLA CHRISTMAS!

and let the whole family listen to REAL MUSIC all the year through! Nothing adds so much to a two-stage set as a high-grade SPIROLAS are

BETTER LOUD SPEAKERS

REAL CABINET TYPE—not just the usual horn enclosed in a cabinet. Powerful, beautiful, with an INCOMPARABLE TONE. We make a complete line—of the highest class construction throughout, with fine hand rubbed finishes. SPIROLAS are and have always been sold under money-back guarantee to equal in volume and far surpass in beauty and tone any other up to twice their price.

SPIROLA CONCERT—Complete with built-in unit and cord, ready to attach \$12.50 in place of phones. Finish: oak (CO) or mahogany (CM), bronzed throat.

SPIROLA DUPEX—For use with any headset. Separate tone chamber for each phone, eliminating interference. Finish: oak (DO) or mahogany (DM), bronzed throat \$4.85

Satin black finish all over, nickel-plated fittings. (DB) \$3.85

SPIROLA SIMPLEX—For use with Baldwin or other unit. Oak (SO), mahogany (SM) and black (SB) finishes, same prices as DUPEX.

At dealers or postpaid (C. O. D. if preferred). If desired we will send in holiday packing direct to recipient, carefully following your instructions. DEALERS! We can fill holiday rush orders!

L. H. DONNELL MFG. CO., DEPT. B, BOX 70, ANN ARBOR, MICH.



Remote Control a Future Use of Radio

As we listen in on our little receiving sets we think that radio is a great thing, and one deserving of much attention. But yet, do we ever consider the many other uses that radio waves may be put to beside that of broadcasting intelligence and music? Remote control of mechanism is also possible with these very same waves, says "The Globe," New York.

With the development of amplifiers there has come the increasing possibility of using radio to control the operation of any machinery or motion at a distance, by use of a relay or switch connected to special radio receiving apparatus. In order to accomplish this, signals are transmitted by radio, and are received by a receiving station employing a very sensitive amplifier and specially designed relay device. This relay is then connected to such mechanism as it is desired to operate at the receiving station. Such mechanism can be an electric light, an electric bell, the control lever of an airplane, the switch of an electric power line, or, in fact, most any mechanical or electrical device. A disadvantage of radio control is that the receiving apparatus must be in continuous operation, with consequent consumption of power from the batteries or generator which supplies current to the receiving set. For certain purposes, however, this is not too great an expense to keep the use of distant control by radio from being feasible. The use of radio in this way is being considered by a number of electric power companies for operating switches at distant power plants or stations.

At one of the recent manoeuvres of our fleet a battleship without a soul aboard, equipped entirely for radio control, was sent out to sea, and acted as an effective moving target for our gunners on other ships.

The Voice Amplifier

As it is becoming popular to broadcast events which take place miles away from the broadcasting station proper, it has become necessary to make use of a "voice amplifier." This device enables the reproduction at the station of sounds picked up a great distance away, without the loss of clearness or intensity at the broadcasting transmitter.

Subscribe for RADIO WORLD. \$6.00 a year, \$3.00 six months, \$1.50 three months.

Attention, Newsdealers

You should keep a good supply of back numbers of RADIO WORLD on hand all the time. It has been the experience of many dealers that a purchaser of RADIO WORLD for the first time will almost immediately want the back numbers, some of which are already out of print and some of which are difficult to get. THE PUBLISHER WILL FURNISH BACK NUMBERS TO DEALERS DIRECT OR THROUGH THE AMERICAN NEWS CO. AND ITS BRANCHES. Dealers should hold their unsold copies for a reasonable length of time. RADIO WORLD of October 28 contained a full page of contents of back numbers to that date. 15 cents per copy; any seven numbers for \$1.00. RADIO WORLD, 143 Broadway, New York.

COMPLETE YOUR FILE OF RADIO WORLD

Copies of Radio World No. 1

If you did not get a copy of Radio World No. 1 send us \$6.00 and we will send you the paper for one year, and start it with our first issue, which will be mailed you as soon as possible after receipt of order. (Adv.)

Those Broken and Burned-Out VACUUM TUBES CAN BE REPAIRED



and Guaranteed Too!

If your dealer does not know, send direct to us.

Harvard Radio Laboratories
165 HIGH STREET BOSTON, MASS.
Tubes returned Parcel Post, C.O.D.

AMERICAN RADIO-STORES

SPECIAL

SPECIAL

TUBE SET

- 1 Rheostat
- 1 W. D. 11 Socket
- 1 W. D. 11 Tube
- 1 Grid Leak Condenser
- 1 "B" Battery, 22½ volts
- 1 "A" Battery, dry cell
- 1 Variocoupler
- 1 "23" Plate Condenser
- Wire for Hook Up Free

\$10.95

Complete

CRYSTAL SET

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RADIO WORLD

(Trade Mark)

ILLUSTRATED. WEEKLY

How Clemenceau's Speeches Were Amplified from a Truck



(C. Kadel & Herber.)

To insure the vast audience that wished to hear Georges Clemenceau, "the Tiger of France," the Western Electric Company used a radio speech-amplifier mounted on an automobile truck stationed outside the hall where the speech was delivered. The photograph at the left shows the amplifying truck; at right, D. C. McGalliard operating the amplifier.

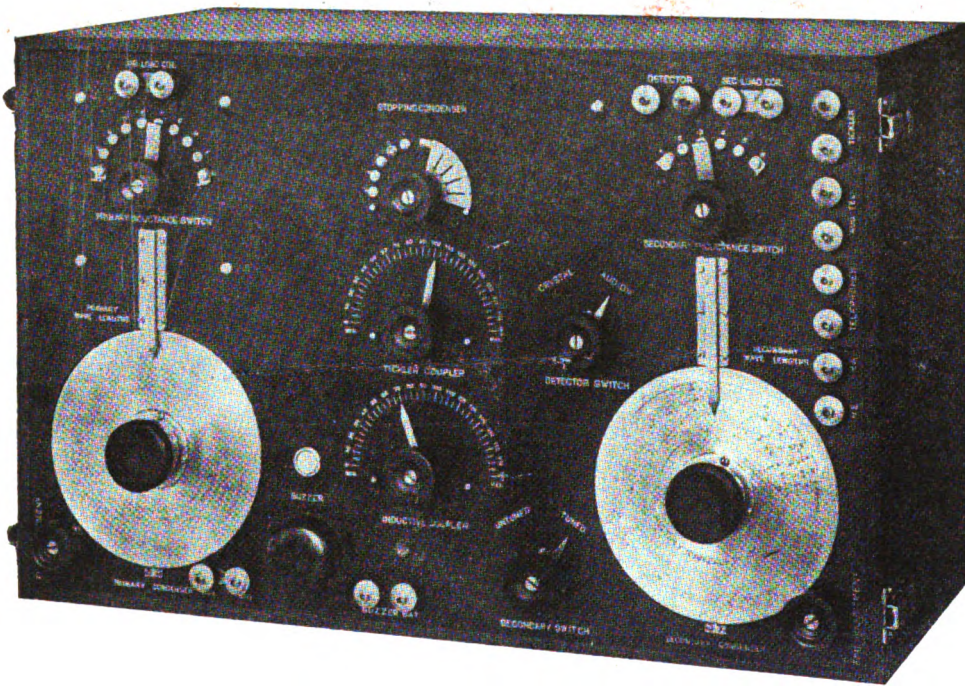
How to Put a Vernier Attachment On Your Condensers—See Page 4
NATIONAL RADIO WEEK NUMBER OUT NEXT WEEK

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VOLUME TWO OF
RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the act of March 3, 1879.]

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December 16, 1922

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They Not Only Pump Air to Deep-Sea Divers But Keep in Touch with Them by Radio



When a man goes down into the ocean's depths, today, he does not have to worry that the telephone cable will break. He gets his instructions and also talks to the ship above by radio. This photograph shows one of the pumps that supply the diver with fresh air and, alongside of it, the transmitting set that makes it possible to keep in touch with him by radio. The aerial for the diver is an insulated wire strung inside his air-cable. He uses a waterproof set strapped to his back. This set is tuned to the wave length of the ship afloat. While submarine wireless is quite an everyday affair, the communication between the diver and ship is a recent improvement.

TO the uninitiated, it is a constant source of wonder and ever increasing mystery as to how deep-sea divers receive signals while under water. Both the United States government and private individuals have made experiments which prove that radio waves transverse water with the same ease as they transverse the air. It is no mystery, then, to understand that if you use a very well-insulated wire for an aerial communication may be carried on through the medium of water. In a series of tests made by government experts, it was established that a

submarine could carry on communication with land stations and airplanes while running fully submerged. A very interesting experiment may be tried out by experimenters who would like to prove this fact. Bury a well-insulated wire in some nearby fairly large body of water, using it as an aerial, and connect up your apparatus in the ordinary way, using the same body of water as a ground. Then use this aerial to prove that it is no different from the aerial you take hours to string up over your roof. Government experts claim that better reception of signals is accom-

plished in some cases than when a regular aerial is used. In the tropics there is a noticeable decrease in atmospheric disturbances when the submerged antennae is used. The outcome of several experiments that are being carried on at the present time will be published in **RADIO WORLD** as soon as they are made public, and some startling news may be expected. The French Government also is carrying on a similar series of tests along the same idea. It is claimed that France has something of vast importance in connection with grounds, which information will be known soon.

How to Put a Vernier Attachment on Your Condensers

By Ortherus Gordon

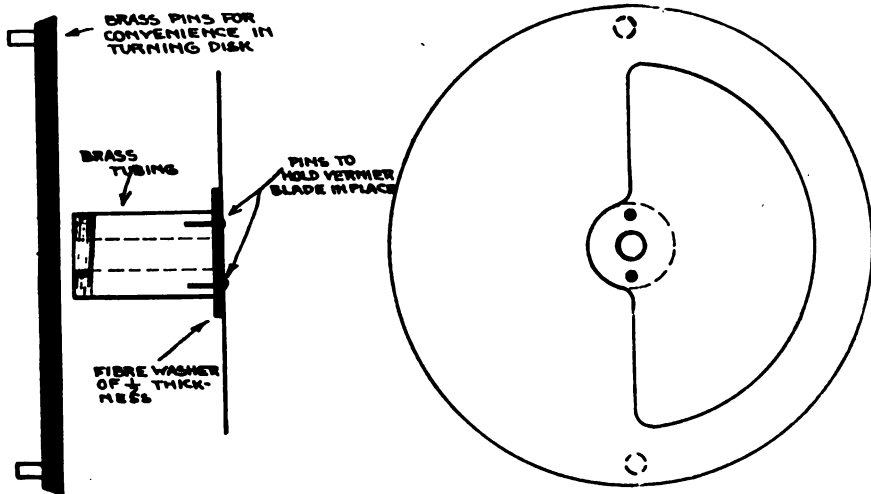


Figure 1—Home-made vernier attachment which may be applied to any standard make of variable condenser.

RIGHT on the heels of the need for sharp adjustment of radio instruments have come "vernier" attachments for almost everything. Vernier is not a Scotch word, meaning "close"; but the last name of a Frenchman—Pierre Vernier—who first felt the maddening desire for a scale which would measure the fractional parts of a whole unit. He invented what is now known as the "vernier scale." His idea was hailed as a boon by scientists. At the present day a scientific instrument which has any leaning toward accuracy cannot afford to be without a vernier attachment. In fact, some of the verniers are so minute that they carry a magnifying glass around with them for convenience in reading; otherwise the fine points would be lost to the naked eye. Applied to radio apparatus the vernier idea has given manufacturers

a chance to put out some pretty slick articles, especially in the way of variable condensers. But woe to the radio amateur who already has variable condensers without Pierre Vernier's neat device to make them discriminating and set them off! Scrapping perfectly good variables is out of the question—even if in favor of such a desirable feature as the vernier. There is only one attitude the unlucky amateur can take—look glum and stand it, unless he sees some merit in the idea that one radio amateur worked out for the benefit of his own little variable condensers. He wanted a vernier control on his condensers because he knew what close tuning meant. He couldn't afford, however, to buy new instruments. Therefore, being a radio amateur, his thoughts naturally turned toward home construction, and they weren't bent more

than a minute in that direction before he decided that what he wanted was not construction, but reconstruction. In other words, instead of building a whole new condenser he decided to build only the vernier attachment and then find some way to add it to his existing instrument. No sooner said and fretted about than, shortly afterwards, several ways were outlined in which the great idea could be worked out. A little later came definite plans. There it was—the neatest little vernier attachment you ever saw, movable and everything, which could be added to a standard

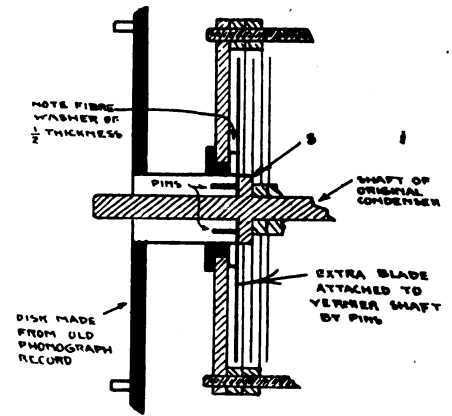


Figure 3—Assembly of the vernier unit and the standard condenser. The phonograph disc is not put on until completed instrument is mounted on panel.

condenser without danger of putting it out of commission! This article, illustrated by the sketches, tells how the amateur did it. What he wanted was an extra movable blade—not one that turned with the others, but an independent affair, which would swing off by itself when he so desired. He also wanted something that could be operated from the panel and that wouldn't be a disgrace to his bright 3-inch dial.

To fill these requirements he collected, on his workshop bench, an old phonograph-record, one fiber washer, a piece of brass tubing and two new condenser blades—one for the stator and the other for the rotor. The inside diameter of the brass tubing was slightly larger than the outside diameter of the rotor shaft, so that the tubing would fit snugly over it. With these simple parts he proceeded to make the "vernier unit."

When it was finished it looked like Figure 1. The phonograph-record had

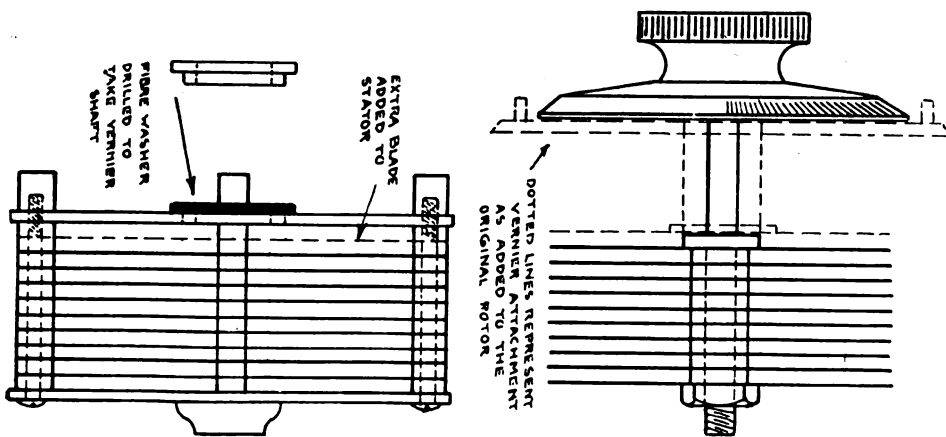


Figure 2—Vernier attachment as fitted to the rotor of the standard condenser, also the changes made in the stator of the condenser to accommodate the new unit.

Broadcasting the Yale-Harvard Game



(C. Underwood & Underwood, N. Y.)

The photograph tells the story. In the background is the soundproof booth which overlooked Yale Bowl. In the right foreground, on the overcoat of a newspaper reporter, is reproduced the device by which the cheers could be heard so plainly. Men with reproducers attached to their overcoats were scattered about the huge bowl so that any section that started cheers or songs could be immediately heard by just plugging in at the booth. From the booth the sounds were transmitted by special wire to WEA.F.

Short Waves

By John Kent

The Potentiometer's Work

THE potentiometer produces fine variations of voltage by means of a sliding contact which plays over a fixed resistance through which a constant current flows and which has a certain definite resistance. A clear idea of the potentiometer may be had by taking two circuits, an input and an output, going to and coming from the resistance. The input, which may be a source of emf (electromotive force), goes to the ends of the resistance. The output is taken from one end of the potentiometer and the sliding contact.

Ohm's law states that $E = I \times R$ (Voltage equals amperage times resistance), and since the input circuit is through the whole resistance, I remains constant. The part of the resistance between the variable contact and the end from which the output circuit is taken is variable; hence, since I is constant, in order to maintain the equality of the equation, voltage equals amperage times resistance. If the resistance changes then the voltage must change in the same direction by a proportional amount.

* * *

Try This Method

MANY amateurs like to hook up their own sets. They buy a lot of apparatus, a panel and other devices, then they solder up all the connections and are surprised and disappointed when they don't get the results they expect. Try this: Instead of going ahead and hooking up permanently at once, use some old copper wire and experiment. Then if you don't get satisfactory results, you can change your connections without feeling that you have been stung.

* * *

The Sensitive Spot

IN operating a crystal detector, it often occurs that a sensitive spot usually is lost with the least jar or shaking of the table. To keep a proper balance, adjust your crystal detector to the sensitive spot of reception. Drop some melted wax from the top of a battery onto the covering of the crystal detector. This means that the sensitive spot of the crystal must be covered. The detector will then be grease proof and cannot be knocked out of adjustment.

(Continued from preceding page)

been cut down until it was half an inch larger all around than the dial. The hole in its center had been enlarged and the threaded end of the brass tubing fitted snugly into it. On the other end of the brass tubing, fastened to it by pins riveted over, was a condenser blade. The whole unit, plus a fiber washer, as shown, was slid over the shaft of the rotor so that the new blade fitted closely against the shoulder of the shaft, as shown in the upper part of Figure 2. The "vernier unit" is drawn in with dotted lines.

The shoulder mentioned (S) should be filed, or machined, so that it is the same thickness as the washers which separate the blades, otherwise the corresponding spaces in the stator will have to be widened so that the vernier blade will not touch any of the stationary blades.

In preparing the stator so that it will accommodate the extra "unit" it was only necessary to add a blade, as indicated by the dotted line in the lower part of Figure 2. Mr. Amateur also found it necessary to enlarge the fiber bushing in the cover of the stator so that it would take the increased diameter of the brass tubing. This is also indicated in Figure 2.

The vernier unit made and the stator prepared, everything was ready for assembling. Figure 3 gives an idea of how the condenser was put together again. A fiber washer, just one-half

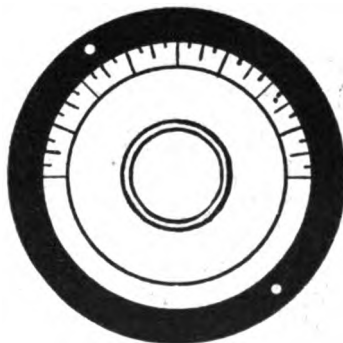


Figure 4—How the disc of the vernier attachment and the dial of the regular instrument look on the panel. The disc and the dial are not put on until the instrument is set up on the panel.

as thick as the space washers used in the instrument, must be inserted between the vernier blade and the inside of the stator cover, as shown in the sketch. The disc and the dial are not put on until the instrument is set up on the panel. Then both disc and dial go on outside, so that it appears as in Figure 4.

The reconstructed instrument is a beauty. The pins, which are sunk into the phonograph disc, help in the adjustment because, actuated by them, the vernier plate may be turned by the idle fingers while the other movable plates are being turned by the thumb and forefingers.

No dimensions are given in this article. It is the idea itself that is the more important.

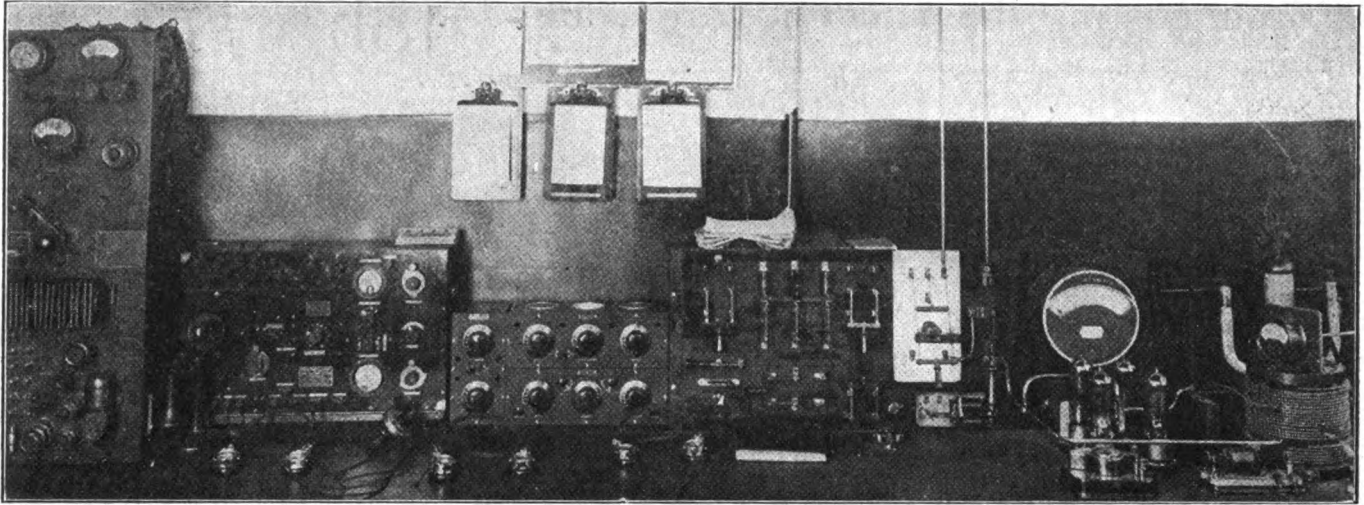


Figure 1—General arrangement of the receiving and sending apparatus of 1XM. On the extreme left is shown the 200-watt, quenched-spark transmitter used only as an emergency set and which has a normal working range of 500 miles.

1XM — A Station That Claims High Radio Honors

By C. White, Consulting Engineer

THE Massachusetts Institute of Technology's radio station 1XM, operated by the M. I. T. Radio Society, is one of the most remarkable amateur radio installations in the United States. Its unique design and high operating-efficiency place it in a class by itself. Signals transmitted by this station have been heard many times in Honolulu and very often in Great Britain and Europe. Such results are made possible only by the most careful technical attention to small-design problems, which actually determine the success of a station.

Figure 1 illustrates the general arrangement of the sending and receiv-

ing apparatus. On the extreme left is shown a 200-watt quenched-spark transmitter used only as an emergency set, and which has a normal working range of 500 miles. Next to it is a Signal Corps type of radiophone transmitter and receiver. This outfit is often used for reception. At times, it is employed to broadcast local phone-messages, but its use in this particular field is limited by the local broadcasting stations. The next group of apparatus is an Amrad short-wave receiver, using radio- and audio-frequency amplification. The switch-board panel is unique in operation. It effectively controls the motor-generators and the connections for modulation on the tube transmitter shown on the right.

This transmitter has a normal working range from 3,000 to 6,000 miles! It is creating much attention among radio amateurs. This feat of opera-

tion is really worthy of nation-wide comment, since with only four 50-watt tubes an amateur station can send at a range equal to that of a commercial station using *many times* the power.

For straight C-W, 1000 volts is impressed on the plate circuit of the tubes and the modulation is accomplished by a key through relays on the grid circuit. The carrying power of the 200-meter wave is enormous. The 1000 volts, D-C, for the plate supply, is obtained by a mercury arc rectifier. For work at shorter ranges, the plate-supply voltage is taken directly from the 500-cycle motor-generator. By this method, a characteristic pitch note is produced. Those amateurs who have copied 1XM signals will testify as to the quality of this note.

Figure 3 shows a close-up of the transmitter showing the control panel, key, and relays, tubes, meters, transformers and filters (under table), tun-

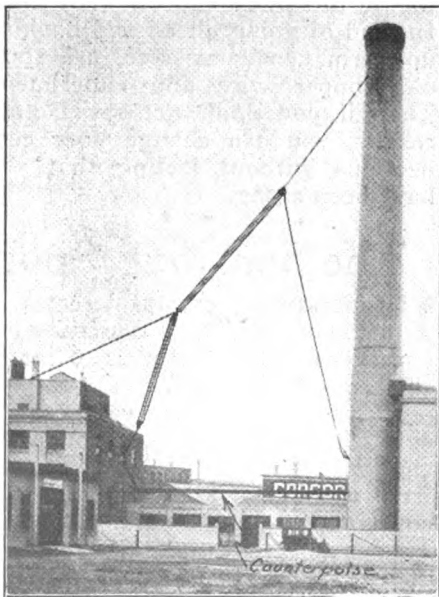


Figure 2—Showing the counterpoise which is used for a ground. The low capacity of this system causes a very sharp wave to be radiated.

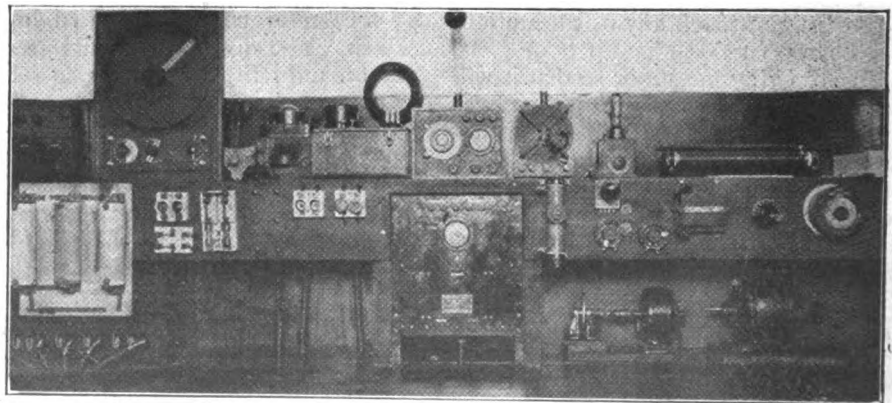


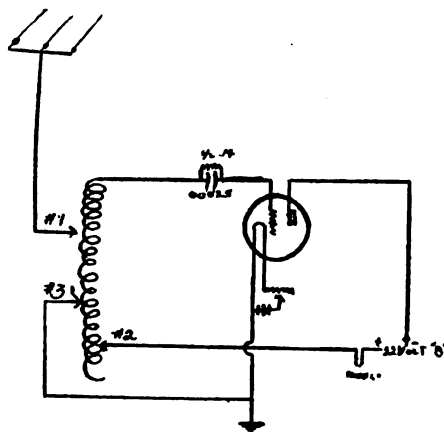
Figure 3—Close-up of the transmitter showing the control panel, key, and relays, tubes, meters, transformers and tuning coil, also the mercury arc-rectifier. The radiating equipment consists of four wire cage-aerials one hundred feet long.

Try This New Tuning-Coil Hook-up

By Robert L. Dougherty

IN these days, when all you hear talked about in radio is superregeneration, heterodyne, and two-variometer circuits, other elements are overlooked. If one refers to a tuning coil, he is looked at in surprise and, maybe, disgust. But if the average amateur were to be told that he could get regeneration on a three-slide tuning coil, he would turn from disgust to wonder. However, this is just what I am going to try to prove to you in this hook-up.

For the person who is inclined to experiment, or the radioist who would like to have a bulb set but is hindered by lack of ready funds, the little circuit published herewith will prove a pleasant surprise. It is not without its merits. Of course, the results will not be equal to those of a three-unit regenerative set, yet it is surprising what may be accomplished with it after one has become accustomed to its manipulation.



Schematic diagram of hook-up for a three-slide regenerative set. If you happen to have a variable condenser around, you can insert it in the aerial lead. This will make the set more selective, although it is not absolutely necessary for proper manipulation. The new W-D 11 works admirably with this hook-up. It needs only a single dry-cell to operate at its highest efficiency. Long distances have been worked with this set. See what you can do with it—you sceptics and hook-up hounds.

The apparatus needed is a three-slide tuner, a bulb, socket, rheostat, A and B batteries, and phones. When hooked up according to the illustration, and slider No. 1 is moved back and forth—that is, the one controlling the wave length—a sound similar to the “frying noise” in a regular regenerative set will be heard. If this noise is not heard, you will have to adjust slider No. 3. The best position for this slider will generally be found about three fourths of the way along the coil in approximately the same position as that accompanied in the illustration. Slider No. 2 should be used after the signals are heard; but it will be found that it will work best when kept below the position of slider No. 3. After slider No. 3 has been adjusted, it will not be necessary to move it, as all the tuning is now done with Nos. 1 and 2. A variable grid leak is of great assistance in connection with this hookup.

Radio Relays to Remember

By George W. May, R. E.

Topography of Country Effects Range

ONE important element in radio is “the lay of the land”—the topography of the country. It has a great deal to do with the effective range of both the receiving and the transmitting set. Outfits that are exactly alike in their make-up and located only a few hundred feet away, have been known to have widely different ranges. Many times this has been experienced by the average radioman and, some-

times, found hard to explain; for conditions seem to be apparently the same, but close observations will bring to light some little factors that tend to reduce or increase the range of the set.

Many advocates of the open air who take their receiving sets with them, especially when situated in a depression between mountains, may be disappointed when they get poor results or even no results. It is a known fact that radio waves do not descend to any extent into valleys

surrounded by high, steep mountains. If there is a considerable space, this does not hold true; for in this case the radio waves follow more readily the exact contour of the earth's surface. When the mountains are close together, the waves seem to jump from peak to peak rather than descend between them. If you are in the mountains, try and erect your aerial at as high a point as possible. Maybe you happen to be in a location where your signals are poor. Dry, arid land surrounding a radio station also tends to reduce its range, while expanses of water will tend to increase the range. Surroundings of metal often decrease the range. High, steel buildings absorb waves. Whenever you are surrounded by buildings, it is well to suspend your aerial as high as possible.

* * *

Locating the Aerial

WITH the best of conditions, the aerial can be run from one end to the other of the house, inside as well as on the roof, although the outside aerial is recommended as superior to any other. The greater the height at which it can be suspended has some effect on the ability of catching wave trains or signals. We must remember that radio waves go through everything. The plaster on the walls of a house have no effect on radio waves and offer no obstruction to them whatsoever.

(Continued from preceding page)

The radiating equipment consists of four wire cage-aerials 100 feet long, the upper end of the antennae is attached to a 150-foot stack. A counterpoise is used for a ground, and the low capacity of this system causes a very sharp wave to be radiated.

Figure 3 also shows the general appearance of the system and gives a fair conception of the magnitude. The efficiency of the cage-type aerial, as proved by actual tests at this station, is very high.

Aside from the ordinary routine relay of messages, the society conducts an active research and testing cam-

paign. Many of the experiments carried out at this station are of an extreme technical nature. The result of tireless effort has been the development of many new and unique hook-ups.

Figure 3 gives a general idea of the nature of the experimental bench. The ease with which any voltage, A-C or D-C, may be obtained makes it quite easy to conduct any type of test work with the minimum amount of wiring. By diligent application, due to well-founded technical training and experience, this station is maintained and operated at maximum efficiency. New apparatus is constantly being added. An 8-tube superheterodyne was contemplated recently.

Secretary Denby Rates Radio High in Government Work

Naval Service Earns Over Two Million Dollars in Six Years. Aids Merchant Marine, Press, and Governmental Service

By Carl H. Butman

WASHINGTON, D. C. — Radio in the United States Navy, taken solely as a business proposition, is a money maker for the government. During the past six years, \$2,222,956 has been deposited in the United States Treasury out of a far greater amount collected for the transmission of commercial radio messages. The collections during the last fiscal year totaled \$627,904, out of which \$369,735 was deposited in the treasury, Secretary Edwin Denby states in his annual report. Collections in the year 1922-23 showed a falling off of such receipts due to the fact that many merchant ships were laid up, while savings also decreased because all governmental departments were endeavoring to economize in communication expenses.

Governmental traffic handled by Naval Radio stations, other than Naval communications, would have cost \$1,080,800 at commercial rates and was less than a third of the traffic handled the preceding year.

This amount added to the commercial receipts would have brought the year's business in Naval radio traffic to \$1,708,704 in receipts and savings. When it is considered that the Navy in no way competes with commercial stations, but handles messages only where and when commercial stations are not available, the aid rendered in this auxiliary radio work is better appreciated.

For the Merchant Marine alone the Naval Communication Service handled 3,749,483 words during the past year and forwarded press matter to the number of 1,012,279 words.

As a new departure in the interests of economy, an attempt was made, last summer, to employ the Naval radio circuits exclusively for transcontinental traffic, but static interfered in May and June so severely that delays were encountered. Fairly satisfactory results were obtained from transpacific circuits, but the completion of the new high-powered set at Guam is required for efficiency in that circuit. Headquarters of the

European communication service were established at Paris, and of the Asiatic Division at Cavite. In Europe, the Naval Service co-operated with the American Relief Administration and the European Chile Fund. During the Limitation of Arms Conference, two Pacific circuits were set up for the Japanese Government, one of which has been continued for business purposes between the United States and Japanese Governments.

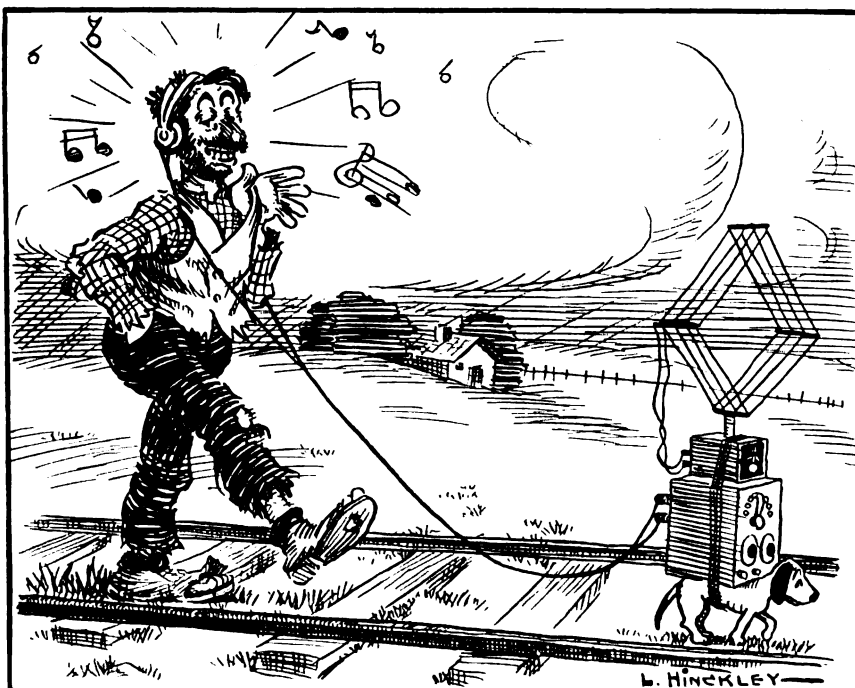
A service rendered by the Navy, but little known, is in receiving S O S calls, which in the winter average thirty a month on the coast between Maine and Cape Hatteras.

Sixteen of the Navy's shore radio stations were closed as "not necessary in accordance with the approved national policies," during the past twelve months. Twelve of the fifty-six radio compass stations, operated by the Navy free for the benefit of merchant vessels lost in fog or without efficient compasses, may have to be eliminated due to lack of personnel, it is stated by Secretary Denby. He explains that the furnishing of compass bearings to vessels off the Coasts and on the Great Lakes is of great value to shipping interests. Some stations handle as many as fifty calls a day in bad weather.

At present these stations operate on an 800-meter wave and are efficient for a range up to 150 miles, but a new long-wave radio compass is being developed which will operate on waves between 500 and 2,500 meters. This would increase the distance of audibility up to about 1,000 miles. In addition, it is expected that this instrument will have great value in time of war.

A new Naval radio-set for use in spotting gun fire was tested out at the Anacostia Naval Air Station recently. After a fifteen-hour flight-test with the manufacturer's model of the SE-1375 spotting plane set, the model was returned to the manufacturers as a guide for production of a number of sets. It is reported to have stood up well under the test and, with the exception of a few minor changes, to have given very satisfactory results.

Roughing It By Radio



(Cartoon by Lawrence B. Hinckley)

Accurate Tuning with the Capacity Switch

By Donald Van Wyck

THE desire to place all controlling elements of a cabinet radio-receiving set on the outside of the panel has brought into general use the series parallel-switch. The suggestion that additional instruments be provided for the receiving set in order to increase selectivity is usually accompanied by groans from the man who pays the bills. But when incorporated in the outfit they may be rearranged to advantage.

The rearrangement consists chiefly in reconnecting the primary condenser so that its sphere of usefulness is considerably increased. By the shifting of a few wires and the addition of a single-switch knob,

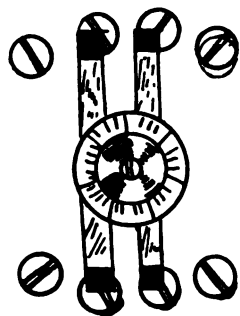


Figure 1. How the switch will look when completed and laid out on the panel.

the goal is achieved. The effect on the radio enthusiast when another switch is added depends entirely on his status in the radio field. The newcomer who scarcely knows the controls feels that he never will be able to tune in the set properly.

The amateur out in the country where open space is not at a premium generally erects an aerial of 200 feet or more. No doubt he believes that a long aerial will produce signals of greater strength; but he fails to consider that radio-phone broadcasting, in which he is most interested, is sent on a wave of 360 or 400 meters, whereas his aerial has a fundamental wavelength of, maybe, 450 meters or more, or is probably very short.

With this in view, the only possible move is to insert some capacity switch and capacity in series, or parallel, with the aerial. The aerial is like a huge conductor with the earth as the other conductor and the air between as an insulator, or dielectric. Thus, by placing a condenser in series with the aerial, it will produce an effect similar to two condensers in series.

The primary condenser of radio-receiving sets is usually connected



Figure 2—A completed knob made from a wooden spool.

in series with either the ground or the antenna lead. When it is in this position, it enables the desired fine tuning, but does so by simultaneously shortening the natural period of the antenna system comprising antenna and ground leads and the primary inductance.

While this reducing is permissible with the antenna and variable condensers in use, it nevertheless lowers the effective tuning of the set as a whole. The series variable condenser makes the tuning of the receiving set more difficult.

With the variable condenser placed in series with the primary inductance, tuning may be said to be more complex because the condenser unit must be set within certain limits depending on the wave length to be received. This with the primary fine and coarse switches makes three controls which must be set in correct relation to one another. When the primary condenser is connected in parallel to the primary coil the condenser dial may remain at zero during the preliminary tuning with the switches, and, later, may be utilized as a corrective tuning measure. This latter arrangement also increases the wave length to which apparatus may be tuned.

There is no doubt that both series and parallel switches have their advantage, the former for the lower and the latter for the longer wavelengths possible with each particular outfit. This series parallel-switch then answers the purpose. This switch has puzzled many radio amateurs who are puzzled when they realize its complications. The double switch-arm has also served to confuse the casual inspector because he labors under the impression that it is necessary to bring flexible leads to each of these metal strips or else he thought that both arms were separate pieces of sheet metal. Yet the series parallel-switch is nothing more than two separate contact arms. It is simpler to construct your own capacity switch than to go out and purchase one. The parts of a capacity

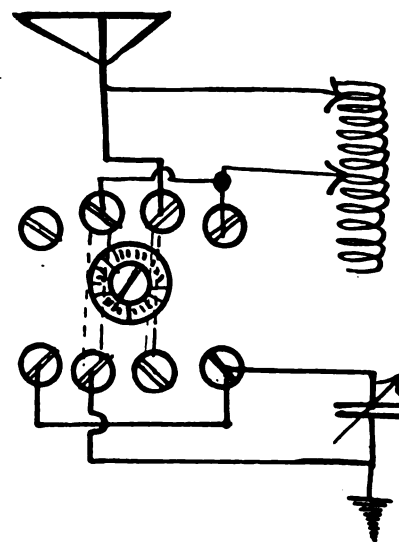


Figure 3—Schematic diagram showing how to hook-up apparatus for a series-parallel switch.

switch consist of spring sheet-brass, a switch knob, and 8 contact points. The knob may be made at home from a piece of hard wood or hard rubber, or it may be made from a large-size thread spool sawed radially in half.

Two contact arms are cut from the sheet brass in the shape shown. The distance from end to end may not exceed 3 inches, and may be less, depending on the amount of available space. From each end, bend the strip at right angles about $\frac{1}{8}$ of an inch from the end. The two metal arms are screwed to the knob on the large, or under, side by small wood screws. The spacing between the two blades is such that there is at least $\frac{1}{8}$ of an inch to separate the two inside edges, and that the cut-out portions at the center may not touch the machine screw which holds the knob in place. The eight contact points for the switch are placed four on each side of the center along the arc traversed by the ends of the switch arms. The spacing between the points is determined by the switch blades and should be such that the blades rest squarely upon the faces of the contacts in each position. The contact points should be neatly placed with reference to the center line of the switch knob so that the appearance of the panel may be enhanced rather than spoiled. The accompanying diagram shows the wiring circuit of the capacity switch. The condenser for this purpose should be about 43 plates, although a smaller size will do.

In general, the switch is placed in the series position for tuning in short wave-lengths and in parallel when tuning in the longer wave-lengths. Usually this switch is used with the honeycomb type receivers, although it may be used with most any type set made to-day.

The Radio Primer

For Thousands of Beginners Who
Are Coming into Radio Circles

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

HOW are electric currents produced?

Electric currents are produced in several ways, the two most important being by electromagnetic induction (magneto and dynamo), and by chemical action. Electric currents are moving electrons. These electrons move along a wire, thus producing the current with which we are most familiar. They may also move

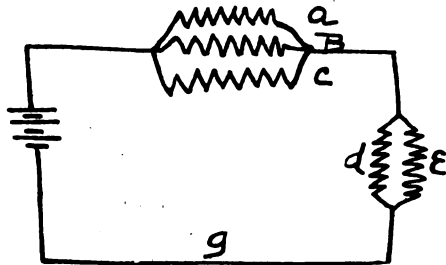


Figure 2—The sum of the currents passing through a, b, and c is equal to the sum of the currents passing through d and e. Each sum is equal to the current passing through any part of the single wire, as at g.

unattached through space from one point to another. This is what happens when a flash of lightning occurs. It is what occurs in the X-ray bulb and in vacuum tubes used in radiotelegraphy. They may move also through a liquid or gas. This is what happens when we use an electric current to electroplate objects—as, for instance, silver-plating spoons.

* * *

What has a circuit to do with conductors?

A circuit is a number of conductors arranged so that they are connected electrically. A current of electricity will flow through a circuit when some source of electric current is attached to the circuit. When a current is flowing in a circuit the current is of equal strength in all parts of the circuit, provided the circuit consists of only one path.

* * *

Will the current be the same when flowing through the circuit, as shown in Figure 1?

The current going through the resistance—R—the current going through the telephone receiver, and the current going through the telephone

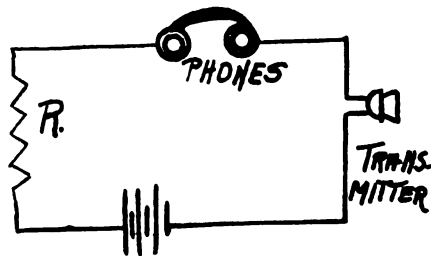


Figure 1—Diagram of electric circuit with resistance, telephones, and transmitter in the circuit. The electric current is equal in each unit.

transmitter are equal. If the circuit is divided then the sum of the currents passing through the divisions are equal.

* * *

How are the currents in Figure 2 divided?

The sum of the currents passing through A, B and C are equal to the sum of the currents passing through D and E. Each sum, of course, is equal to the current passing through any part of the single wire, as at G.

* * *

Will an electric current produce magnetism?

A current is recognized by the effect it produces. An electric current will cause magnetism, give rise to heat, cause chemical action, and may be made to operate by using the magnetic effect.

* * *

What have we learned?

We have learned that magnetism is produced by an electric current; that a moving electron is surrounded by a magnetic field; that the magnetic field is made up of magnetic lines of force; that the direction of the magnetic lines of force is the direction along which the north pole of the magnet is urged.

* * *

What is the magnetic circuit?

The magnetic circuit is the path which the magnetic lines of force follow in going from the north to the south pole of the magnet. It has been found that iron is the only perfect conductor of these magnetic lines of force.

* * *

What does iron contain?

Iron is said to have permeability be-

How to Treat Phones

By John Kent

IF the owners of receiving sets would realize what delicate instruments the headphones are, we wouldn't hear so many complaints that they are not getting as good results as they did the first few weeks their set was in operation.

You wouldn't expect your ears to be as perfect as they are if you gave them half the abuse that the average headphone gets during its life.

Here are some of the things you shouldn't do to a pair of phones:

Don't open the phones (take off the ear caps), or let anybody else do so unless you know just what you are about.

Don't tap on the diaphragms. They are easily bent and dented.

Don't drop them. They may not break; but any jar lessens the magnetism in the permanent magnets, thereby lessening their sensitiveness.

Don't pull the phones out by the cord. It is only tinsel.

Don't set them in a place where they are liable to get damp or wet.

DON'T TEST BATTERIES with a pair of good phones. You are liable to burn them out. Most phones are wound with No. 40 wire which is as fine as a hair and is not meant to stand heavy voltages.

Aerial Connections

By George W. May, R. E.

LEAD-IN wires to the receiver may be connected to the end of the aerial or to the center. If connected at the end, it then becomes what is known as an inverted aerial. If connected at the center of the aerial it becomes a T aerial. This type aerial has a tendency to reduce the wave length approximately one-half that of the inverted L aerial. In case the aerial is constructed on the roof or outside the house, it is advisable to carefully insulate the lead-in wire by running a porcelain tube through the window casing or some other part of the house. This is not absolutely necessary in dry weather; but when the wood gets wet, it becomes a good conductor and may cause trouble as a result of electrical leakage through moisture.

cause it will carry lines of force. Different kinds of iron have different degrees of permeability; therefore, certain kinds of iron will carry more magnetic lines of force than others. Wrought iron has a very large permeability. All other substances are poor conductors of magnetic lines of force.

National Radio Week—Dec. 23 to 30

Are You Ready for this Big Event?

NEXT WEEK, beginning at dawn on Saturday, December 23, and ending at midnight on Saturday, December 30, is National Radio Week.

It is the first National Radio Week in the history of this important and wonderful new science.

It will be celebrated all over the United States, Canada, and Cuba.

It comes at a time of the year—Christmas and New Year's—when all the civilized world is alive with gaiety—filled with the desire to do good and bring cheer to others.

And, this year, in no other way can the people give or receive cheer so well as through radio.

It is new! You who are dyed-in-the-wool fans know its joys and surprises. Those yet uninitiated are anxious to know—to "listen in."

It is estimated that there are six million radio fans in the United States. How many others want to be fans?

You can help them to become fans. By doing so, you help radio.

What can you do? you ask.

Hold block parties—the good old-fashioned kind—substituting radiophone music for bands.

Have radio parties—invite all your friends—and get the "kick" out of the air.

If there are any radio "knockers," prove to them that radio has come to stay.

Improve your set. See what distance you can get out

of it and communicate with everybody you hear at any great distance.

Boost radio to your friends who have no sets.

If you have a radiophone transmitter, coöperate with the neighbors by transmitting for their benefit. Get acquainted with them. Help them to become fans.

If you have a spark station, try to help out by transmitting only when necessary. Cut out talking to the fellow on the next block just to hear your spark working.

If you can play any instrument—outside of a receiving set, of course—apply to your nearest broadcasting station and offer your services. They will be glad to have you.

You Old Timers! Get acquainted with the little fellows. Show them what they can do with a little time and patience. You had to be taught first.

You Experimenters! Try out new ideas. Everybody is looking for them. And you may strike something big.

See if the pastor of your local church wouldn't like to have you install your set for a couple of nights and give small radio recitals from the broadcasting stations.

Interest the merchants in your locality. Maybe they don't realize that they are letting a good thing get by them.

In any event, celebrate National Radio Week and be a National Radio Week booster!

Radio Rules for the Day, Week and Month

MANY who own radio sets believe that once the sets are in working order and bring in signals, the only thing left to do is to watch the batteries. A radio set isn't like an egg—it improves with age. A radio set needs looking over once in a while. Dust is an enemy of radio, because it generally forms a short circuit.

Aboard ship there are certain things that are part of the daily routine that must be done. They serve to illustrate the care that should be taken with a radio set. Here is a set of rules to follow:

Daily

1. Wipe off all instruments carefully with chamois skin or a very soft cloth.

2. Examine contacts of all receiving circuits and remove dirt and corrosion.

3. If using crystal detector, clean by immersing in bisulphide of carbon.

4. Clean spark-gap and transmitting apparatus. Inspect all transmission leads both on the back and front of board.

Weekly

1. Rub all moving parts lightly with vaseline. Blow out variable

condensers to remove particles of dust that may collect between plates.

2. Clean transmitting condensers and inspect the connections.

3. Clean key contacts and dress down with a light filing, if found to be pitted.

4. Rub the antennae switch blades lightly and see that the clamps are making good contact.

Monthly

1. Test and charge storage batteries. See that the solution is clean by use of hydrometer.

2. Make note of any deviation in the operation of any of the instruments and file same with the head of the department.

3. Inspect antenna connections and wipe off all insulators with stiff brush dipped in carbon bisulphide.

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NEW YORK

Be a National Radio Week Booster

Factors That Effect the Range of Radio Transmission

By *B. R. Cummins*

Radio Engineer, General Electric Company.

ONE of the questions almost invariably asked regarding a radio transmitter is, "How far will it send?" This question is justifiable. It has become standard practice with builders of radio-transmitting equipment to carefully specify the conditions under which any guaranteed ranges can be made. Even then it is seldom that a conservative company will guarantee transmission at all times.

In the first place, a radio transmitter will transmit several times as far at night as in daylight; it will transmit farther on a dark night than on a moonlight night. This is due to the fact that sunlight and moonlight causes an ionization of the atmosphere, which results in much greater losses than occur when such ionization is not present. The greatest ranges are obtained when the atmosphere between the transmitting and receiving stations is most nearly a perfect insulator.

The range depends on the nature of the territory lying between the transmitting and receiving stations, the greatest ranges for a given power usually being obtained over water. Any metal, particularly iron or steel, lying between the stations will cause a loss of signal strength. Such metal may either be in the form of artificial structures such as buildings or building frameworks, or may be in the form of ore deposits. Some sections of the country are noted for their poor location for radio reception, and the cause of this can usually be traced to this reason.

In many places it is possible to receive effectively from all directions but one, and it is usually found that in this direction a metallic structure, or a metal deposit, is responsible for the lack of reception.

A radio station which can be depended upon for reliable communication, through the winter months, for a given range can only work effectively during the summer months over a fraction of this range, assuming that the power of the transmitter is not increased. This is not due to any diminution of signal strength, but to the percentage presence of so-called static disturbances during the summer months. Static disturbances, which result in cracking, hissing, or grinding noises

in the receiver head-phones—frequently sufficient to make this radio signal unintelligible—have been the subject of investigation and analysis for many years, during which time many attempts have been made to determine their origin and means for preventing their detrimental effect on radio reception. While some very special receiving-equipment and antenna systems have been devised to increase the ratio of signal strength to static strength (the so-called "signal-static ratio"), the most positive way of overcoming static seems to lie in transmitting sufficient power to make the radio signals intelligible even in the presence of static. This was the procedure followed, for example, at the Lafayette Station in Bordeaux, France, built by the United States Navy Department during the World War, for reliable communication if transatlantic cables were cut by the enemy. This station has a capacity of 1,200 kilowatts.

The range depends, also, on the type of receiving equipment which is used and the ability of the operator to use his equipment to the best advantage. A receiver with one or more stages of amplification will receive stations which cannot be heard without such amplification. There is a limit to the extent to which amplification can be used. It does not serve, for example, to overcome static disturbances, because such disturbances are amplified to the same extent as the radio signal itself, leaving the signal-static ratio the same and, therefore, not making the message any more intelligible.

The wave length at which transmission is carried on is also an important factor in the range of a given power. Energy radiated at short wave-lengths is absorbed to a much greater extent than energy at longer wave-lengths. For this reason, very long wave-lengths, comparatively, are usually used for a long distance such as transoceanic communication.

The personal equation of the receiving operator is of importance. Signals which are quite readable to some operators are absolutely unintelligible to others.

The number of stations working in close proximity also decrease ranges which would otherwise be

obtainable; for many signals which have sufficient strength to be easily interpreted are made unreadable by interference caused by other stations.

In general, therefore, in specifying the range of a radio transmitter, it is necessary to specify whether transmission will be carried on by day or night; in winter or summer; the type of receiver, and the amount of amplification; the nature of the country lying between the transmitting and receiving stations; whether or not uninterrupted communication is required or whether so-called "deferred service" is satisfactory; the wave length on which transmission will be carried on; the kind of transmission desired, that is, telephony, continuous wave telegraphy or interrupted continuous wave telegraphy; the vicinity in which the transmitter will be located with respect to other transmitters; and, lastly, but by no means of least importance, whether or not the range specified, even after the foregoing conditions are known, shall be a conservative one or the maximum expected.

It is impossible, in a very brief discussion, to analyze more fully the various factors entering into range considerations which have been enumerated; but the mere mentioning of the existence of these factors should be sufficient to make all of us realize that a brief statement to the effect that a radio transmitter has a range of, say, 500 miles, is practically meaningless.

This does not mean that reliable communication cannot be carried on over given distances, for a careful consideration of all conditions will permit satisfactory equipment being installed. Such equipment will frequently transmit distances far greater than the rated range of the set. For example, a transmitter manufactured by the General Electric Company which is rated, under definite conditions, at 175 miles, has recently communicated by telephone over a distance of 4,050 miles.

In view of the foregoing, anyone concerned in the range of radio stations should assure himself of the conditions under which the transmission has been, or is to be carried on, before arriving at any definite conclusions.

Remote Logging Camps on Pacific Coast Get News Daily by Radio

WASHINGTON, D. C.—The spirit and morale of the logger, situated far within the fastnesses of the great Pacific Coast forests, has been materially improved since the installation of modern radio-receiving sets in logging camps. Many of the western newspaper broadcasts carry the daily news of the world into the heart of our lumbering districts where their daily papers do not reach and the telephone is not available.

Instead of waiting a month to learn of some event in the outside world, the logger gets press dispatches daily. Thanks to radio, he is no longer a backwoodsman, in the old sense of the word. He received the news referring to the President's message on the Ship Subsidy Bill and the final score of the Army and Navy football game almost as soon as the city radio fan.

Forest Workers Get Forty Stations

"With modern apparatus of the vacuum tube type, the logger can tune in on no less than forty broadcasting stations from Calgary to Los Angeles, and from Denver to Portland," according to the National Lumber Manufacturer's Association, whose research department has been devoting considerable time to the use of radio. Up in the forest-clad hills of Oregon, far from the railroad and mail routes, a digest of the daily news or a concert from San Francisco, "listens pretty good," as one logger put it.

The logger's radio set has a more important use than its recreational value, however; it is a business asset in the remaining big timber stands of the country. Through the aid of the fleet of airplanes, assigned to forest-fire observation by Major General Patrick, of the Army Air Service, each of which is equipped with sending and receiving radio, conflagrations in the districts patrolled have lessened notably.

Co-operating with federal, state, and private forest-protection, high-flying airplanes cover more territory in a day than a forest ranger on foot could cover in three months. "Spotting" a fire, or smoke, the plane hovers over the site while the observer plots the location on a map and then broadcasts a fire warning giving the location. Station operators equipped with receiving apparatus catch the air scout's message and relay it, usually by private phone lines, to the ranger or patrol station nearest the fire, and within a few minutes detachments of skilled fire-fighters are enroute to the section in danger. Since speed is so essential in

By Carl B. Hawes



(Photo by National Lumber Mfrs. Assn.) Loggers of to-day are enjoying radio as much as city fans. "High-Climbers" crawl to the upper branches of trees 300 feet high to ring the aeriels, carrying axes to trim branches as well as a line by which the aerial is hoisted.

fighting forest fires, first the airplane, and now radio, won the respect of the owners and operators of timber lands.

Radio also serves to anticipate the approach of lightning storms and to approximate their intensity by means of a static barrage which might be called a "radio lightning recorder." This consists, the Lumber Association states, of a movable loop-antenna which rotates about a vertical shaft, not unlike a radio compass. By turning the loop parallel to the general direction of the oncoming storm, the direction of approach may be determined with an error of less than four degrees, as the static discharge is at its maximum when the loop is parallel to the line of approach.

Radio Lightning Detectors

The purpose of learning the direction of the storm is to enable the members of the patrol to plot its course and send out observers to locate trees struck by lightning. Lightning is said to cause twenty-five per cent of forest fires, and its particular hazard lies in the fact that unseen bolts strike trees

and smolder for days before actually breaking into flames.

The static barrage, the latest of radio fire-fighting equipment, has been operated quite successfully. Technically it measures the frequency of the static discharge and records it on a dial or indicates it visibly across a spark gap. When the frequency of the discharge becomes excessive an automatic electric gong is rung to announce impending danger. The direction of the storm is then determined by means of the radio loop, and by the time lightning is flashing over the stands of timber, patrols have started through the threatened district, alert to spot trees struck by lightning.

Many of the forest wireless stations are manned by ambitious young amateurs, some of them owning their sets, and all of them seeking to do constructive radio work and perfect their knowledge. One privately owned receiving set is reported to have picked up accurately messages from four airplane patrol routes miles apart.

Lofty Aeriels, 200 Feet High

City amateurs who boast of thirty-foot aerial masts, would be envious of the natural masts available in the western forests, where giant fir trees tower three hundred feet. At least they would be envious until they began to wonder how to utilize this excessive height for stringing an aerial. On the camp's "high-climber" evolves the job of rigging the lofty antenna. He is skilled in climbing tall trees, as part of the logging business demands daily trips aloft to oil pulley blocks for cables or to prepare a new setting for the yardage operation. By skillful manipulation of a single loop of rope about his waist and around the bole of the tree, the high climber, equipped with a pair of leg-irons, or spurs, slowly raises himself upward. With a deft twist of his wrist, he flips the rope upward a foot or two at a time, trusting his weight to it while he replants his leg irons a little higher on the trunk. It is a task the city-aerial builder would not relish. It requires unusual skill and steady nerve on the part of the climber; but that veteran thinks nothing of it.

Foresters and lumbermen say that, in the Pacific Coast timber-belt, radio has accomplished, within a few months, what would otherwise have taken decades to bring about. It has become a permanent fixture tending to promote both contentment and efficiency, as well as to afford a means of fire protection of hitherto undreamed-of worth.

Radiograms

The Latest Important Radio News Briefly Told for the Growing Army of Radio Fans

PRESIDENT HARDING'S message to Congress was successfully broadcast from NOF, Anacostia, D. C., on Tuesday, December 5. A full-page photograph showing a similar broadcast was published in RADIO WORLD, No. 37, dated December 9, the Christmas Number. Broadcasting the President's address will always be an important radio event. Three separate telephone-wire circuits carry his voice from the Capitol to the Naval broadcasting station NOF. The transmitter which picks up the President's voice on the platform in the House is part of the public-address system recently installed to carry the voices of speakers to all parts of the Capitol. This transmitter is connected to NOF by three wire circuits. The Chesapeake and Potomac Telephone Company has provided three circuits to insure against any possible interruption. One circuit will be used for conveying the President's voice, a second will be used by the engineers as an "order wire" over which they can direct operators and keep the transmitter at an even pitch. The third circuit is provided in case anything happens to either of the others. These telephone circuits are extremely important and without the greatest skill on the part of the local telephone engineers, the President's speech could not be broadcasted directly from the Capitol.

A new radio-receiving set has been installed at the Government's Hospital for the Insane, Anacostia, D. C., by the Department of the Interior. The set has a receiving range of about 750 miles and enables the inmates to receive concerts every evening from many different sending stations.

Domestic exports of radio apparatus during the month of October totaled \$207,535 and weighed 114,309 pounds, according to figures compiled by the Department of Commerce. The value of these radio shipments was as follows: England, \$70,391; Quebec and Ontario, \$35,728; Argentine, \$32,092; Brazil, \$27,072; Japan, \$11,299.

The first broadcast of the War Department was transmitted from NOF Monday evening, December 4, on 412 meters. It was a speech on the Muscle Shoals Nitrate Plant.

The Weather Bureau advises in connection with a recent hurricane which occurred in the Yucatan Channel and southern Gulf of Mexico that the warnings issued by the Weather Bureau were promptly received by cable and by Swan Island (US). These messages were broadcast by radio and by notices to mariners as fast as received by the Panama Canal office. They were instrumental in causing some of the boats in

the New Orleans trade to postpone their sailings for a day or two. The canal and shipping interests appreciate the prompt service given by Forecaster Mitchell and the Swan Island radio station.

The world's record for long-distance radio transmission was broken on November 5, when President Harding's message to the world was received in practically every country of importance on the face of the earth. It was heard even in New Zealand, 10,000 miles away. The message was transmitted from Radio Central, the station at Port Jefferson, L. I., designated for international radio communication.

Morris Keyser, of Philadelphia, recently heard a spoken voice without an ear trumpet for the first time in twenty-seven years. A week before he heard music for the first time on a receiving set, using headphones. He believes that radio has stimulated his hearing so that he will eventually catch sound without any artificial help.

The first detailed report to reach New York City of the rescue of the steamer "Monte Grappa's" crew of forty-five men in midatlantic by the White Star lines, "Pittsburgh," again puts another medal on the breast of the never sleeping radio.

The "Monte Grappa," a new 10,000-ton ship belonging to the Navigazione Libera Trestina, with a cargo of 9,200 tons of grain, was bound from Montreal to Venice. She left Montreal on November 5, under the command of Captain Stefano Bartoli. On Sunday, November 12, she ran into a heavy southerly gale. Her cargo shifted and the ship took a heavy list to port.

Fearing his ship would roll over, or sink, Captain Bartoli ordered an S O S sent out at 7 a. m. Tuesday. His position was given as 43 degrees, 18 minutes north; 41 degrees, 55 minutes west. This call was picked up by the "Pittsburgh," and Captain Jones, after plotting his own position, found he was 185 miles from the "Monte Grappa." Radio communication was kept up during the day.

Captains of deep-sea vessels are requested to report the date when ice and other obstructions reported by radio from ship to ship are sighted. Many reports of this kind come to the Hydrographic Office of the Navy Department bearing only the date of the radiogram and lacking the date when the obstruction was seen. Co-operation in supplying this additional fact will be thankfully appreciated by the United States authorities.

Weather bulletins, forecasts, and storm warnings are now broadcast from the Naval radio stations at Key West, Florida, and Point Isabel, Texas, by continuous wave (arc) instead of by spark, on the following schedules: Key West (NAR), 10 p. m., (seventy-fifth meridian time); wave length, 5,700 meters. Point Isabel (NAY), midnight, noon, and 7 p. m. (seventy-fifth meridian time); wave length, 5,000 meters.

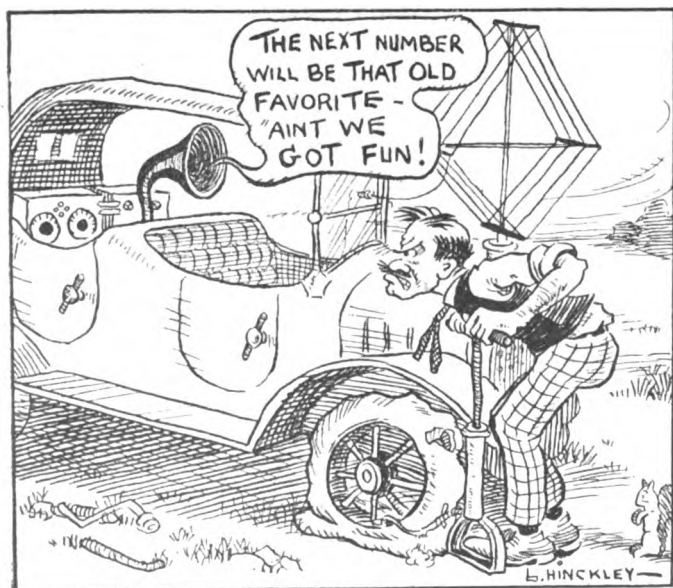
An applicant for radio operator's license was barred from being examined, for a period of six months, on account of having used a false name in his examination papers. Anyone making false statements in applying for examination will be likewise treated.

The French wireless company, "La Compagnie Generale de Telegraphie Sans Fil," recently founded a subsidiary radio company to operate under the name of "Radio-Orient." It has started radio communications with Syria, Lebanon, and most of the European countries.

The decree of May 31, 1921, prohibiting the operation of radio of foreign ships in Swedish territorial waters within 10 miles (nautical) of a coastal radio station is being strictly enforced. The only exception to this rule is in cases of great urgency or where the safety of the ship is concerned. Under the same decree, foreign ships in Swedish harbors may not receive radio messages without permission of the telegraph directorate.

The general call signal WWAA has been assigned for all vessels operated and controlled by the Radio Corporation of America. This general call signal will be used by R. C. A. ships or coast stations desiring to ascertain whether there is an R. C. A. ship within range, and any R. C. A. vessel hearing another ship or coast station calling WWAA should answer.

Mr. Grouch's Radio in Danger!



(Cartoon by Lawrence B. Hinckley)

Radio and the Woman

Crystal D. Tector Says that the Women of the Country Will Be Heard from During National Radio Week

A WEEK from next Saturday—December 23 to be exact—and the first National Radio Week will have started. May it be a great and glorious success from every point of view! May every city and hamlet in the United States and Canada and Cuba—and even in Mexico, where radio is beginning to get a foothold—celebrate it in a thoroughly fitting manner. May it be the forerunner of an annual event that will be looked for by every true American—just as is the Fourth of July or Christmas or any other happy season.

* * *

I KNOW that the women of the country are going to be heard from. In fact, I can truthfully say that my radio sisters have expressed the genuine radio spirit and have planned and built in a manner far beyond my wildest dreams. I told the editors of RADIO WORLD that we would not be lacking in interest and in willingness to work. We will do our share and do it with a thoroughness that will make our place in radio equally as important as that held by the sterner sex.

* * *

THE holiday spirit has begun to entirely envelop this big and breezy city. New York is completely permeated with radio. In every shop there seems to be something with a radio flavor—even to radio hats and radio perfumes. And most everyone seems to be either putting in a radio set or wanting to do so. Most every woman I meet seems to have the radio fever. It is quite the thing for a woman to say that she is able to work her own set. In fact, going up town in a Fifth avenue bus, the other day, I heard two pretty young misses talking in radio terms in a manner that would have floored an expert.

AND I know of several families who are clubbing together to purchase sets. The alleged edict of selfish landlords does not seem to bother much, for excellent results are now obtained from indoor aerials. In fact, David Saranoff, vice-president of the Radio Corporation of America, recently sent messages to England, France, Germany and Norway, and received answers on an indoor aerial. Some of the loop affairs that I have seen are very handsome and would look well in a sitting room or parlor.

* * *

THE women of the "upper ten" are having their sets made to match certain effects of their furnishings, for radio parties are something of a vogue in New York this winter. I have seen several indoor affairs—and have heard of others—that were broadly extravagant in finish and coloring—some even being silver mounted. Of course, such sets are only for those who can afford them, and do not enhance reception to any extent; and I simply mention them to show how the craze is spreading.

* * *

ONE does not need an extravagant set. The best results are obtained from sets that are well made and, above all well managed. The thing is to know your set. One gets better results from a motor car, a watch, a cooking stove, or any other commodity if one really knows it. So to every woman who contemplates owning a set I say, "Learn to know it," and you will be surprised at the results that will follow. Study it as you would study a child and you will find that it will be the greatest source of joy you can imagine. You can not install a set and start it going like a phonograph. It isn't that sort of mechanism. Take time—and know it inside out.

Radio Penetrates Fog

What Is Being Done by Lighthouse Service to Safeguard Shipping

THE greatest peril to shipping is fog. Until recently the captain of a ship has had no practicable means of accurately locating in a fog either his own ship or other ships which he is meeting. The radio fog-signal and radio compass give the navigator accurate bearings in fog just as well as in clear weather. In his annual report to Secretary Hoover, the Commissioner of Lighthouses states that several additional radio fog-signals have been installed during the past year, including one on the new lightship off Cape Hatteras, and one on San Francisco lightship.

The United States now has five such stations regularly in operation, and six more will be installed in the near future. The United States is in advance of any other nation in the establishment of these protective signals.

The lightships are the outermost signal stations of the country, many of them being anchored in the open sea, miles off the coast. Arrangement has been made this year between the Navy and Commerce Departments, for the Lighthouse Service to take over the radio communication equipment on the lightships, placed there mostly during the World War. Hereafter regular radio-service will be maintained with twenty of the outside lightships off the Atlantic, Gulf and Pacific Coasts; this will be of great value both in safeguarding and operating the lightships themselves, and in reporting the needs of other vessels, or of boats in distress. Provision is being made to receive radio broadcasting on these and other isolated vessels of the Lighthouse Service, and radio telephones are being tested for remote lighthouses.

A Quebec Guide Listens In

THE following letter was recently received by the General Electric Co.:

"WGY, Schenectady General Store, New York State, Sir:

i am gide for hunter man wot come at dis place Lac-des isle for hunting deer. dese hunter man bring it wit him a machine for heer you spik sunday nite also tuesday nite i heer song about my old modder dats long tim i dont see my modder and i tink dats dame fine song also i heer oder song i dont no de nam. tuesday nite storie for de small boy and girl bout mak de star shine for dem if dey is good boy and girl. hunter man laff lik hell an tole me ax you how we mak some moon shine.

i hear you spike jus de same lik your at me place i ting you have good machine i lissen more nex week.

tank you and much oblige
gide Camille Poirier
Chemis P. O., Quebec, Canada"

Listen In—Then Write

RADIO WORLD has received a letter from a reader—a member of a radio club—who puts forth a little idea that, to our way of thinking, is a fine stunt. The letter is as follows:

"We have a small club of listeners and very often hear fellows in other States. We think it would be a good idea if, when anybody else hears a station, he would write and tell him about it. By doing so, we can get and exchange little helpful hints and ideas. It is always a pleasure to know that one is heard in other States and cities.

"We ask anyone reading this in RADIO WORLD to write us and start the ball rolling. "Listen in—then write!"—Charles Doherty, 746 Howard avenue, Bridgeport, Connecticut.

Said It with Letters

Hook-up in Radio World Brings Mail too Big to Handle

IN RADIO WORLD No. 30, dated October 21, there appeared a hook-up of a single-coil receiver designed by Mr. W. Miller, Southern Methodist University, Dallas, Texas, with an invitation to amateurs who delight in experimenting to give it a try-out. That the invitation was heeded—and that there is a keen interest in hook-ups that are new and original—is attested by the following letter from Mr. Miller:

Box 222, S. M. U., Dallas, Texas.
December 1, 1922.

Editor, Radio World:

Since you published a diagram of my circuit, in your issue No. 30, I have been snowed under with mail. Inasmuch as I am a student, I cannot reply individually.

I have received over 1,500 requests for further information, description, panel lay-out, and many other things—and I would like to know if you are in a position to publish the matter.

Yours very truly,

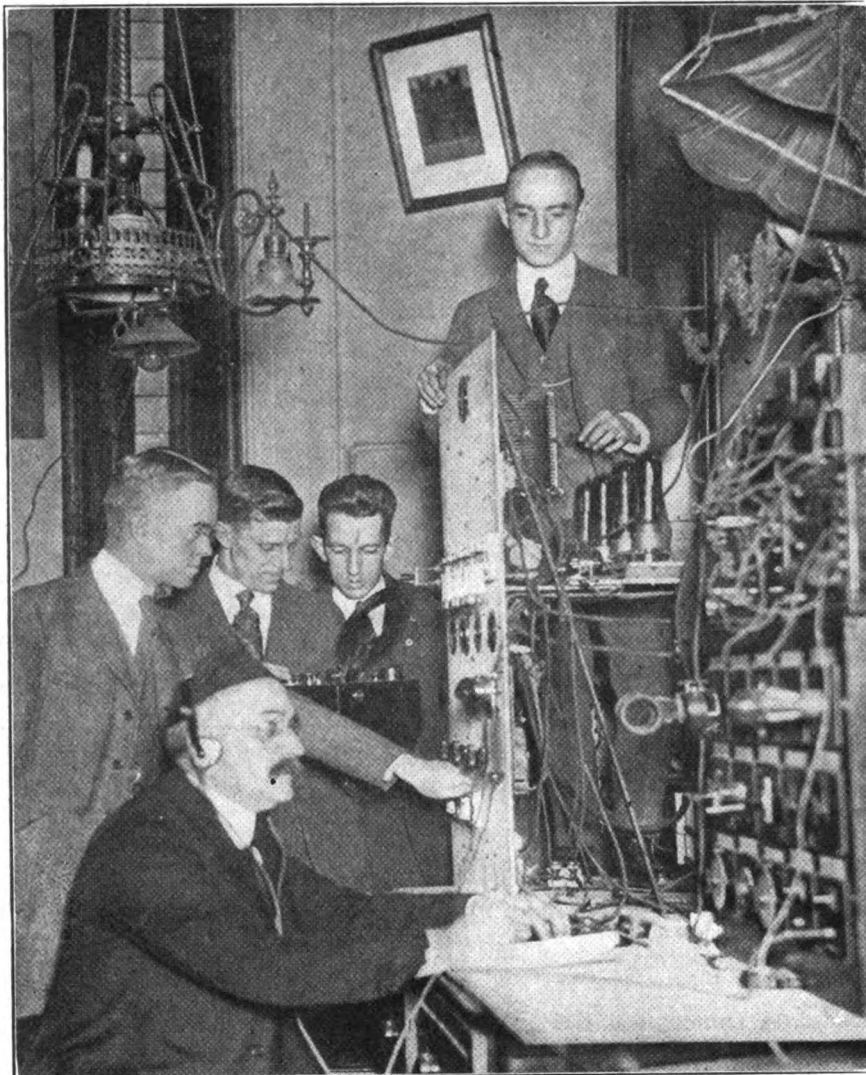
(Signed)

W. MILLER.

Are there other radioists who have original hook-ups they would like to have published, so that the vast army of radio fans may have a chance at them? If so, it is evident that RADIO WORLD is the publication through which to present them. It would be interesting to learn how many fans *did not* write to Mr. Miller.

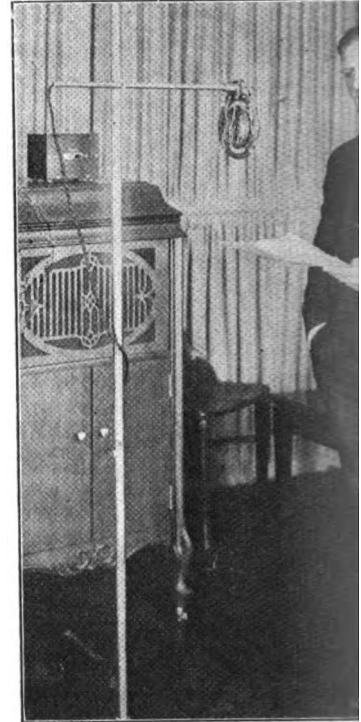
To many anxious inquirers: **RADIO WORLD** has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

Latest Photographs of the Week Sho



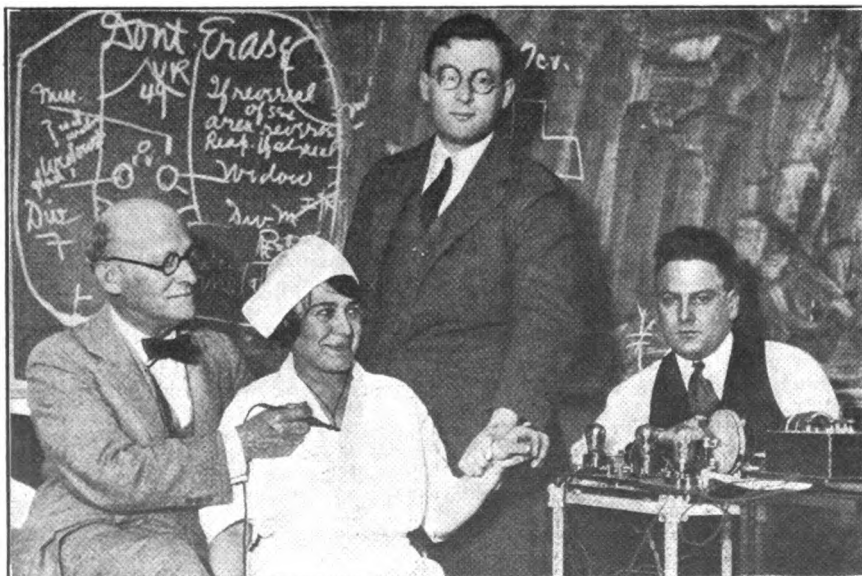
(C. P. & A. Photos)

(Left) The radio broadcasting apparatus recently installed in the rectory of Calvary Baptist Church, New York City. This is the church over which the Reverend John Roach Straton, the militant pastor, presides. Dr. Straton has joined the ranks of ministers who believe in reaching as large an audience as possible and realize that the only way to do so successfully is by radio. As will be seen from close study, Calvary Church possesses a pretty powerful transmitting set. Dr. Straton decided that his sermons—particularly those regarding the Ku Klux Klan—were being heeded by many people outside his own parish, so he had the transmitting set installed that all who wish may hear. An expert operator and staff are in charge of the set.



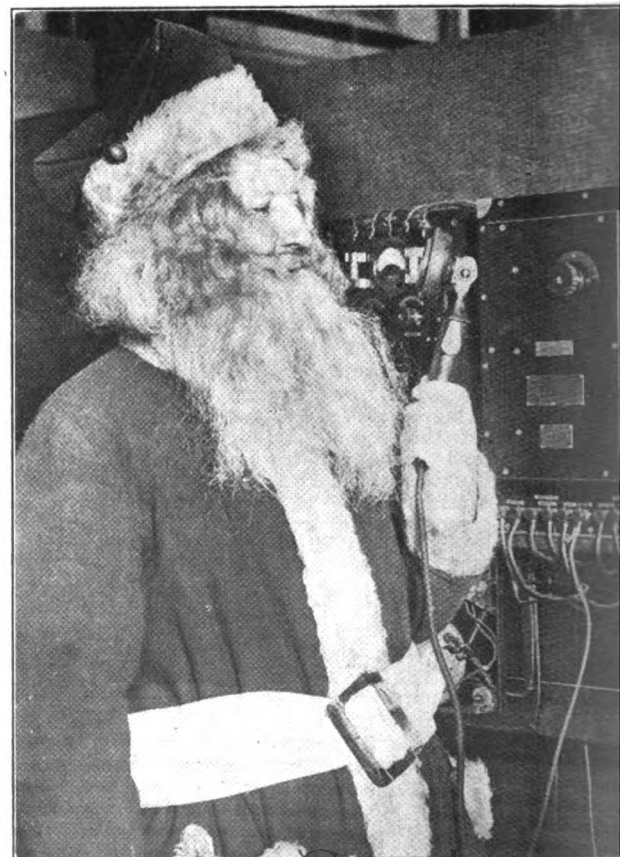
(C. Fotograms)

(Above) Lieutenant Elmer I. Oliphant, one of the gridiron's gr who played with the United States Army team, now director education at Union College, New York, is shown here giving a new football rules at the WGY broadcasting station of the Gen Company at Schenectady, New York. As will be seen, Lieutenant is talking directly at a microphone—the small circular-shaped ob of him. This picture gives an excellent idea of how one should talking for broadcasting—in a perfectly natural position about half from the microphone. Then speak clearly and naturally.



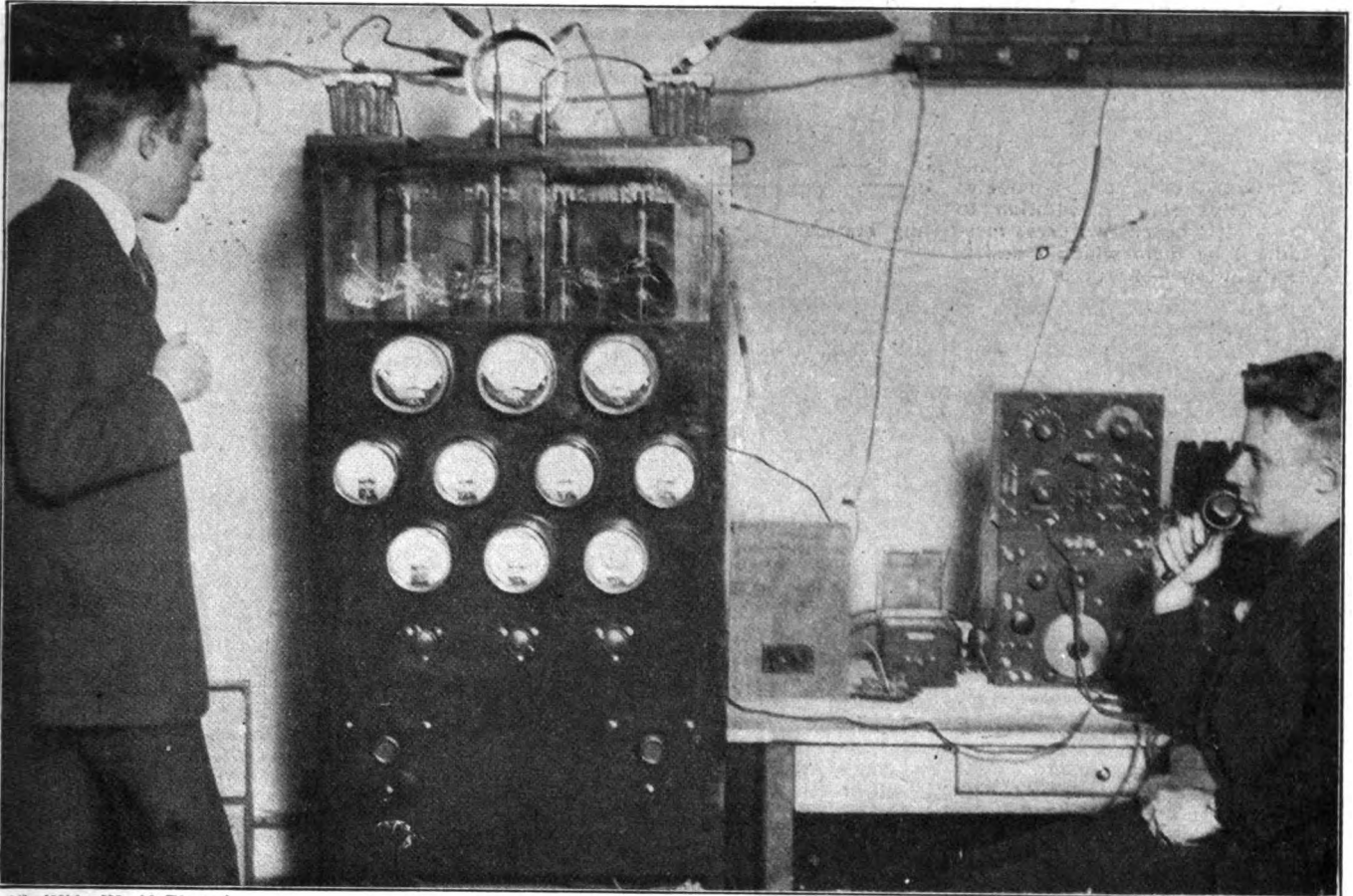
(C. Underwood & Underwood)

(Above) Dr. Albert Abrams, noted pathologist, who is now on the Pacific Coast, demonstrated his little "radio love detector," or, scientifically called, "electronic energy detector." This shows, right to left, Joseph O'Connor, radio expert, Dr. Wirklich, and Miss Ruth Rittman and (seated with glasses) Dr. Albert Abrams, holding a test of the machine. The young lady, a nurse, wished to know if she was in love. Dr. Abrams told her to concentrate and he then placed a glass electrode connected with the "detector" over her heart. The radio machine hummed and told the story—she was very much in love.



(C. Kadel & Herbert)

How Radio Put to Startling New Uses



(C. Wide World Photos)

(Above) Thomas Donnelly and J. H. Jenkins, prominent clubmen of Chicago, have equipped a radio station atop the roof of the Drake Hotel. They spend their spare time transmitting concerts with a normal radius of 1,200 miles. They assume all expense and pay prominent stars to sing or play for the benefit of radio fans. Messrs. Donnelly and Jenkins have a novel arrangement of "plugging in" on any of the hotel ballrooms, thereby being able to broadcast all other concerts given at the hotel, aside from their own. They are known to "fans" as WDAP and 9XA. The photograph shows Mr. Jenkins and Ralph Shugart at work transmitting.



(C. Underwood & Underwood)

(Above) Did you hear the cheers when Princeton defeated Yale and Harvard, and Yale defeated Harvard, during the recent football season? Did you hear the Army and Navy boys sing during their recent thrilling game? This is one of the devices that brought these effects to you and permitted you to hear them as plainly as if you were right there in a front seat. The microphone, that cylindrical object so clearly shown in this photograph, is a wonderful thing. No sound is too insignificant for it to catch. It performs its task with accuracy and precision. It has helped to give outdoor sports a world-wide range of interest.

(Small picture below) Radio is now used as an aid in securing recruits for the United States Army. The photograph shows Sergeant George Kline with his home-made radio set which he rigged up on the roof of a skyscraper near City Hall Park, New York City. Assigned to the duty of securing recruits for the Army, he decided on this novel scheme. And it may be said to his credit that he has already recruited several dozen men who, otherwise, might not have given their services to their country. Sergeant Kline's set, while a home-made affair, is simple and effective. He is a pioneer among radio enthusiasts.



(C. P. & A. Photos)

(Left) Here is a modern Santa Claus and the very modern transmitting set through which he will speak to his legion of children this Christmas Eve. It is said that there are now over six million radio "listeners in" in the United States, and that nearly three million of them are children. So, this Christmas Eve, when dad begins his famous recitation, "Twas the Night Before," tell him not to be surprised if he is interrupted.

...st stars,
...nd physical
...alk on the
...nal Electric
...st Otthant
...st in front
...stand when
...st and a
...o not yell!

With the DX Night Owls

Page Kenneth F. Smith

EDITOR, RADIO WORLD:—I have a home-made receiving set, using a modified Colpitt's circuit with direct coupling and one Aeriotron (WD-11) vacuum tube operated on one dry-cell, with which I heard station KHJ, "The Times," Los Angeles, California, on two different occasions, namely: November 13 and 16. In addition to musical numbers, I heard two press messages broadcast by them which I understood very distinctly—one regarding the severe snow storms in the vicinity of Cheyenne, Wyoming, and the other regarding farm loans by Federal Reserve Banks. These facts may be verified. I figure Los Angeles a little over 2,000 miles from Cincinnati.

In addition to the above, I have heard PWX, Havana, Cuba, three times recently—a distance of over 1,450 miles, air-line; Denver, Colorado (DN-4), a distance of about 1,250 miles; and numerous other stations from 500 to 1,000 miles distant, such as Fort Worth and Dallas, Texas; Kansas City and Jefferson City, Missouri; Des Moines, Davenport, and Ames, Iowa; Minneapolis, Minnesota; Schenectady, Troy, and New York City, New York; Springfield and Bedford Hills, Massachusetts; Newark, New Jersey; Anacostia, D. C.; Atlanta, Georgia; and other nearby stations too numerous to mention.

I would not even intimate that this record has not been, or will not be, surpassed; but I think it is a fair record for a detector-tube set with *no stages of amplification*, using so little voltage. I would like to call the attention of Mr. Kenneth F. Smith, Birmingham, Alabama, to this letter, as he claims a record of 1,667 miles and says, "Come on, you amateurs; step up and get your feet wet!" I say, "Come on in, the water's fine!"

I will be glad to furnish the hook-up I am using, upon request.—F. E. Smith, 3508 Evanston Avenue, Cincinnati, Ohio.

* * *

Claims a Canadian Record

EDITOR, RADIO WORLD: The only radio magazine that I can get really interested in is RADIO WORLD. While reading your last issue I discovered that many of your readers have established, or are trying to establish, long-distance records with bulb sets. I am not in the habit of bragging, but I think I have established the long-distance record in Canada so far as crystal sets are concerned.

With an ordinary crystal receiver (not a loose-coupler) and a four-strand inverted-L type aerial I have been successful in hearing WWJ, Detroit "News"; WCX, Detroit, Michigan; WWI, Dearborn, Michigan; WJAX, Cleveland; KDKA, Pittsburgh; WGY, Schenectady, New York. I have heard all these stations regularly. I have also heard WOC, Davenport, Iowa.

Of course, I heard all these stations in the fall, when weather conditions are ideal. Still I would like to hear from any other crystal-set owner who has made a record.—W. M. Guillot, Box 224, Windsor, Ontario, Canada.

* * *

In 18 Days

EDITOR, RADIO WORLD:—I am sending a "DX night owl's" list. I have heard on my home-made one-tube, U-V 200 hook-up, by Greene, published in the Boston "Globe," October 15, the follow-

The Editors of RADIO WORLD will be pleased to receive sketches of hook-ups of the various "DX Night Owls" sending in records, with a view of publishing them.

Other letters from the DX "bugs" will be published from week to week.—The Editor.

ing stations in eighteen days, some of them more than once. My aerial is 42 feet high, 110 feet long, 2 wires, 4 feet apart, running east and west, T type:

KYW, WKN, WIAO, WBZ, WGY, WHAZ, KDKA, WIP, W2NA, WEAN, WJZ, WLK, WHAN, WLW, WBT, WOO, WNAC, WOC, WGM, WBU, WMAQ, WSB, WAAF, WDAF, WFAS, 2XI, WFI, WJAX, WOR, WAKP, WHAS, WEA, 1OMB, WJAR, NOF, 1OMK, WHA, WWJ.—William J. Head, Receiving Station WJH, 24 First Street, Bristol, Rhode Island.

* * *

"Get Your Feet Wet!"

EDITOR, RADIO WORLD: In RADIO WORLD, No. 35, dated November 25, a letter was printed concerning DX work.

The author of this particular letter is Kenneth F. Smith, 133 Francis Street, Birmingham, Alabama. Mr. Smith challenged amateurs to "step up and get their feet wet." I am here with a record which, I believe, will prevent me from getting my feet wet. I beg to submit the following record for one evening: All stations were heard on a one-step, using a Reinartz circuit. My aerial was 100 feet in length, 50 feet high, using a water pipe as a ground.

One evening I heard the following stations, all over 500 miles away: KHJ, Los Angeles, 1,535 miles; KHQ, Seattle, 1,740 miles, DN-4 and KFAF, Denver, 800 miles; WFAA and WBAP, Dallas and Fort Worth, both 750 miles distant; WNAC, Boston, 912 miles; WGM, WSB and WDAJ, all in or near Atlanta, 650 miles.

The following evening I heard KHJ, CKCK, Regina, Canada, 950 miles; WAAC, New Orleans, 830 miles; WIP, Philadelphia, 740 miles; also WBAP, WFAA, WGAG, WHB, and twenty others, all over 250 miles away.

Come on, you amateurs, and "get your feet wet!"

I would appreciate hearing from any other amateur not using radio-frequency who can equal the above record.—Howard J. Hall, 521 E. McKenney Street, Dixon, Illinois.

* * *

70 Ft. Long, 65 Ft. High

EDITOR, RADIO WORLD:—The record I have established with my set, I think, compares favorably with any I have read in your magazine. I use only a single-circuit regenerative set without any radio- or audio-frequency amplification whatsoever and only one tube. Yet I hear such stations as Minneapolis; WWJ, Detroit "News"; WOC, Davenport; Fort Dodge; WLW, Cincinnati; Cleveland; Chicago; WEA, New York (1322 miles, air-line); KDKA, Pittsburgh; Louisville; KSD, St. Louis; PWX, Havana; WSB, WGM, WDAJ, Georgia; Charlotte, North Carolina; Des Moines, Iowa; WEAV, Lincoln, Nebraska; WFAT, Sioux Falls, South Dakota; Portland, Oregon (2,127 miles, air-line); KHJ, Los Angeles (1,667 miles, air-line), and many other stations located within a radius of 500 miles such as Sweeney Auto

School; WHB, Jefferson City, Missouri; Denver, Colorado; and others. I use a double-strand aerial 70 feet long and 65 feet high. My set is home-made and is only a week old. The joints are not soldered yet. Furthermore, this is the first set I have ever owned or operated.—R. Diamond, 413 Royal Street, New Orleans, Louisiana.

* * *

Detector and 2-Stage

EDITOR, RADIO WORLD:—For some time I have taken a great interest in RADIO WORLD and thought I would send you the results I get with my home-made set—detector and two-stage audio. With this set and horn, which is a plain horn with receiver from head-set, I have heard the distant station of Honolulu and several others on the Pacific Coast; also many other stations in the United States and Canada. The hook-up is my own regenerative type.—Carlton D. Shults, Fort Plain, New York.

* * *

First Set in His Town

EDITOR, RADIO WORLD:—In RADIO WORLD, No. 31, dated October 28, Mr. J. A. Merklein, Brooklyn, New York, claims the receiving record, so I will send in the list of stations that I received on November 20:

WEAY, Houston, Texas; WGM, Atlanta, Georgia; WDAF, Kansas City, Missouri; WMAM, Beaumont, Texas; WHB, Kansas City, Missouri; WBAP, Fort Worth, Texas; WHAS, Louisville, Kentucky; WSB, Atlanta, Georgia; WOC, Davenport, Iowa; WWJ, Detroit, Michigan; WJAD, Waco, Texas; WOS, Jefferson City, Missouri; WHAN, Wichita, Kansas; WOI, Ames, Iowa; WCX, Detroit, Michigan; KSD, St. Louis, Missouri; WBZ, Springfield, Massachusetts.

All the concerts came in clear and loud, although I am only using one stage of amplification. I built my own set on June 4. There are only two sets in this town, mine being the first. Anyone desiring the hook-up I use, please write me. Best 73.—Quentin Weaver, Saratoga, Texas.

* * *

With Only One Bulb

EDITOR, RADIO WORLD:—Using only one bulb, I have heard over 60 different phone stations since June, scattered between the Pacific Coast, Canada, and Cuba, practically every high-powered station in the East, and a score or more of the low-powered ones are heard very QSA at all times. Reception from the South and West seems to be excellent. The most distant point in the West heard was KGW, Portland, Oregon, on July 8.—Albert Bannister, 2 Washington Street, Hudson Falls, New York.

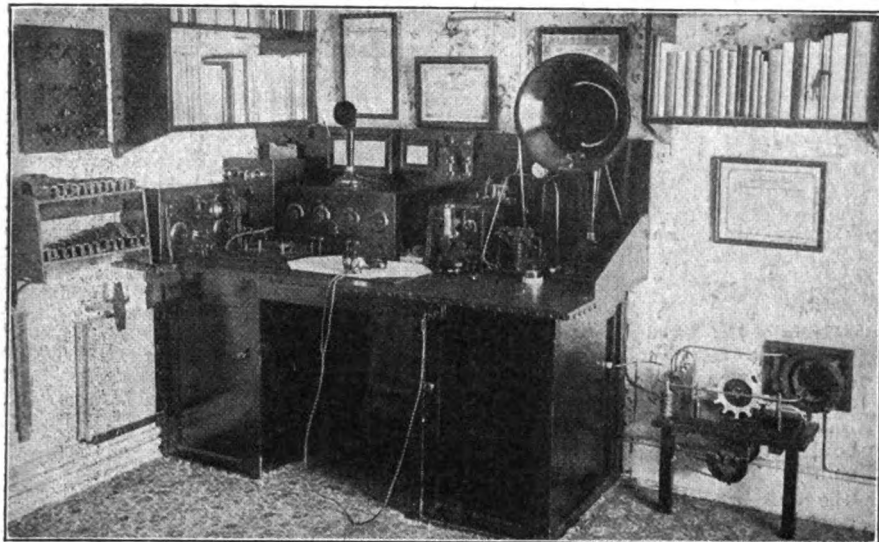
* * *

On a Home-Made Set

EDITOR, RADIO WORLD:—I thought you would be interested to know that on Sunday evening, November 12, I received very clearly part of the program of WOC, Davenport, Iowa, on my home-made set which is only a single detector-bulb regenerative set. I used a Meteor Antenna Plug instead of outside antenna. If you care to check up this statement, at 10 p. m. eastern standard time, WOC was sending "The Star-Spangled Banner" played by the P. S. C. orchestra.—William C. Hicks, Waterford, New York.

What I Accomplish with My Home-made Set

By Paul G. Watson
3 BV, West Chester, Pennsylvania



Very neat, attractive and businesslike is the layout of Mr. Watson's set.

STATION 3 BV has made notable long-distance receiving records. On June 1, the C-W station 6 XAD, Avalon, California, was copied and confirmed by letter. C-W station 5 XA also comes in very QSA. The station signing 3 BV on C-W is Canadian 3 BV and may be distinguished from the United States stations as he uses "FM" instead of "DE" in calling and signing off.

All the apparatus is home-made from original designs. For the information of those interested in construction, the circuit of the short-wave tuner accompanies this article. It consists of a 43-plate .001 microfarad condenser, short-wave coupler, and two variometers. The pri-

cessfully. Phones, Magnavox, and small horn are connected to this amplifier—the small horn for sound reading of telegraph signals, the Magnavox for music, and the headset for DX signals. Music from many distant music stations have been received, WOC, WHB, WSB, WBAP and many nearby stations.

The transmitter is a low-power, coil affair, and does not use the rotary gap. Power has not been available for some time, hence the spark coil. However, tuned sharply to 190 meters, I have worked 44 miles. It is inductively coupled and radiates about three-tenths of an ampere.

The antenna is a 6-wire, inverted-L, 90 feet long with an average height of 45 feet. The ground system is a grid of wires buried under the antenna.

In the construction and design of this apparatus, many points of electrical design were considered. The wire used on all the pieces of the set is No. 14, and connections on the table were made with No. 10 wire. Care in insulating connecting wires, proper arrangement of apparatus, all contributed to the efficiency of this station

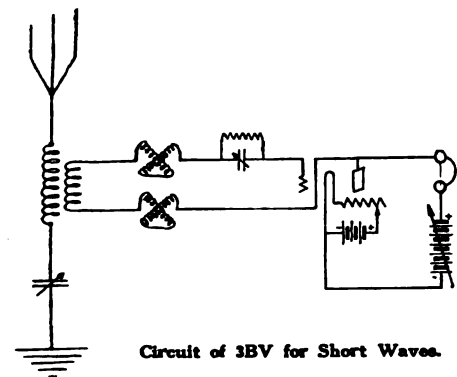
The above article and illustrations were contributed by Mr. Watson in response to RADIO WORLD'S call to amateurs and fans to send us just such material that brother radioists may profit by what others are doing. This is an ideal little story—brief, practical, and informative—and the accompanying photograph and hook-up complete it and give a capital idea of the author's very attractive set.—The Editors.

Battery Hints

KEEP your eye on your storage batteries. Don't let them stand too long without recharging.

If you charge them at home, take them to the service station at least once every year. A few dollars spent in having an expert look them over may save the price of a new battery.

Keep the tops of the elements covered at all times. The water evaporates, but the acid does not. Use only distilled water.



Circuit of 3BV for Short Waves.

mary inductance-switch of the variocoupler is back mounted and is controlled with a panel knob. Fine regeneration is obtained in this type tuner. The long-wave tuner is a honeycomb-coil tuner using a feed-back, or tickler, circuit. Either of these tuners may be connected to the audion-control panel through an anticapacity switch. This audion panel contains all the necessary controls, variable grid-condenser, vernier rheostat and B-battery switch for the "soft" tube. A two-step audio-frequency amplifier is connected to this detector. Acme A-2 transformers are used suc-

No Wireless Receiving set complete without it

Make it the **GREATER** Radio Christmas

THIS year the message of Christmas will flash one inspiration over all lands and to all peoples — no frontier can turn back the swift messenger, Radio, whose steed keeps pace with light.

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R-2 Magnavox Radio with 18-inch horn: this instrument is intended for those who wish the utmost in amplifying power; for large audiences, dance halls, etc. \$85.00

R-3 Magnavox Radio with 14-inch horn: the ideal instrument for use in homes, offices, amateur stations, etc. \$45.00

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Radio.

2 Stage AC-2-C . . . \$80.00
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Latest Radio Patents

To Determine the Direction of Remote Radio Waves

No. 1,435,941. Patented: November 21, 1922. Patentee: James Robinson, Andover, England

MR. ROBINSON'S invention relates to improvements in electromagnetic arrangements for the reception of wireless waves, in which the direction of arrival of such waves from some remote point may be determined.

It is known that when an electrical circuit having characteristics suitable for the reception of electromagnetic waves is arranged in the form of a closed coil, or loop, the intensity of the signals received upon it from a remote transmitting station will be at a maximum when the plane of the coil coincides with the direction of propagation, or arrival, of the waves; and at a minimum when the coil is at right angles to the incoming waves. By rotating such a coil about an axis, it will be possible to discover the bearing of the transmitting station.

Mr. Robinson uses a pair of aerial coils in vertical planes set at an angle to each other—preferably at a right angle—and rotated about a vertical axis until no appreciable difference in strength of signal is found, when the effect of that coil which lies at right angles to the direction of arrival of the waves (the bearing of which is desired) is superimposed positively or negatively upon the effect of the other coil. Obviously the bearing can

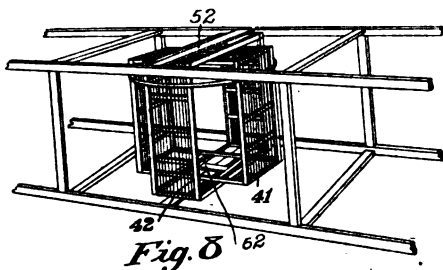


Fig. 8
Eighth Figure of Mr. Robinson's patent showing diagrammatically a method of fitting coils to aircraft.

then be determined by the position of the first coil.

In the case of coils actually at right angles, the position for the reception of maximum signals by one coil can be roughly determined. By the superimposition of the other coil, this maximum position can be definitely fixed.

Not only does this arrangement represent a considerable saving of time in the determination of a bearing but it is now possible to appreciate and interpret signals, simultaneously and without interruption while their direction is being determined.

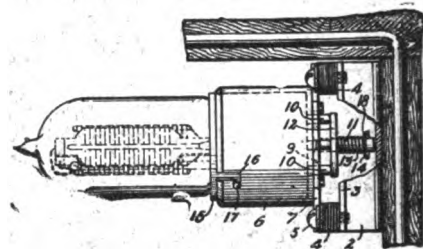
Holder for Hard Usage

No. 1,432,992. Patented, October 24, 1922. Patentee: John O. Gargan, Brooklyn, N. Y.

THIS invention relates to socket structures, and has for its object the provision of a socket in which spare vacuum tubes used in telegraph sets may be carried without undue vibration or liability to breakage.

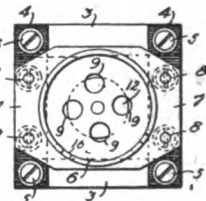
In telegraph sending and receiving sets, particularly of the portable type for field work, it is often advisable to carry spare tubes. Due to the rough usage to which these sets are often subject it is necessary to provide a holder for them, of such construction that the tube shall not fall out.

Mr. Gargan's invention comprises a socket into which the tube is inserted and to which it is locked by a bayonet slot-construction acting in combination with a resilient means at the base of the socket which operates on the base of the tube to hold it in place.



The upper sketch is an elevation of the tube and socket, with a portion of the base broken away, showing the device attached to a portable telegraph set.

At right is a plan view looking downward on the device with tube removed from socket.



Broadcasting Gain for November Is 17 Stations

DURING November, the Department of Commerce licensed 46 broadcasting stations and cancelled 29. Three of those deleted were transferred to other ownership and have been recorded as new stations. The gain for the month was 17 stations, which indicates that the looked-for saturation point in broadcasting stations has not yet been reached.

The stations whose licenses were cancelled in November follow:

WLAT—Chas. G. Bosch Co., Burlington, Iowa.

WBAE—Bradley Polytechnic Institute, Peoria, Illinois.

WEAP—Brown's Business College, Peoria, Illinois.

WIAN—Chronicle & News Publishing Co., Allentown, Pennsylvania.

KFAV—Cooke & Chapman, Venice, California.

KDZJ—Excelsior Radio Co., Eugene, Oregon.

WKAJ—Fargo Plumbing & Heating Co., Fargo, North Dakota.

WKAT—Frankfort Morning Times, Frankfort, Indiana.

WDAW—Georgia Railway & Power Co., Atlanta, Georgia.

WGAF—Goller Radio Service, Tulsa, Oklahoma.

KDYN—Great Western Radio Corporation, Redwood City, California.

WBAQ—Myron L. Harmon, South Bend, Indiana.

KDYU—Herald Publishing Co., Klamath Falls, Oregon.

WFAL—Houston Chronicle Publishing Co., Houston, Texas.

WSV—Dr. L. M. Hunter and G. L. Carington, Little Rock, Arkansas.

WHAL—Jeffrey & Derby, Lansing, Mich. (now "Lansing Capitol News").

WFAX—Arthur L. Kent, Binghamton, New York.

KHJ—G. R. Kierulff & Co., Los Angeles, California.

WMAU—Louisiana State Fair Association, Shreveport, Louisiana.

WIAG—Matthews Electric Supply Co., Birmingham, Alabama.

KFDB—John D. McKee, San Francisco.

KDZD—W. R. Mitchell, Los Angeles.

Wouldn't It Be Great, If—

The fellow with the phone set on the next block, who radiates 'steen amps, wouldn't turn on full power when he talks to the fellow two blocks away?

• • •

Every time you have a bunch of people for company your set would work as well as it does just after they go home?

• • •

You could get the results out of your set that you tell the other hams you do?

• • •

You could open up a radio store. Think of all the apparatus you could fool around with, and it wouldn't cost you a cent?

• • •

When you asked a radio salesman some question he would answer in such a way that it wouldn't make you ashamed to say you don't understand?

KFAB—Pacific Radiofone Co., Inc., Portland, Oregon.

WTK—Paris Radio Electric Co., Paris, Texas.

KYG—Radio Service Bureau, Inc., Portland, Oregon.

WHAN—Southwestern Radio Co., Wichita, Kansas.

WDA—Ward-Belmont School, Nashville, Tennessee.

WHAT—Yale Democrat & Yale Telephone Co., Yale, Oklahoma.

WEAZ—Redmond, Donald, Waterloo, Iowa.

12 New Broadcasters

The following limited commercial or broadcasting stations, on 360 meters, licensed week ending November 29:

KFGG—Astoria Budget, Astoria, Oregon, 5 watts.

WPAG—Central Radio Co., Inc., Independence, Missouri, 500 watts.

KFEJ—Guy Greason, Tacoma, Washington, 10 watts.

WSAJ—Grove City College, Grove City, Pennsylvania, 100 watts.

WCAP—Kalamazoo College, Kalamazoo, Michigan, 100 watts.

KFCL—Los Angeles Union Stock Yards, Los Angeles, 500 watts.

WOAR—Henry P. Lundskow, Kenasha, Wisconsin, 100 watts.

KFCQ—Motor Service Station, Casper, Wyoming, 50 watts.

WOAZ—Penick Hughes Co., Stanford, Texas, 100 watts.

WAOQ—Portsmouth Radio Association, Portsmouth, Virginia, 150 watts.

WCAW—Woodmen of the World, Omaha, Nebraska, 50 watts.

KFDF—Wyoming Radio Corporation, Casper, Wyoming.

One new Class-B station, 400 meters, was licensed:

KFDB—Mercantile Trust Company of California, San Francisco, 500 watts.

THE GOODMAN



PATENT PENDING

The Nickest Short Wave Tuner on the Market
Only \$6.00 & PP on 1 lb. Send for pamphlet.

L. W. GOODMAN
DREXEL HILL, PA.

Major _____, Halifax, N. S., writes: Delighted. Received Selenosteady clearly on one tube first time I tried the GOODMAN. Would have saved trouble and money by buying months ago.

GITHENS TRUTONE RADIO HORN—LOUD SPEAKER



First one to sell on ten day trial Money back Guarantee

Retail Price \$21.00 Includes Loud Speaker

Trutone has been pronounced the best on the market by experts. It has a clear, true tone. Every radio fan should try Trutone and compare it with others. If YOU don't find Trutone the best, your money will be refunded. It is sold on a ten-day trial money-back guarantee. If not carried by your dealer write us.

Distributors and Dealers, write!

AUTO PARTS MFG. CO.
1815 Trombly Ave., Detroit, Mich.

the standardization of a high-precision standard wave meter by this means. A tuning fork of known frequency, approximately 1,000 cycles per second, is used as the basis of the standardization. A low-frequency generator is tuned to successive multiples of this frequency by means of the cathode-ray oscillograph, and corresponding settings of the wave meter are obtained. A third generator is similarly tuned to multiples of these frequencies, and thus by successive stages the standardization is extended to include frequencies as high as 5,000 kilocycles (60 meters). It is intended that this wave meter be used as the basic standard for the standardization of commercial wave meters.

Lighthouse Men Organize

SEVERAL men in the Lighthouse Bureau, Washington, D. C., have been dabbling with radiotelephone receiving sets, and it has occurred to them that their experience would be valuable to keepers and other members of the service who would like to enjoy the pleasures of the radio concerts. Therefore, they propose to organize a radio club among the amateur fans of the service. The initiation fee will be a postal, or letter, stating approval of the scheme and a desire to be enrolled as a member. The dues will be a word or two from time to time telling of difficulties encountered, results secured, or asking information. A space in the Lighthouse Service Bulletin will be reserved for answers to questions and interesting information that will enable them to construct their own sets or improve those they already own; also to conduct a clearing house for new ideas. Articles will appear from time to time on different phases of the subject. Charles C. Brush is in charge of the plan.



Pignolet RADIO VOLT-METER

ONE INSTRUMENT MAKES ALL TESTS

Write for booklet with suggestions for testing and adjusting Radio Sets. Thousands now in use give absolute satisfaction.

Pignolet Instrument Co., Inc.
114 Liberty Street, New York, N. Y.

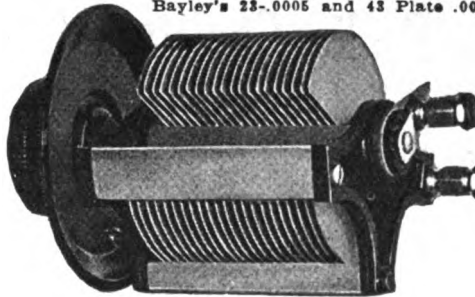
Basis of Radio Measurements

Bureau of Standards Develops Precise Method of Standardizing Wave-Lengths and Frequencies

THE Bureau of Standards has developed a very precise method of standardization of radio wave-lengths and frequencies, which is the fundamental basis of radio measurements in this country. By the process used, the frequency of radio waves is compared with that of an audible musical note. A tuning fork is mounted in such a way that it may be made to control the frequency of an oscillatory circuit. The frequency of another oscillatory circuit operating at much higher frequencies is then compared with it by an oscillograph.

This latter instrument consists of the cathode-ray tube—a special kind of vacuum tube in which the narrow stream of electrons is subjected to the action of electric fields applied by the two alternating-current generators. When neither generator is operating, the electron's, impinging on the active screen at the end of the tube, cause a single luminous spot. If one generator is connected, the spot is deflected back and forth along the single line, horizontal or vertical, as the case may be, with such rapidity that it appears as a solid line. If both generators are applied simultaneously, the spot oscillates both horizontally and vertically, and appears, in general, as a blurred luminous rectangle. If, however, the frequencies of the two generators bear a simple ratio, such as four to one, the spot traverses and retraverses a definite simple path, forming a figure by which the frequency ratio may be recognized. It has been found possible to compare frequency ratios as high as 21 to 1. The bureau is at present engaged in

RADIO FINDS A BETTER CONDENSER



Bayley's 25-.0005 and 43 Plate .0011. Its plates spaced close give it the finest tuning qualities. It is a die-cast product; the stationary plates are cast solid, accurately and permanently spaced, on three upright supports, while the movable plates are cast on the center revolving spindle. Plates cannot loosen, which eliminates shoring. Each condenser has our money-back guarantee.

Price, 25 Plates \$5.25 each
43 Plates \$3.75 each

TO JOBBERS AND DEALERS A SPLENDID PROPOSITION


Bayley Condenser Co.
165-169 Vanderveer St., Brooklyn, N. Y.

DELICATE SOLDERING

Both the manufacturers' and amateurs' problem on all line work is readily solved by the instrument constructed for this particular purpose.

THE POST SOLDERING IRON

Platinum Heating Unit—Interchangeable Tip—Universal Current



One Half Actual Size
\$6.00

From Your Dealer or Write

Awarded Certificate of Excellency, N. Y. Evening Mail Radio Institute

POST ELECTRIC COMPANY, (Div. 509) 30 E. 42nd St., New York

YOUR NEWSDEALER

will deliver RADIO WORLD to your home. In order to be sure of getting RADIO WORLD regularly, and of not missing a single issue, we suggest that you either subscribe direct or through your newsdealer at \$6.00 a year (52 issues), \$3.00 six months, and \$1.50 three months. Or instruct your newsdealer to deliver RADIO WORLD regularly to your home each week. Dealers will take standing orders and make deliveries of paper whenever requested. Radio World, 1403 Broadway, New York.

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

Bank Operates Giant Radio

San Francisco Institution Broadcasts News to Fans West of Rocky Mountains

THE most powerful radio broadcasting-station on the Pacific Coast—and one of the most powerful in the United States—is now "on the air" in regular service on Telegraph Hill, San Francisco.

The station, officially known as KFDB, was established by the Mercantile Trust Company of California, and is the first on the Pacific Coast to be built, owned, and operated by a bank.

KFDB has a sufficient range to reach all points west of the Rocky Mountains. It is broadcasting every day (Sunday excepted) commercial, financial, and agricultural information between the hours of 10 and 11 a. m., and 2 to 3 p. m., with a musical program between 9 and 10 p. m.

The first attempt at broadcasting from KFDB, in August, developed an interesting

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Benjamin Electrical Supply Co., Manhattan, \$10,000; B. Schmones, J. Solomon, D. Getz. (Attorney, M. S. Yochelson, 320 Broadway, New York.)

problem in radio engineering. The power was supplied direct from a 2,000-volt generator, but the commutator hum of the generator prevented satisfactory radio reception.

To eliminate this disturbing noise, it was decided to install a 2,000-volt 20 ampere-hour storage battery, and use the generator for recharging the battery in series. The Philadelphia Storage Battery Company supplied 333 Philco Radio A Batteries for the purpose, and regular broadcasting was started on November 1.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31. Colwell & Korbell, Fisk Building, New York City, directors of publicity.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

FIRST UNIVERSAL EXPOSITION OF INVENTIONS AND PATENTS, Grand Central Palace, New York City, February 17 to 22, inclusive, 1923.

A Freshman Improvement

THE very latest improvement in radio is a combination variable grid-leak and Micon-condenser.

The grid-leak consists of a piece of fiber specially treated on which a bronze spring is rotated to vary the resistance in an unbroken range, from practically zero to five megohms. The condenser is a tested Micon-condenser of .00025 mfd. The whole is combined and sealed in a neat molded body with nicked binding-posts and a pointer and dial to set the grid-leak resistance.

Every tube requires a different grid-leak resistance to operate at its maximum efficiency, especially when working on weak signals. It has been found in practice that it is possible to tune in distant stations by varying the grid-leak resistance to the proper point.

The variable grid-leak and condenser may be used in the parts of the circuit to eliminate noise and distortion. It has distinct advantage when placed across phones instead of usual phone condensers.

This device is manufactured by the Chas. Freshman Company, Inc., of New York City. The accuracy and construction will be in line with the tested Micon-condenser now well known in the radio field.

Improved Anti-Capacity Radio Jacks

Manufactured by the Radio Improvement Co., 25 West 43rd Street, New York City



THE improved Anti-Capacity Radio Jack is one of the latest developments in radio and was designed especially for radio work. Radio enthusiasts are quick to realize the importance of these jacks—no soldering of wires, an important element; occupies less room, which is very true; inductance is practically eliminated and it has a classy appearance. This device is practically an improved radio jack, radically different from all styles of the old ordinary telephone jack. They will fit any plug. Owing to the elimination of long leads, induction is minimized. They are made in single circuit, open; single circuit, closed; double circuit, closed; and both single and double filament circuit. The "A" Battery Switch is, also, a practical device which, due to its red knob, permits the "A" Battery to be disconnected or connected at a pull, or push, of a knob.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

National Radio Week Special Number!

Remember "This Is a Radio Christmas"

and that millions of dollars will be spent during the holiday time for radio gifts.

Be sure to get your share of this business by advertising in the issue of RADIO WORLD of December 23, which will be

RADIO WORLD'S NATIONAL RADIO WEEK NUMBER

Thru this medium you can reach thousands of readers, who are not only interested in radio themselves, and want new equipment, but who also will give presents to others whom they wish to make radio fans.

ADVERTISING RATES:

Regular advertising rates in force for RADIO WORLD'S NATIONAL RADIO WEEK NUMBER, as follows:

\$150 a page, \$5 an inch. Discount, 10% four times, 15% thirteen times.

Take advantage not only of RADIO WORLD'S circulation, but also its cash-thru-the-mail pulling power.

Be represented in RADIO WORLD'S National Radio Week Number, and reach the many thousands who actually want your goods and are ready and willing to pay for them.

EARLY COPY GETS BEST POSITIONS.

RADIO WORLD, 1493 Broadway, New York

Radio-Wire Tables

By Frederick J. Rumford, E.E., R.E.

No 4—Single Silk-Covered Wire

Showing the Number of Feet in a Pound and Fractions of a Pound

APPENDED is the fourth of a series of five tables which the radio amateur will find useful for many purposes. The fifth table—"Double Silk-Covered Wire"—will be published in an early number of RADIO WORLD.

Size	1/8 lb.	1/4 lb.	3/8 lb.	1/2 lb.	1 lb.
20	39	78	156	234	319
21	48	96	192	288	398
22	63	126	252	378	504
23	80	160	320	480	645
24	99	198	396	594	795
25	125	250	500	750	1004
26	155	310	620	930	1240
27	201	402	804	1206	1615
28	252	504	1008	1512	2023
29	328	656	1312	1968	2625
30	416	832	1664	2496	3335
31	477	954	1908	2862	3820
32	609	1228	2436	3654	4876
33	770	1540	3080	4620	6243
34	969	1938	3876	5814	7757
35	1207	2414	4828	7242	9660
36	1488	2976	5952	8828	11967
37	1684	3368	6735	10104	13474
38	2064	4128	8256	12384	16516
39	2782	5564	11128	16592	22261
40	3368	6736	13472	20208	26947

The following tables have already been published:

- No. 1—Enameled Magnet Wire, RADIO WORLD, No. 34, dated November 18.
- No. 2—Single Cotton-Covered Wire, RADIO WORLD, No. 35, dated November 25.
- No. 3—Double Cotton-Covered Wire, RADIO WORLD, No. 36, dated December 2.

American Radio Exposition Offers Prizes to Boys and Girls

IN order to stimulate interest in the wonders of radio among school boys and girls, prizes aggregating \$200 in gold and a few additional prizes other than cash are being offered by the management of the American Radio Exposition at the Grand Central Palace, December 21 to 30.

To the boy or girl in school or high school who enters in the contest the most ingenious home-assembled set of radio apparatus, a prize of \$100 in gold will be awarded. The second prize will be \$50 in gold; third prize, \$25; fourth prize, \$15; fifth prize, \$10. There will be also several other prizes worth competing for, including ten tickets of admission to the exposition for sixth prize; eight tickets for seventh prize, and six tickets for eighth prize.

To be eligible, contestants must be bona fide amateurs and bring their entry to the exposition to be exhibited. The parts may be home made or assembled and the ingenuity and original ideas embodied in such assembly will count as the chief factor. An inexpensive layout will have just as much chance of winning first prize as an expensive one.

Pupils of public schools, high schools and private schools within a radius of one hundred miles will be eligible. Special prizes for amateurs under twenty-one years of age, who are no longer in school, will be offered.

Prospective contestants must make their entry by letter (not in person) to the American Radio Exposition, 120 Broadway, New York, on or before Saturday, December 16, and they will receive particulars relative to exhibiting the apparatus. The management reserves the right to exhibit or not to exhibit any entries. A jury of competent impartial engineers in no way connected with the management of the Exposition will make the awards.

"The Fool" Broadcast

First Theatrical Performance to Be Sent by Radio from Stage

WHEN the Westinghouse Electric Company broadcast the performance of "The Fool" from the Times Square Theater, New York City, December 14, it was the first time in the history of radio that a theatrical performance was sent from the stage of a playhouse with the audience present and participating in the event. The Westinghouse folk sent a force of engineers to the Times Square Theater Monday to install apparatus. The broadcasting began at 8:45 with introductory remarks by Channing Pollock, author of "The Fool." Two or three important scenes were played, the intermission being filled by appropriate music sent from Newark. All this involved the use of three microphones—one in the basement of the theater for Mr. Pollock's speech, one in the footlights for the performance on the stage and one in Newark. The sending was absolutely synchronized, although from places miles apart. The story of "The Fool" begins in a fashionable New York Church on Christmas eve, and revolves around the determination of one man to apply the principles taught by Christ Jesus to his everyday living. The applause of the audience was heard all over the country.

National Radio Week Number
Out Next Week

To Harmonize Radio Activities

National Radio Chamber of Commerce Claims There Are Too Many Broadcasters and a Concrete Study Must Be Made

PLANS for the organization of chambers of commerce in the principal cities of the country as a step towards harmonizing, on a nation-wide scale, all radio instrumentalities—the efforts of which, because of the rapid development of the industry, are producing confusion and disorganization—are announced here by the National Radio Chamber of Commerce, 165 Broadway, New York City.

The first of these chambers, which will operate under charters from the National Chamber, will be established in Chicago. A meeting to discuss organization plans was held on Friday, December 8, at the Union League Club in that city. A national gathering of broadcasters will be summoned in Chicago to take up a national policy of broadcasting.

The National Radio Chamber of Commerce, it is said, has undertaken the leadership in this direction after conferences with the Navy Department, the Department of Commerce, the United States Bureau of Standards and other public and private agencies. Kenneth P. Gregg, of New York, one of the managers of the National Chamber, now in process of organization, will represent this body at the Chicago meeting. Establishment of a Chicago Radio Chamber, he said, was a link in a general plan to federalize the National Chamber by the formation of similar chambers in the cities comprising the nine regional districts into which the chamber has divided its activities.

With New York as the headquarters

of the parent body, Chicago has been selected as the starting point from which other chambers will be brought into being. Radio representatives from all over the country will attend the meeting.

Once the Chicago chamber is organized, it is planned to set up similar chambers in other cities of the ninth radio district, which, besides Chicago, includes Milwaukee, Indianapolis, St. Louis, Kansas City, Omaha, Denver, Minneapolis, St. Paul, Duluth, Louisville, and Davenport, Iowa. The States comprised in this area are Wisconsin, Indiana, Kentucky, Illinois, Missouri, Nebraska, Minnesota, Iowa, North and South Dakota, and Kansas.

This general plan, the organizers of the National Chamber believe, will accomplish an essential union of national and local effort. In this way, Mr. Gregg said, local interests will be conserved and property represented in the national body, under whose charter the regional chambers will come into existence.

In a statement issued by the National Chamber it was said that entirely too many radio stations are operating in this country. A great many of these are very small-powered stations. A concrete study must be made, it was said, to determine where these stations should be located, and what class of service they should broadcast without interference.

A study just completed by the National Chamber shows that the total area covered by broadcasting stations in the United States is 179,500,000 square miles.

**B C M
BROADCAST RADIO
RECEIVER**

Many people live in locations where an aerial is impossible. Others object to their premises being disfigured by poles and wires, and many doubt their ability to operate sets with such complications. Eliminate these features by using B C M Radio Frequency Broadcast receivers and inside aerial.

Dealers should write
B C M RADIO COMPANY
YPSILANTI, MICH.

**Those Football Returns by
Radio**

**Being a Stenographic Report of Them
as They Came from the Yale-
Harvard Game**

CROSS kicked off for Yale to Harvard's thirty-no-twenty-yard line—(Ray-y-y-y-y-y!—Hah-vud-d-d!—Hah-yud-d-d!—Ray-y-y-y!) Gehrke ran it back—huh?—wait a minute—that's right—Gehrke ran it back fifteen-no-about ten yards before he was downed.

It is now Yay-hul's ball—no—Harvard's ball—on Yale's—wait a minute—no—on Harvard's own 35—37—40—am I right, Eddie?—yard line—Rekety kex-ko-

ex-ko-ex; Reckety kex ko-ex-ko-ex-Yale! Yale! Yal-l-le! Harmon—no—Hammond—punted to whozatplayer—Joe—huh?—punted to Deaver—no—to Neidlinger on the (Band: Oompah-Oompah-to-rara-tah-tah-tum-crash-boom-tah)—Yale returned to kick—no thanks, Oscar, I don't care for Scotch—(Tremendous outburst of cheering: Yah-h-h-h-h—Yea-a-a-a-a—Hah-vud-d-d-d-d!—Hah-VUD-D-D—Yay-y-y-y!) and on a fumble by—huh?—whatzat, Eddie?—by one of his own men Hammond ran the length of the field—huh?—wait a minute—Owen ran the length of the field. (Deafening cheer: HAH-VUD-D-D-D-D! HAH-VUD-D-D-D-D!) kicked the goal—the score is Hahvudd seven—Yahul nothing—hey, Dick, give us a shot o' that, will yer?

"B" Batteries That Last for Five Years
Send for Catalogue

Sidbenel

RADIO EQUIPMENT MFG. CO
Dept. "B," 1633 JEROME AVE. NEW YORK, N. Y.

GLASS ENCLOSED GRID LEAK
Guaranteed
35c.

Values are constant. Resistances vary from 1/4 to 5 megohms.
Dealers and Jobbers: Write Us
LINCOLN RADIO CORPORATION
116 W. 65th St. Manufacturers New York City

THE ONLY GENUINE AND GUARANTEED

"All Wave" Coupler

TRADE MARK FLAT AND BANK WOUND

Wave Length, 150 to 3,000 Meters

Eliminates the use of all Variometers, Variocouplers and Leading Coils, inasmuch as it performs in one compact unit the functions of all of these devices combined.

For the Novice—The six efficient hook-ups given free with each "All Wave" Coupler enable the greatest novice to attain the same results attained by the expert in building the simplest, most compact and most efficient radio receiving set possible.

Be Prepared—For the higher wave lengths that have been and will be allotted to broadcasting stations because of their ever-increasing number. BUILD a set that cannot become obsolete.

Unusual Results Attained—Individual users of the "All Wave" Coupler have written us that in Rhode Island it is nothing unusual to bring in stations as far south as Havana, Cuba; while in Mobile, Alabama, Newark, N. J., is brought in daily.

Beware of Imitations—of the "All Wave" Coupler, which is guaranteed with a money back to operate as advertised. Look for the trademark, "All Wave," on the rotor, also the six efficient hook-ups in the box.

\$9.00 Six efficient Hook-ups sent upon receipt of 10c. stamps or Free with each "All Wave" Coupler

GUARANTEED WITH AN ABSOLUTE MONEY-BACK GUARANTEE
THOUSANDS OF SATISFIED USERS

Capitol Phonolier Corporation

Patents Granted and Pending
60 Lafayette Street
New York City





**Something Brand New
in Antenna Wire**

\$1.50 That will at once appeal to you. It is different and better than any makeshifts to date, being hard drawn from the finest copper having a corrugated surface with 10 collecting points on its circumference. This gives a greater collective and gathering surface. The result is extreme sensitiveness, and an increase in the range and clearness of any set from the simplest crystal type to the finest V. T. Receiver.

PER HUNDRED FEET

Packed in neat cartons of 100 feet, 200 feet and 500 feet.
Dept. C. Postage paid.

Xardell Corp.
UTICA, NEW YORK

There is time out for—hey!—where's that flask, Sid?—for injuries to a Yale—no—to a Harvard—no—to a Yale player—Cruikshank—no—O'Hearn. (Band: Umpah!-Umpah!-Ta-ta-ra-ta-ra-dum-la-ra)—is injured. Mallory—I mean Neidlinger—ran the ball back 10 yards by beautiful interference—got a match, Eddie?—by O'Hearn.

Jordan punted to Hammond on Yale's—I mean Harvard's—40-yard line—(Rah-h-h-h!—Rah-h-h-h!—Rah-h-h-h!—Yahull!—Yahull!—Yahull!). Somebody is hurt and there is time out—Hey, Damon, gimme a cigarette?—On the next play (Yay!—Whoohah-h-h! Wow-w-w-yah-h-h-h-cow-w-w-rey!) Gordon—no—Dunker—no, think it's Eastman—went through centre—no—left end for 10—no—for 8—no—for four yards. (Band: Tum-tah-ra-ra-ratum-tah-crash-boom-m-m!).

Somebody's hurt—where's that bottle? It is very cold here and a biting wind is sweeping across the bowl and—thanks!—here's the cork, Scotty—(Hah-vud!—Hah-vud!—Hah-vud!—Rah-Rah!—Rah!—Hah-vud-d-d!—on an attempted forward—no—on a fake kick—wait a minute—on a delayed pass Jenkins—no—Owen was thrown for a loss of ten yards—where's that flask, Bozeman?—the ball is now Yale's on Harvard's 15-yard line—no—that's wrong—just a minute (Rah-h-h!—Hah-vud!—Hah-vud!—Har-vud!—Reckety-kex-koex-koex—Yale!—Yale!—Yale!—Yale!) Harvard fumbled and the ball was recovered by—thanks, Eddie!—gurgle-gurgle-gurgle—by Lovejoy or Cross—wait a minute—the ball was (hic) recovered by A'Hearn—O'Hearn—A'Hearn (Band: Blam-blam-dah-dah-crash-bang)—H. I. Phillips in "The Globe," New York.

PATENTS

To the Man with an Idea

I offer a comprehensive, experienced, efficient service for his prompt, legal protection, and the development of his proposition.

Send sketch or model and description, for advice as to cost, search through prior United States patents, etc. Preliminary advice gladly furnished without charge.

My experience and familiarity with various arts frequently enable me to accurately advise clients as to probable patentability before they go to any expense.

Booklet of valuable information, and form for properly disclosing your idea, free on request. Write today.

RICHARD B. OWEN, Patent Lawyer
32 Owen Building, Washington, D. C.
2276-F Woolworth Bldg., New York City

Subscribe for **RADIO WORLD**. \$6.00 a year, \$3.00 six months, \$1.50 three months.

RADIO SALESMEN!

**A Rare Selling Opportunity
For Live Wire Men**

Handle Grewol Detectors in territories not opened.

Write for full particulars

RANDEL COMPANY

9 Central Ave. Newark, N. J.

Do You Like Clear Tone—Sharp and Distinct? If so try

MARSH'S

**Vernier Variable Condenser
AT LAST**

Made in Three Styles. Dial Knob and Screws Complete. Fully Guaranteed.

- 27-Plate @ \$4.00
- 23-Plate @ \$4.75
- 11-Plate @ \$4.95

Mail orders promptly filled.

F. P. Marsh, 145 Nicoll St.

NEW HAVEN, CONN.

TOBACCO HABIT BANISHED

QUICK, SURE, LASTING RESULTS

Tobacco Redeemer banishes the habit completely, almost before you know it. An absolutely scientific, thoroughly reliable treatment. No matter how long the habit, or in what form used, you will have no craving for tobacco after you take this pleasant, inexpensive treatment. This we positively guarantee. Your money returned without argument or question if not satisfied. Write for free explanatory booklet and proof of what Tobacco Redeemer has done for men addicted to the tobacco habit. Send post card or letter today.

Bowen Pharmaceutical Co., Dept. 971, St. Louis, Mo.

PRICES SMASHED

Each sale has created new friends and customers with the result that we now announce drastic reductions in our quality lines. All goods prepared. Send card for complete price list. You'll be surprised. You'll tell your friends. A simple saving follows:

REGENERATIVE VACUUM TUBE SET		
Approximate range—1,000 miles.		
	Our Price	Others
Panel—Bakelite—7"x12" drilled.....	\$1.75	\$2.50
Cabinet of 3-ply wood to fit panel.....	1.50	2.50
Two dials—each \$5c.....	.70	1.40
10 switch points with nut. Ea. 1c.....	.10	.40
4 switch stops with nut. Ea. 1c.....	.04	.12
8 binding posts. Nickel plated @ 3c.....	.24	.48
2 switch levers @ 35c.....	.70	.90
1 silver sheet.....	.05	.10
1 silver sheet.....	.05	.10
1 20 plate variable condenser.....	1.95	3.00
1 tube socket—Bussard.....	.45	.85
1 grid condenser and leak.....	.10	.20
1 phone condenser.....	.10	.20
1 tube socket support.....	.10	.20
15 feet spaghetti tubing @ 4c.....	.60	.84
15 feet copper connecting wire.....	.30	.45
Blueprint showing details to assemble.....	.10	.25
	\$11.42	\$20.12

Other articles taken at random from our late price list are—

Detector tubes—Cunningham—NOT rebuilt.....	\$5.00	\$5.00
Transformers—Audio frequency.....	2.05	4.50
Transformers—Hardwood starters 4 1/2".....	2.25	4.00
Front Panel—4000 ohms.....	3.00	5.00
Kellums—2400 ohms.....	3.75	5.00
Western Electric 2500 ohms.....	0.25	12.00
Blueprints giving detail of 3 step amplifier or regenerative receiving set.....	.10	.25
Two step amplifier—knocked down.....	12.00	25.00
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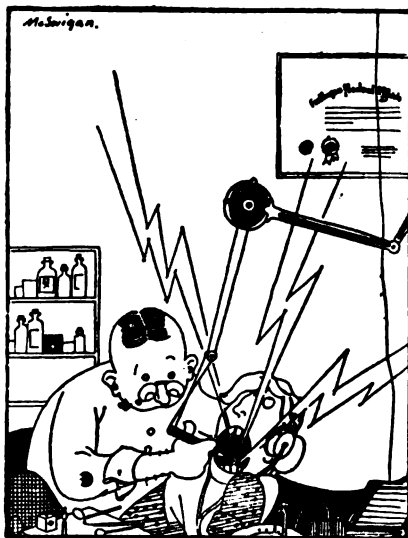
Send for list today or order direct from above. Goods sold subject to return for rebate or exchange. YOU MUST BE PLEASED.

Radio Parts Manufacturing Co.
15 Park Place West Detroit, Mich.

Broadcast Bill's Radiolays

By William E. Douglass

DOC McDOUGALL (he's our dentist) thinks a lot of me; an' Doc, he's wise on sev'ral things besides plain dentistry. Why, me an' him will sit for hours discussing radio. Course, I'll admit I ain't no whizz but what I'd like to know is how he kin remember all of that there highbrow talk with oscillatin' heterodynes, he beats me at a walk. Not long ago he says to me in kind a braggin' way, "Well, Bill I got Havana with my outfit Saturday." He's got a fairly decent set of which he's pretty proud. It took him down a peg when I saz, "Yes, they come in loud." But all the same Doc's waitin' room is strictly up to date, an' while you're parked there in a chair bemoanin' unkind fate, his office girl will offer you a pair of them receivers. These doctors have some clever tricks (the bunch of "gay deceivers"). She helps



"Doc got out his tools an' started diggin' in my jaw."

you put the harness on, an' then adjusts the phones, so while you're listenin' you can't hear his other patient's moans. Doc says that this new stunt of his keeps 'em from gettin' nervous, and when they're calm an' peaceful he san give 'em better service. The other day my tooth ached so, I thought I'd stop an' see, when I went down to get the mail, what Doc could do fer me. I had to wait a while outside before he called me in, and all the time my blamed old tooth wuz hurtin' me like sin. When he began to work on me he sez, "I s'pose you know, my patients always have their choice—some gas or radio." Then, lookin' at the clock, I saw 'twuz quarter after three. "Let's get the latest tunes," I sez, "from station JAZ." So Doc got out his tools an' started diggin' in my jaw. I asked, "How far you goin'?" and the band played "Arkansas." "That's far enuff," I sez, and groaned. The set kept right on hummin'. Doc laffed an' sez, "I think they'd ought to play 'The Yanks Are Comin'."

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No Free List

RADIO WORLD has no free list. The only copies sent out by the publishers are to fill the ever-increasing orders of the American News Company, the large numbers of subscription orders received at the office of publication, and one voucher copy to each advertiser and advertising agent represented in current issues.

RADIO WORLD, 1493 Broadway, N. Y.

A Partial List of the Impressive Array of Exhibitors at the

American RADIO Exposition

The Official Exposition
for American
Manufacturers

Grand Central Palace
New York

December 21st to 30th

(Sunday excepted but Christmas Day included)

- Western Electric Co., Inc.
- Radio Corp. of America
- National Carbon Co., Inc.
- General Insulate Company
- Parent Electric Company
- DeForest Radio Tel. & Tel. Co.
- Sleeper Radio Corporation
- C. Brandes, Inc.
- Sound Wave Corporation
- J. Burgess Davis
- Davis Radio Company
- Hutchinson Radio Company
- Manufacturers Patent Company
- Novo Manufacturing Company
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- Clapp-Katham Company
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- American Radio Relay League
- Coto-Coll Company
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- Ferl Radio Mfg. Co.
- Bel-Canto Corp.
- Tait-Knob Dial Co.
- Ackerman Bros. Co., Inc.
- Electrical Record
- Experimenter's Information Service
- American Radio & Research Corp.
- Executive Radio Council, 2nd Dist.
- National Radio Chamber of Commerce

The Exposition is being organized with the endorsement of the NATIONAL RADIO CHAMBER OF COMMERCE and sanction of the Radio Apparatus Section of the ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES.

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 (Mention RADIO WORLD)

Answers to Readers

Is it possible for me to change my set (diagram enclosed) so that I can get further distances without spending money for an entirely new set?—Leslie Roberts, New York City.

By putting variometers in your plate and grid circuits you can make your set regenerative and increase your range. This is the easiest way unless you wish to add radio-frequency amplifiers. According to your diagram you are not using any transformer between your detector and your second bulb; therefore we don't understand how you can get any amplification.

I enclose diagram of my apparatus, which consist of following: loose-coupled tuner, crystal detector, and phones. I wish to hear concerts coming from Cuba. Can I accomplish it?—Alonso Aheirs, New York City.

Absolutely not. In order to receive that station, as well as any of the other radio-telephone stations located at a distance greater than 30 miles (approximately) from your home, you must employ a very sensitive bulb set. There are a number of good ones on the market.

I recently purchased a receiving unit, and, at the advice of the salesman, put a variable condenser in my aerial circuit. When this is turned over a certain spot I get a loud and troublesome click in the loud-speaker. Explain the trouble.—Joseph Turner, Laredo, Texas.

From the way in which you explain your trouble it is evident that your condenser is "shorted" (short-circuited). Take the condenser to the store where your purchased it and let them look it over and test it out.

Publish hook-up of set using one stage of radio-frequency, detector, and two stages of audio-frequency in connection with set using

A SURPRISE FOR XMAS

VARIOCOUPERS 65c

With every one sold, we will give a hook-up for using the variocoupler with one tube, which others are using with good results for receiving from 250 to 300 miles.

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4-WAY TELEPHONE PLUG

Takes the Place of 2 Plugs and a Jack—\$1.20

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Phone Columbus 8584

Broadway-7th Avenue Subway
6th or 9th Avenue L.

variometers, vario-coupler, and 43-plate condenser.

You will find a treatise, as well as two hook-ups, in RADIO WORLD, No. 37, dated December 9, under the heading "Why Radio-Frequency Amplifies Signals," by Donald Van Wyck.

I have a two-step amplifying set. When I turn on my second step I am bothered with a howl in my phones and loud-speaker. How can I remedy this?—Charles Peters, Liberty, N. Y.

Try putting your amplifying transformers at right angles to one another and shielding your bulbs with some light screening

(Continued on next page)

The Latest and Most Essential Part of an Efficient Tube Set



Variable Grid Leak and Micon Condenser (Combined)

Obtainable in an unbroken range from zero to 5 megohms—all intermediate points. Fixed capacity—.00025 M. F. Improves your set wonderfully by

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Have You a Friend Who Is Interested in Radio as an Amateur or a Fan?

If so, you must know that such a friend would welcome a yearly subscription for RADIO WORLD from you. Send us \$6.00 and we will place the name of your friend on our mailing list for the coming year, and also we will send a special notification to your friend to the effect that RADIO WORLD will be sent for 52 weeks to his address with your compliments. Send in a yearly order, so that the first copy and our acknowledgment of your courtesy to your friend will be received before Christmas.

Address: Subscription Department, RADIO WORLD, 1493 Broadway, New York, N. Y.

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1493 Broadway, New York, N. Y.

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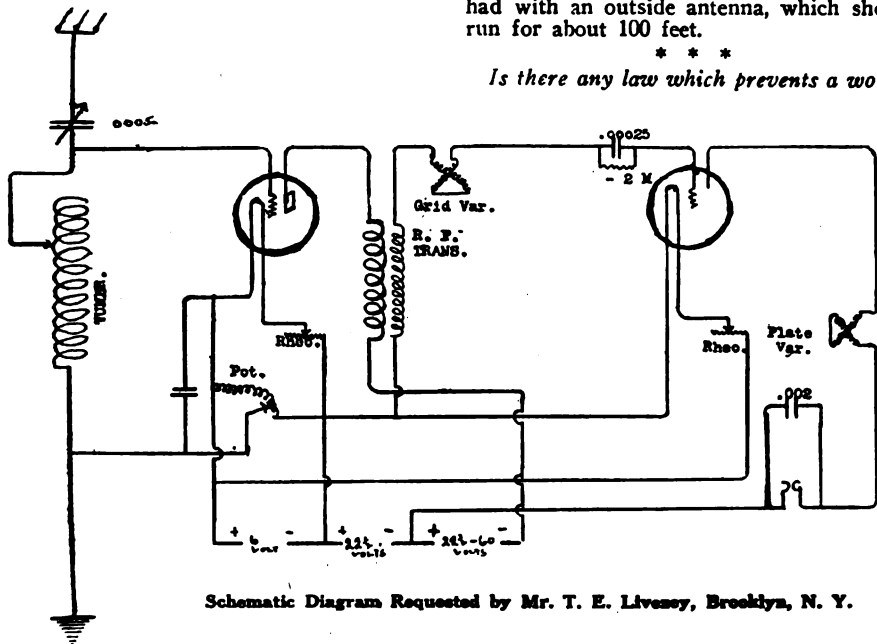
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Answers to Readers
(Continued from preceding page)

made in the form of a cone. Maybe you are using too much B battery. Try reducing it. Don't burn your detector bulb too high. Go over the wiring of your second step to see if you have made any errors.



Schematic Diagram Requested by Mr. T. E. Livesey, Brooklyn, N. Y.

Kindly publish diagram of tuned radio-frequency, showing all values. Can a set of this kind be combined so as to incorporate the units of a regenerative set that I have?—T. E. Livesey, Brooklyn, N. Y.

We publish herewith the diagram you request. You will notice that we are using two variometers and tuner. If you will refer to the article in RADIO WORLD dated December 9 you will find a full treatise, as well as two very fine hook-ups, by Donald Van Wyck. You can use this hook-up as you suggest, but it will necessitate rewiring all of your set, as all the wiring will have to be made as short as possible for the highest efficiency.

I have a crystal set, but do not get signals loud enough. Could I add an amplifier to bring them in better?—S. Wolkin, New York City.

You could, but it would not be advisable. Why not build a bulb detector and amplify it from that? A crystal is not steady enough.

Why can't I use iron wire on a tuning coil? Iron has more resistance than copper. Are telephones wound with resistance wire?—James Oakley, San Antonio, Texas.

It is not resistance that you want, but inductance. This cannot be obtained with iron. Telephones are wound with very fine copper wire. No. 40 is used mostly. Some

firms selling a cheap phone have tried using German silver; but you cannot get the phones so treated to work, as the internal resistance of both German silver and iron wire dissipate the minute energy in heat.

Is it necessary to have an outside antenna for use with a crystal set? How long should it be?—Jerome Llayng, Port Chester, N. Y.

With a crystal set better results will be had with an outside antenna, which should run for about 100 feet.

Is there any law which prevents a woman

from applying for a radio license? What is the best type of receiving apparatus? Where can they be purchased? Do I have to apply for a license before I can purchase my apparatus?—Miss A. Winterbottom, New York City.

There is no law preventing anybody, male or female, from getting a license to operate a radio-transmitting station. The only limitations are that the applicant know the laws pertaining to radio, and transmit and receive signals at a fair rate of speed (10 words per minute). The best type of receiving apparatus is a regenerative bulb set. Follow the advertisements in RADIO WORLD. A license is not necessary in order to operate a receiving station.

5 Instruction Books of the RADIO READING COURSE \$1.97

Learn how to design, construct, install, operate and maintain all kinds of radio apparatus. No tedious study. A complete radio education. Course edited and approved by Prof. J. N. Mercereff. Up-to-date, accurate, complete. SEND NO MONEY. Just send your name and address and pay postman only \$1.97 and you own this five-book Radio Library. Write today, Dept. RW4.

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Everyone is Because
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Your dealer should know, but if he does not, send direct to
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Western Electric Phones	\$7.95
Made for U. S. Government with Ear Mufflers and Extra Caps.	Special
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Also the names of your president and other officers. We want to add these to a list of radio clubs and officers we are preparing for publication in an early issue. RADIO WORLD, 1493 Broadway, New York.

Attention! Fans and Amateurs!

Have you built your own receiver?
Are you experimenting with any particular hook-up?
Are you improving your set?
Are you doing any interesting constructive work in radio?
Why not share this knowledge with your thousands of brother fans who read RADIO WORLD every week?
We want pictures of receiving sets with descriptions of how you overcame some difficulty, or of any additional part or unit that you have added to obtain better results. These are the things that, probably, the other fellow is looking for. Send in your information; pictures or whatever you have done to improve the art.

Remember the beginner is looking for them.
We intend to print in this paper, each week, pictured information and description of value to radio amateurs. If you have found a newer or better way of doing anything, don't keep the secret but tell it to your thousands of brother fans.
Send in a photograph of your set with or without accompanying diagrams and measurement. State whether you figure in the picture yourself, or not, and without any expense whatsoever to you we will make an engraving and publish it. Be sure to write your name and address plainly on photograph.
Send in your picture at once, or if you have not made a set or done anything else in making radio material, tell the boy next door all about this offer.

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 All on 3 Tubes
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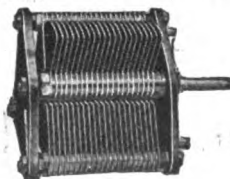
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Take the middleman's profit and selling costs for yourself. We sell you direct. These extremely accurate instruments made by experienced condenser people are minus the decorative frills that add to cost. Price reduced to rock bottom without sacrificing quality in the least. Satisfaction or your money back. Write today for very interesting circular.



PRICES:
 21 Plate
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 Complete with Mounting Screws

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No checks or money orders needed. Pay postman. Send the order TODAY, enclosing 5 two-cent stamps to cover mailing cost and receive your condenser in a day or two.

MANUFACTURERS' RADIO ASSOCIATION

90 East Kinney St. Newark, N. J.

That Armstrong Circuit

So much interest has been displayed in the special article, "TESTED INVENTION OF MAJOR ARMSTRONG AMPLIFIER SET 100,000 TIMES," by John Kent, that appeared in RADIO WORLD No. 13, dated June 24, 1922, the publisher decided to put aside a number of copies for those who were not able to get this issue when published. Copies will be sent, postpaid, on receipt of 15c, or send in your subscription, \$6.00, for one year (52 issues), \$3.00 six months, or \$1.50 three months, and subscription will be started with the issue containing the article about Major Armstrong's Amplifier.—RADIO WORLD, 1493 Broadway.

QRM Preventers

SMALL BOY—"Say, mister, you remember you sold me a set last week?"
Salesman—"Sure, sonny; what's the trouble?"
Small Boy—"Well, I put up an aerial outside my window, and I got the wire coming in through the top. Do I have to keep my window open to get signals? It's gettin' awful cold now."

clock. Sure they work, especially when the clock needs winding, and they make the chimes ring." "A single wire is best." "Use two wires at least seventy-five feet long." "It should be at least one hundred and fifty feet long." "The best aerial is an indoor loop." "Why put up an aerial when all you need is a bed-spring."

One of our subscribers claims he has found a novel way to keep his wife quiet for an hour at a time. It is this: Tune in and get the station that is broadcasting the latest fashions. She becomes so interested in it that she forgets to ask him why he stayed out so late the night before.

First Night of the Set

AND do you really get wireless messages with that thing?"
 "What's that funny whistle? Sounds like a bird."
 "How much longer are you going to charge that battery?"
 "How is my tone?"
 "This will conclude the evening concert."
 "Vy.QSA hr can hear u all over the house."
 "Does the lamp light when a message comes in?"
 "What does all that funny buzzing mean?"
 "Why do you call him O.M.?"
 "Why do you turn all those knobs?"
 "Isn't it wonderful?"
 "How can more than one talk at a time?"
 "Guaranteed twenty-five per cent. more power in the aerial."
 "How do you get me now, George?"—
QTC.

Times Have Changed

WHERE is the boy—the family pride and wonder—who used to be called on to exhibit to all the neighbors and callers the set that "He made all by himself!" and then would show a table filled with a lot of useless switches, doodads, polished brass, and a score of different knobs?
 Like the old Negro's horse and buggy, he "jest ain't no mo."
 In his place you will find the efficient young man who talks fluently about "radio-frequency," "superheterodyne," "CW," and whose set is an efficient regenerative tube-circuit with which he is hearing over half the world.

A Record for WGE

WGE, "The Constitution," Atlanta, Georgia, was picked up on December 5, by the radio operators of the fleet of destroyers of the United States Navy, cruising off the coast of the State of Washington. The distance is over 2,600 miles, and establishes a record for WGE.

Telling the Beginner

FOUR wires or nothing make your aerial a matter of pride and not a personal regret." "Oh, shucks, Charlie, such advice! Don't take a bit of notice. Do what I'm doing, and connect up your set with the springs on grandfather's



GIVE A SPIROLA CHRISTMAS!

and let the whole family listen to REAL MUSIC all the year through! Nothing adds so much to a two-stage set as a high-grade loud speaker. SPIROLAS are

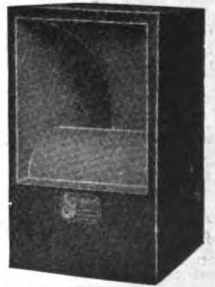
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REAL CABINET TYPE—not just the usual horn enclosed in a cabinet. Powerful, beautiful, with an INCOMPARABLE TONE. We make a complete line—of the highest class construction throughout, with fine hand rubbed finishes. SPIROLAS are and have always been sold under money-back guarantee to equal in volume and far surpass in beauty and tone any other up to twice their price.

- SPIROLA DUPLEX—for use with any headset. Separate tone chamber for each phone, eliminating interference. Satin black finish, nickel-plated fittings (DB)..... **\$3.85**
- Oak (DO) or mahogany (DM) finish, bronzed throat..... \$4.85
- SPIROLA SIMPLEX—for use with Baldwin or other unit. Black (SB), oak (SO) or mahogany (SM) finish, same prices as DUPLEX.
- SPIROLA CONCERT—complete with built-in unit and cord ready to attach in place of phones. Oak (CO) or mahogany (CM) finish, bronzed throat..... \$12.50

At dealers or postpaid (C. O. D. if preferred). If desired we will send in holiday packing direct to recipient, carefully following your instructions. DEALERS—We can fill holiday rush orders!

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- Marvelous wrinkle remover and cleanser..... \$4.00
- Amber Royal Perfume..... \$1.00
- Eye Lash Grower..... \$1.00
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Mme. Kanti's wonderful preparations have been the favorite for years and used by the famous beauties of both Paris and New York.

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STANDARD HEADSET
2,500 OHM

Guaranteed to be equal of any phone on the market listing at \$3.00. **\$5.75**

Dealers and jobbers write.

Standard Electric Sales Co.

343 Broad Street Newark, N. J.

Junk your common detector spring or catwhisker and
INCREASE YOUR CRYSTAL RANGE
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Price, with instructions, twenty-five cents.

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ASSOCIATE EDITORS

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What a Real Spider's Web Did

RADIO engineers employed by the "Post-Intelligencer," Seattle, Washington, to discover the cause of the erratic transmission from that newspaper's broadcasting station finally discovered a spider's web near the top of one of the poles—a spider's web covered with carbon from soft coal. Swayed by the wind, the web had been swinging against the antenna wires, causing momentary short circuits which had disturbed the transmission.

With Mr. Ehlert's Hook-Up

EDITOR, RADIO WORLD:—I am getting fine results with the hook-up of Fred. Chas. Ehlert which you published in RADIO WORLD, No. 27, dated September 30. To anyone desiring good, clear concerts, I heartily recommend this hook-up. With it I have received Havana, Cuba; Washington, D. C.; and twenty-two States, including Texas, Iowa, Nebraska, Florida, Illinois, Missouri, Massachusetts and New York.—T. J. Bowman, Altavista, Virginia.

Tri-Boro Club News

THE Tri-Boro Radio Club, Parnassus, Pennsylvania, holds regular meetings at the Lindsay Radio Shop in that city. The members are working for the welfare of the community as well as in the interests of radio. All amateurs in the Tri-Boro observe the "quiet hour" from 7 to 10:30 p. m. The officers are: Clyde Hichew, president; R. E. Lindsay, secretary; C. R. Ackliss, treasurer.



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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

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A VALUABLE RADIO LIBRARY—The special articles in back numbers of RADIO WORLD from April 1 to date, make an invaluable library of information and reference for everybody interested in radio. Single copies 15c each. Any seven numbers for \$1.00. The entire thirty-seven numbers to date for \$4.25. Our issue of Oct. 18 contains a list of articles published up to that date. Sent on receipt of 15c. RADIO WORLD, 1493 Broadway, New York.

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Conference on Radio Standardization

Bureau of Standards Calls Important Meeting to Be Held in New York City, January 12, 1923

THE Bureau of Standards of the Department of Commerce has called a conference on radio standardization to be held on Friday, January 12, 1923, in New York City. The desirability of calling a general conference on radio standardization has been apparent in many ways. This call is issued by the bureau at the specific request of the following

associations and organizations: Institute of Radio Engineers; National Radio Chamber of Commerce; Radio Apparatus Section, Associated Manufacturers of Electrical Supplies; National Retail and Dry Goods Association; American Radio Relay League; Radio Corporation of America.

These organizations have pointed out that there is need for greater uniformity in the methods of describing, rating, and testing of performance of radio apparatus.

Invitations are being issued to all of the national associations of an engineering and technical nature which are known to be interested in radio standardization.

The representation of radio manufacturers will be through the trade associations of which they are members. While it is desired to make the conference thoroughly and broadly representative, it is expected that the organizations invited will limit their representation to one or two persons in order that the conference may be as effective as possible.

The purpose of the conference is to consider broadly (1) whether a formulation of standards for radio apparatus and service shall be made; (2) if so, what general classes of apparatus or service should be included, and (3) what procedure shall be recommended for carrying out the conclusions reached by the conference. If the conference decides that radio standards should be formulated, it is expected that they will be prepared with special consideration of the wide range of interests which are concerned with the subject, and that these standards may ultimately be adopted with the approval of the American Engineering Standards Committee as an American Standard.

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Dealers: Order through your jobber or write direct for names of authorized distributors.

DICTOGRAPH PRODUCTS CORPORATION

220 West 42d Street (Branches in all principal cities) New York, N. Y.

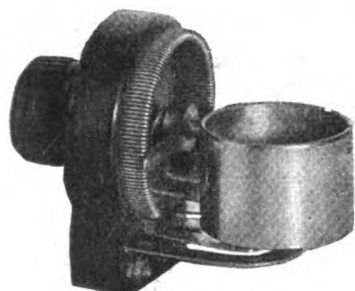
List Price
\$20



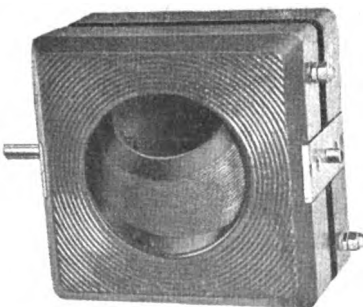
Note: Plans are now under way for the production of the new 4,000 ohms Dictograph SUPER-TONE Headset, the most perfect radio head set that can be made. For the most delicate work, the most exacting requirements. A new standard of super-sensitive-ness! List price, \$12.00.



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A device for which amateurs and professionals have long been waiting. Eliminates wiring between socket and rheostat. List..... **\$2.00**



Keystone Moulded Variometer
Made of a special composition—extremely light in weight and durable. Wave length ranges from 150 to 580 Meters. Terminals conveniently arranged to afford easy connections and avoid crossing terminal wires. Rotor and Stator windings guaranteed not to loosen. Brush type contacts. List each.. **\$5.00**

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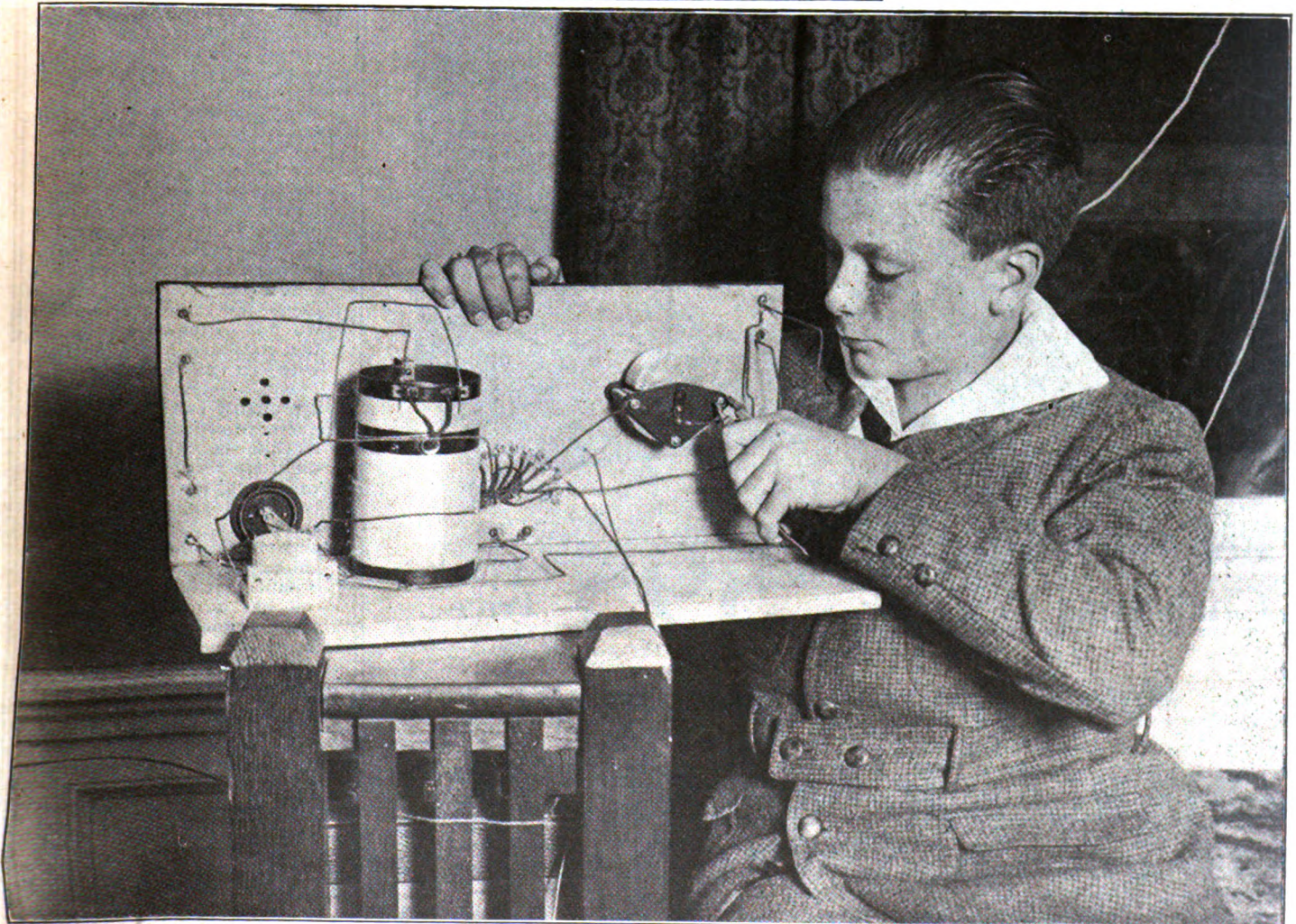
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Make a New Radio Fan This Week!



(C. Kadel & Herbert)

David Orgain, thirteen years old, and the prize regenerative set he built at little cost (See Inside for Details)

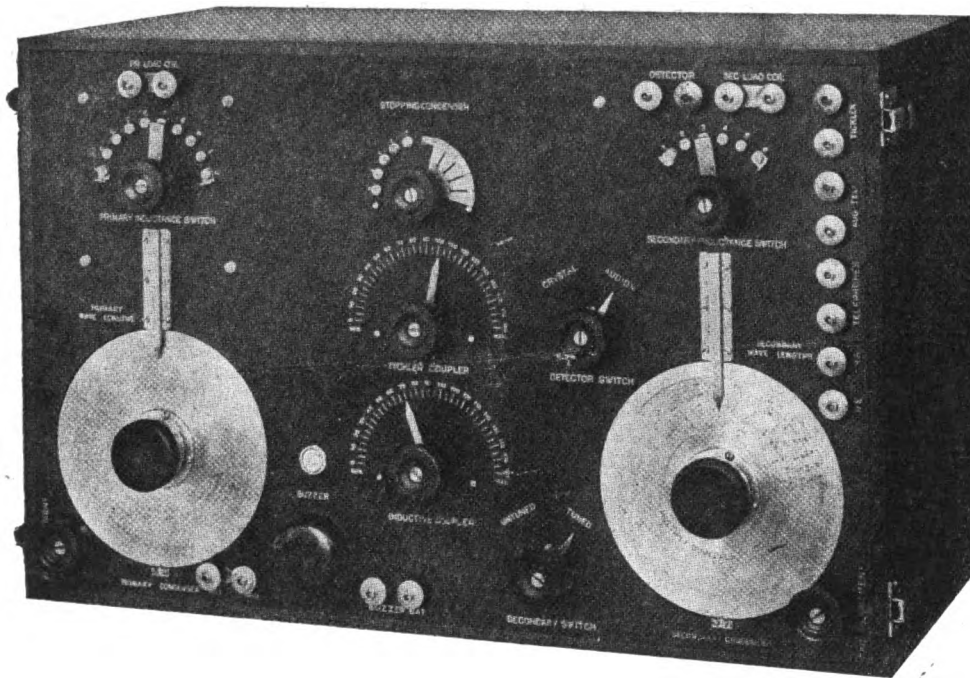
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Is The Rolls-Royce of Radio Gives Exact Tuning to Any Distance

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This De Luxe U. S. Navy Type Radio Receiver must not be confused with instruments selling for from \$200 to \$300. Highly selective. Will pick up messages, music, lectures, etc., that lower-priced instruments will not hear.



Detail Description

THIS receiver is equipped with binding posts which are normally short circuited for 300 to 6800 meters by which wave lengths up to 23,000 meters may be received by the attachment of loading coils. Capacities of proper loading coils for above are: Primary 50; Secondary 50; Tickler 30 millihenries. While the receiver is provided with a "standby" or untuned circuit, it also has an unusual degree of selectivity. Although primarily designed for the more advanced fields of Radio work, or the laboratory, the simplicity of arrangement and beauty of finish make it unusually desirable for the radio club or for the individual who desires the finest equipment obtainable for his home or office. In the receiver, Bakelite tubes, threaded, provide the forms on which inductance coils of high frequency cable are bank-wound. After assembling, the coils are impregnated with an insulating compound, in vacuum, and thoroughly baked. The inductance switch controls a mechanism whereby the different sections may be connected, completely disconnected and opened, or completely disconnected and individually short circuited. This arrangement is important for, by it, each coil has a natural period when connected which is less than the shortest wave length in the receiver's range. The reception of parasitic signals is overcome, the absorption of desired signals by the coils is minimized, more energy is forced to the detector and on all wave lengths the interference is reduced.

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VOLUME TWO OF
RADIO WORLD

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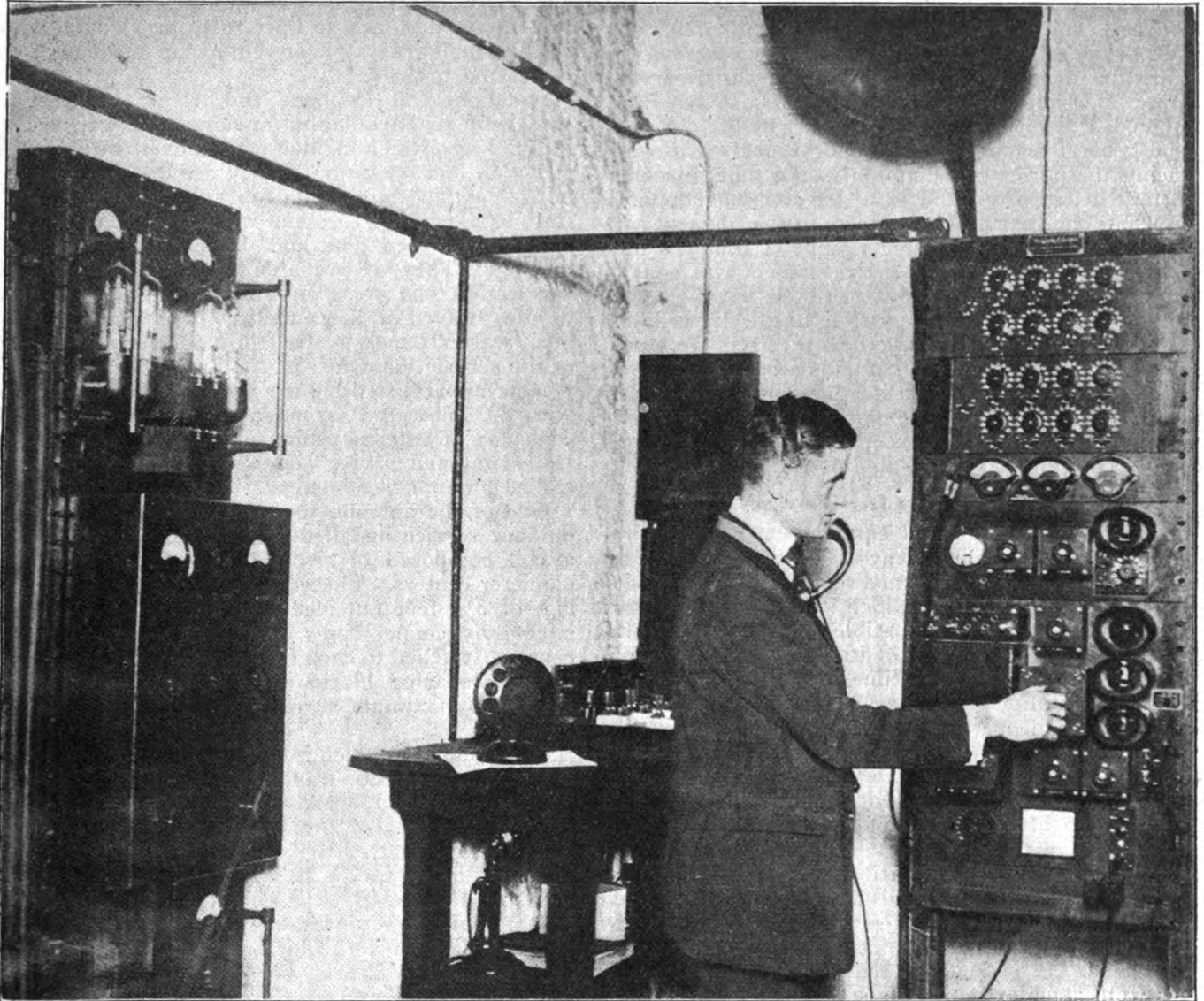
A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. II, No. 13. Whole No. 39

December 23, 1922

15c. per copy, \$6.00 a year

To Catch Every Whisper in Congress



(C. World Wide Photos)

Sound-proof room in basement of the Capitol, Washington, D. C., in which is located the most remarkable speech-amplifier in the world. The room is free from all outside noises—but no syllable of the legislative speakers can possibly escape it.

THE public-address amplifier-control-room in the United States Capitol, Washington, D. C. A startling title! It is in this room that all the speeches in the various committee rooms and clerks' offices are amplified and are carried over wires to any part of the capitol and through outside lines to any part of the country—perhaps, all over the world! On the right-hand side of the room are the power-speech amplifying tubes and controls, with the loud-speaker above, so that the man in charge of the

apparatus may tell if the spoken words are going out without interference. This is the most complete speech-amplifying apparatus ever installed. Up above, on a level with the operator's head, are the complicated resistances used to prevent the least distortion of speech. On the other side of the room are the tubes and controls for broadcasting through the agency of the radio station at Anacostia. In order to prevent any mistakes the circuit over which the speech is amplified can either be used to talk to or from

any of the rooms. If you will glance at the tubes used on the speech-amplifier you will notice that they are completely shielded to prevent outside interference. The meters directly over the tubes permit the operator to tell at a glance the conditions along the entire line of wires and apparatus used. By use of anti-capacity switches and jacks he can immediately switch from a faulty microphone to a reserve microphone without as much as losing a single syllable of "Man of the People," who is doing the talking.

How Radio Advanced

A Record of Progress

IMPORTANT progress was made during 1922 in the design and manufacture of radiotelephone and radiotelegraph apparatus both for commercial and amateur purposes. The sale of amateur equipment made a spectacular increase, due to the sudden aroused interest of the public in the new application of radio to broadcasting.

The line of standardized component parts which had been originally designed for commercial purposes was later produced for the amateur. Broadcast receivers were built, making use of these parts and a line of sectional units, such as the tuning unit, the 3-stage radio-frequency amplifier-unit and the detector-amplifier unit were developed. The main idea in these sets was the production of receivers, each of which would serve a definite function separately, and could also be easily combined.

The general tendency in receiving tubes was toward reducing the power consumption in the tube filaments. The first attempt resulted in a detector and amplifier tube using one-fourth of an ampere in the filament; superseding one previously using 1 ampere. Later, a tube using only 60 milliamperes for the filament was equally successful.

These new tubes made it possible to use dry cells for the filament excitation and two new receivers were produced. One, a portable set, contains a sensitive tuning system, a detector and single-stage audio-frequency amplifier. The other set is similar in its electrical characteristics to the first one, except that it has two stages of audio-frequency amplification instead of one.

New Sets That Receive from Foreign Lands

In the line of commercial equipments, new requirements were met, due in many cases to broadcasting. In one case, a power company sought a duplex radio telephone installation with which it could provide during times of storm against possible interruption of communication between several of its stations seventy-five miles apart. At the same time, signals from nearby broadcasting stations operating on 360 meters were not to interfere with operation of this station on the only available wave length of 400 meters. The set was to be operated through remote control from a desk-stand by the regular powerhouse switchboard operators and to require no attention except that usually given to such moving parts as motors and generators. This set was installed and is operating successfully.

For the use of amateurs and for installation on small boats and yachts, there was produced a small radiotelephone transmitter having an output of 20 watts in the antenna. It is built so that it may be operated either from a motor generator set or from a kenotron rectifier which was designed for this equipment. It also may be used on a telegraph transmitter, either continuous wave or interrupter continuous-wave.

A new tube attachment for converting spark transmitters into vacuum-tube continuous-wave transmitter makes it possible for owners of spark sets to realize the advantages of continuous-wave transmission at a minimum cost. It has an output in the antenna of approximately $\frac{1}{2}$ kilowatt continuous-wave and a wavelength range from 200 to 2,400 meters. It utilizes the power equipment and high-potential transformer of the spark transmitter and includes necessary switching apparatus so that communication can be transferred from the spark set to the tube attachment.

This equipment makes it possible not only to carry on communication with stations now listening in on

2,200 meters, but to carry on communication over much greater ranges with a 2-kilowatt spark transmitter. During actual service tests conducted with one of these transmitters, a range of 1,500 miles daylight, over water, was realized.

An aircraft transmitter was constructed for telegraph communication only with a continuous wave output in the antenna of 300 watts. Provision was also made for interrupted continuous-wave telegraphy. The transmitter was designed to operate from a double current stream line generator driven by an automatic speed regulating propeller.

A number of telephone and telegraph transmitters were built for installation on submarines of the United States Navy which include many novel features of construction and operation. They are designed for transmitting either on the flat-top antenna or a loop, and include a break-in system whereby the operator can listen-in between dots and dashes of the transmitted message. They are available for three methods of communication and have an output of 600 meters, continuous wave, in the antenna. The complete equipment was extremely restricted in dimensions on account of the service for which it was built.

New apparatus designed and manufactured for use with 200-kilowatt Alexanderson alternator equipments consisted of antenna-tuning inductances, remotely controlled antenna wave-change switches and remotely controlled antenna-variometers.

One of the antenna tuning-inductances designed for outdoor service installed at Radio Central Station has a coil composed of ten vertical supports on 82-foot diameter centers. These supports are of porcelain tubing, of $3\frac{1}{2}$ feet outside diameter and are held semi-rigidly by copper rings on the inside of the vertical tubes. Attached to each of the ten vertical supports are fourteen spacing blocks which are so designed as to provide a maximum surface-creepage-distance between turns.

The conductor which is wound in grooves of the spacing blocks is of 686 strands of ten mil-diameter copper wire, each strand insulated with enamel. Varnished cambric and treated braid on the outside provide insulation and protect the conductor from the weather. The total inductance is 19 millihenries.

Ten of these coils were furnished with two 200-kilowatt alternator equipments for the new radio station near Warsaw, Poland, which is being built by the Radio Corporation of America.

Material for four coils of the same general design, except that six vertical supports on 65-inch diameter centers are used, is being furnished for the Radio Corporation's station near Bolinas, California.

Remotely controlled antenna wave-change switches are to be mounted adjacent to the tuning inductances described above, and will be used to change the number of active turns in the inductances.

Ten of these switches were furnished with the two alternator equipments for the Polish station. They will be located at various distances up to more than a mile from the generating station, the point from which they are to be controlled.

In the operation of remote controlled antenna variometers for indoor service, means for remote control from switchboard and hand control at the variometer were provided.

During the Year 1922

By *John Liston*

General Electric Company

These variometers are connected in series with 200-kilowatt Alexanderson alternator, feeding energy to multiple tuned antennae. They are used to maintain close adjustment of antenna tuning, particularly when antenna capacity is varied by wind and sleet. Porcelain supports are used throughout for all parts connected in circuit and the conductor is composed of 4,270 strands of five-mil copper wire, each strand insulated with enamel. Varnished cambric and treated braid form the outside insulation.

Due to the high-intensity high-frequency electromagnetic field produced by the windings, no metals of any kind are used inside the windings. The top supports of the framework are of brass. Iron pipes attained high temperatures at fractional load in the windings. Closed circuits in the pipe framework are broken up by suitable insulators to prevent circulating currents.

The stationary and movable windings may be connected in series or parallel. The average range of inductances in series connection is .19 to 1.1 millihenries. Maximum coupling averages 50 per cent.

A new method of recording and reproducing sound was developed, which is a distinct improvement in many ways over all previous methods used and opens up several entirely new fields of application. It is known as the pallophotophone.

There are two distinct devices in the pallophotophone—one for recording and one for reproducing the sound—and either may be used independently. The

recording device consists essentially of a tiny mirror on which is reflected a beam of light. This mirror is attached to a delicately vibrating diaphragm and when sound waves cause the diaphragm to vibrate, the mirror oscillates and the ray of light causes projection of corresponding oscillations upon a strip of photographic film which passes in front of the mirror in a continuous motion.

The film is then developed in the usual way and shows a succession of delicate dark markings which constitute the sound record.

In the reproduced device, the film passes in front of an arrangement of vacuum tubes which are sensitive to light so that the variations in the light falling on them caused by the lines recorded on the film produce electromotive force variations in the circuit in which they are connected. Therefore, as the film is moved in this device the electric current is actuated, which corresponds with great accuracy to the original sound wave. This electric current can be made to actuate a telephone loud speaker or to operate radio broadcasting apparatus directly.

The Largest Vacuum Tube and Its Wonders

Many interesting applications of this new device have already been made and a few possibilities can be briefly outlined as follows: It makes possible the talking motion picture, for on a film of the normal width both sound and action can be recorded simultaneously and projected with absolute synchronism. It is practically unlimited as to the length of record it can make and reproduce and is, therefore, suitable for recording speeches, debates, concert programs, in the taking of evidence and for any purpose where a lengthy record of sound is required. It can be duplicated and used as a film photograph and applied in radiotelegraphy in producing wireless signals and for audio-amplification. It has already been successfully applied in broadcasting.

The largest vacuum tube ever made consists essentially of a water-cooled cylindrical anode 30 inches long and $1\frac{3}{4}$ inches in diameter. In the axis of the anode is a tungsten filament 0.4 inch in diameter and 22 inches long. This filament is excited by a current of 1,800 amperes at 10,000 cycles, the filament excitation requiring about 20 kilowatts. The magnetic field produced by this large hearing-current is sufficient to cut off the electric current from the cathode to the anode during a portion of each cycle of the current passing through the cathode, this action taking the place of that of the grid in a 3-electrode tube. The electron current to the cathode is thus interrupted 20,000 times every second. By the use of properly tuned circuits, this may be used for the production of high-frequency power for radio or any other purpose.

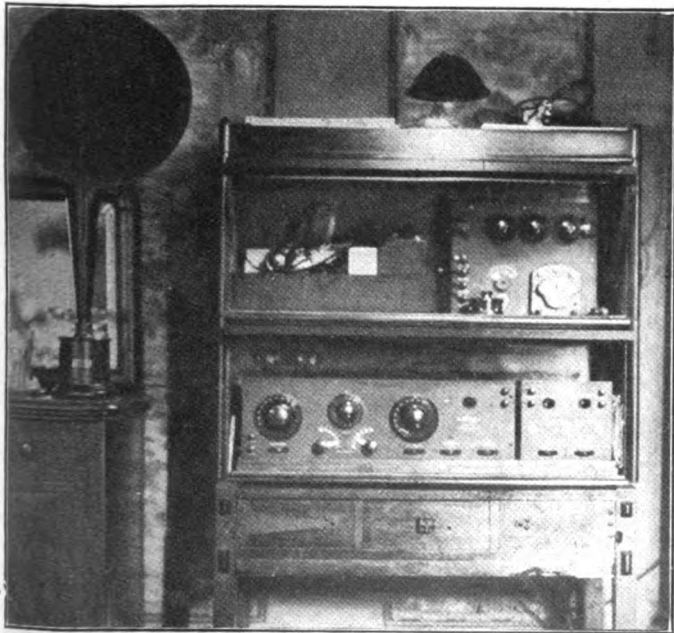
This particular type of tube, which is called the magnetron, will supply 1,000 kilowatts of 20,000 cycle power at an efficiency of 70 per cent., operating with an anode voltage of 20,000 volts direct current.

Complete carrier current equipment of telephone communication over the high tension transmission lines of power companies was developed and a number of tests were installed. The transmitter has an output of 50 watts and is rated at 75 miles, provided there are not a great number of "tie-ins" or transformer stations in this distance. The equipment includes a calling system whereby a bell is rung at the station called when the station calling actuates a push-button on the desk-stand forming part of the equipment.

Book Case for Receiving Set

By *J. R. W., Louisville, Kentucky*

I AM sending you what I consider an ideal arrangement for a receiving-set in the home. Sectional bookcases with glass doors keep the set dust proof and give a neat appearance. Many of my radio friends like the idea and, so far as I am aware, this arrangement is original. The large A batteries, battery charger, etc., are in the compartment below—out of the way.



Bookcase Made to Hold Receiving Set, as Described by J. R. W.

National Radio Week to Be a Big Celebration Over All America

THE tremendous contribution of radio broadcasting to the educational life of the country is to be especially emphasized during National Radio Week, to be held this coming week, from December 23 to 30 inclusive.

Broadcasting has assumed many roles since its inception, but none has received such whole-hearted and enthusiastic support from the nation's leaders as when it dons the toga of the educator.

Sending of operatic arias on the air has become frequent within the past few months. All the progress thus far made in that field, together with a wealth of new material and ideas, is to be assembled during National Radio Week for a grand display.

Announcement to this effect has been made by J. Andrew White, chairman of the executive committee of National Radio Week. Mr. White and the committee feel that the broadcasting of the highest type of music not only has recreational value, but is inspirational in home circles as well, and there is tremendous economic benefit to be gained

in educating the American people, through radio, to an appreciation of the higher forms of culture.

Radio's use in the church and school are also to be demonstrated in special nation-wide programs from scores of stations.

National Radio Week is an unselfish, co-operative effort on the part of every one in radio, from listener to manufacturer, to demonstrate what the new science and industry has accomplished thus far in the brief span of one year of general popularity and to give the listener an insight into the yet unrealized possibilities of the near future. It is an organized effort to add to the ranks of listeners—to double this number, in fact.

The biggest thing the amateur or fan can do is to create another amateur or fan. Building up the already growing army of radio enthusiasts will have a vital effect on the advance of radio throughout the country.

Here are a few final suggestions that may be carried out easily to make the big week a smashing success:

Humanity Night. In a dramatic way you can allow the Salvation Army, American Red Cross, or any other organization explain the purposes of its movement. This has been done effectively by the playing of music or singing of songs very softly as a background for the speaker. A series of war songs, for instance, played softly by a stringed orchestra would work an appropriate background for a Red Cross appeal. If an appeal was given for the Near East Relief Committee the music would have an Oriental flavor.

Christmas Eve. A complete Christmas Eve program would include the singing of carols by boy choirs and soloists, who are available usually in every community; stories by representatives of as many foreign nations as you can get, explaining how Christmas Eve is celebrated in their countries; a speech by Santa Claus earlier in the evening for the children; messages of welcome to the home town by one or two men or women of representation who have come back to their home town to spend the holidays.

Contest Night. One splendid contest could be a guessing contest. Gather together some fifteen or twenty prominent people in your city and have them make short talks, but do not introduce them except by number, then have the radio audience send in their guesses as to the names of the speakers to see whether the people recognize their most prominent men or women by voice.

Theatrical night, of course, will be a big one. Talent which is appearing at the local theatre should be invited to appear at your station, and not just formally sing a song or two, but to give a "chummy" sort of program for the listeners.

Special attention should be paid to children at least two nights during the week.

Kolin Hager, of the General Electric Broadcasting Station, WGY, at Schenectady, New York, has been made chairman of the broadcasting managers' committee of National Radio Week.

The executive committee, which has charge of all details to "put over" the big radio event, is composed of the following:

J. Andrew White, chairman, editor, *The Wireless Age*; H. Gernsback, editor, *Radio News*; Arthur H. Halloran, editor, *Radio*; Roland B. Hennessy, editor, *RADIO WORLD*; Laurence Nixon, editor, *Radio Dealer*; Arthur H. Lynch, treasurer, editor, *Radio Broadcast*.

Remember!—

The movement will not die on the night of December 30. National Radio Week is to be a permanent national affair.

Eminent Radioists Send Their Greetings Through Radio World

Around the World in Five Minutes

By Edwin Denby

Secretary of the United States Navy

THE wonderful development of radio has brought pleasure to millions of people. Radio has developed into a great commercial and departmental agency. Christmas greetings may be sent around the world by radio in five minutes.

A Veritable Public Service

By John V. L. Hogan

Eminent Radio Engineer and Inventor

NATIONAL RADIO WEEK will give alert dealers their opportunity to demonstrate to the public that radio broadcasting is not a noisy fad for using squawking loud-speakers, but, instead, a veritable public service, capable of placing in the home finer music than can the phonograph or reproducing piano.

One of the Greatest Gifts of the Age

By General John G. Harbord

President, Radio Corporation of America

CHRISTMAS is a season of gift-giving and of remembering only the good in life. Radio is one of the greatest gifts to this age, blessing mankind with its achievements and practically marking a new era in the way of entertainment, communication, and education.

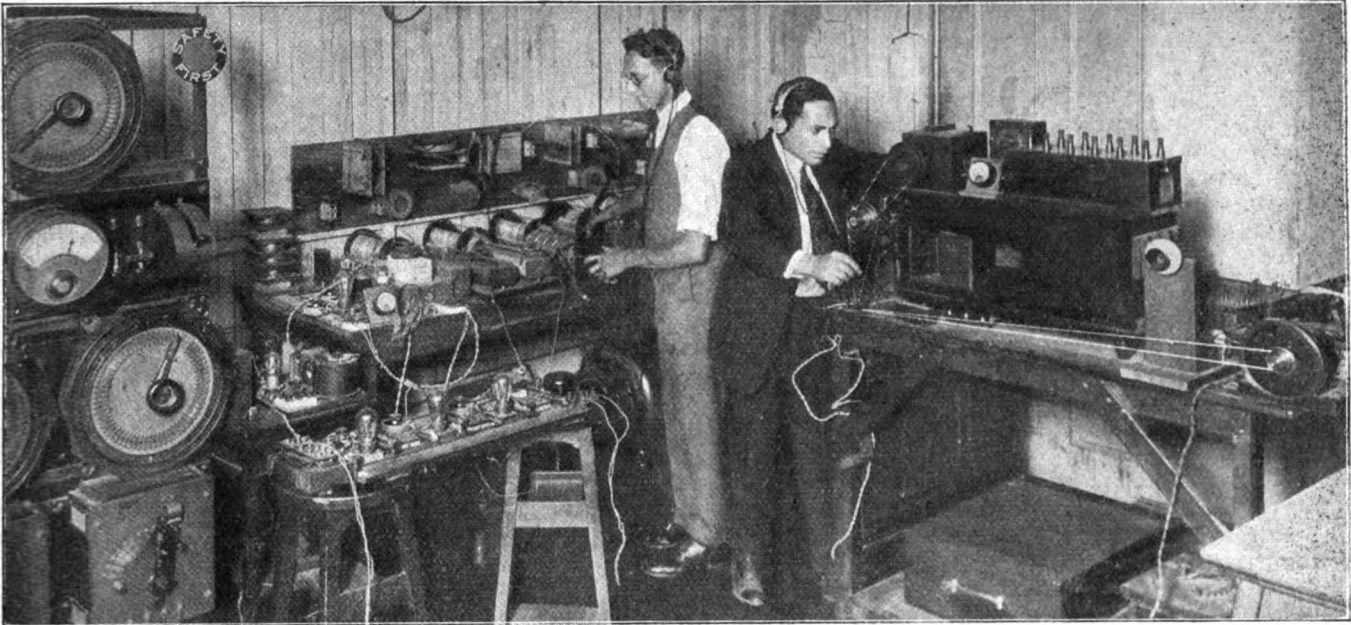
How Season's Indications Point

By Paul F. Godley

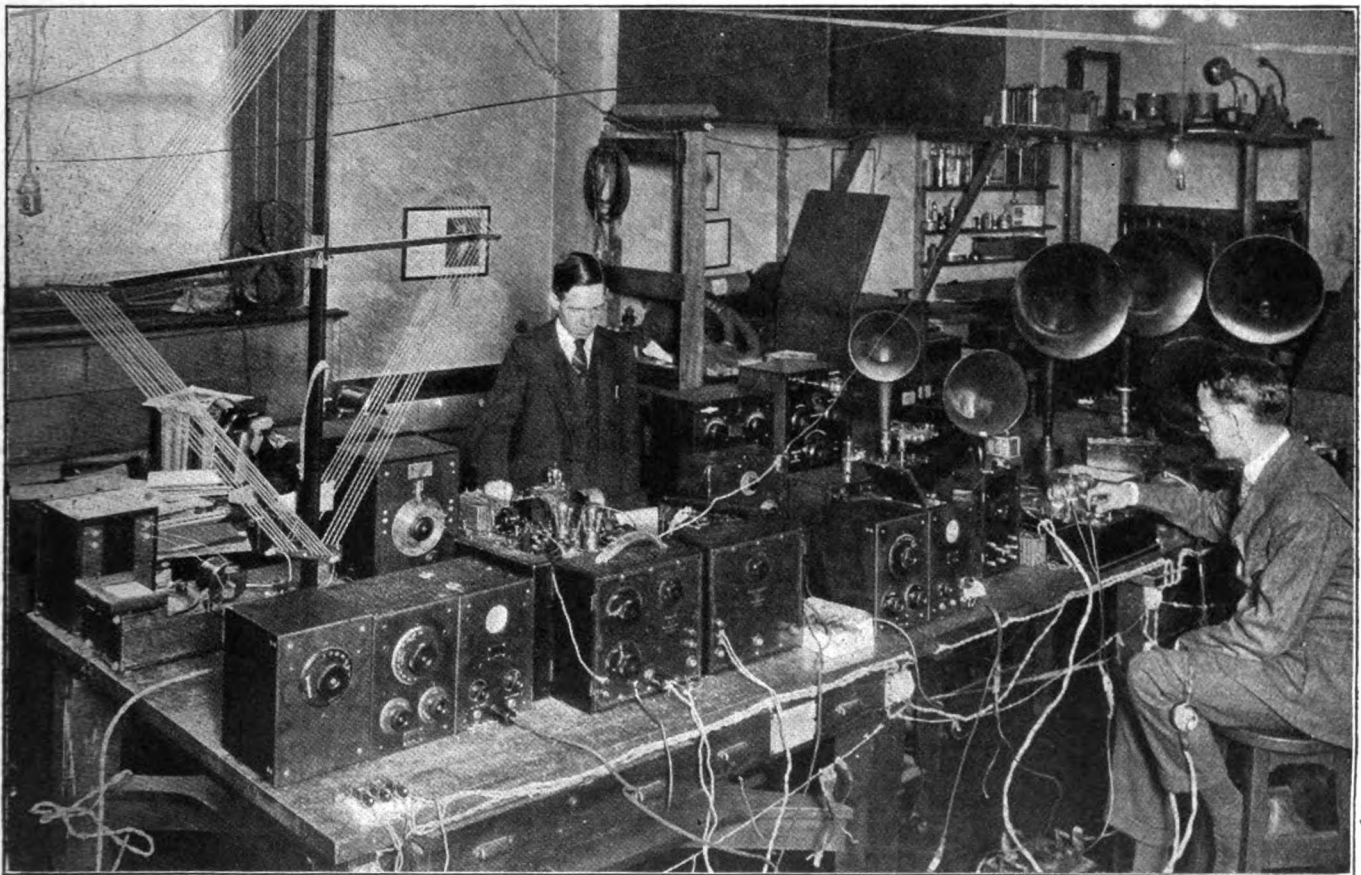
Radio Engineer, Adams Morgan Company, Montclair, N. J.

THERE is no doubt, that the large bulk of business which is bound to put in an appearance around Christmas time will more than restore the full confidence of the industry in the future of radio. There still seem to be some people who think that radio has no future. The indications now point to a larger radio business during the coming holiday season than during last year, and instead of verging on hysteria, it will be business placed by business men who know exactly just what the market demands.

Receives Radio Messages at Over 1200 Words a Minute



(Both photographs C. Kadel & Herbert)



The upper photograph shows a busy corner of the research department of the Radio Corporation of America where investigations are being made regarding the operation of a high-speed receiver capable of copying messages at a speed of 1200 words a minute. When signals are sent at this speed the listener, unless he is equipped with a machine similar to this, will hear nothing but a steady hum or dash, as at this terrific speed there are, approximately, 6000 "breaks and makes" of the key every minute, approximately 100 every second. This is a rate of speed much faster than the human ear is capable of catching.

The lower photograph shows another part of the extensive research

department of Radio Corporation. Here they test out circuits, loud-speakers, and other instruments before they are marketed. The illustration shows actually the testing out of five different loud-speaking horns in connection with a power amplifier in order to prove which responds with the least distortion. This department not only tests materials of Radio Corporation, but any others that seem of particular importance. Thousands of amateurs and experimenters would give a lot to possess such machinery and test out apparatus and circuits to their heart's desire. The man in the dark suit, facing, is testing out the wave length of various apparatus in order to correctly calibrate and chart them.

Vast Army of Goods Baptized "Radio"

By Washington R. Service

WITH nearly every new development that attains great popular interest, there comes an era of using the new name for, practically, anything else that bids for public support.

Hundreds of articles have been christened "Radio." Some products are aptly named, but many have nothing to do with the art or practice of radiotelegraphy or radio-telephony.

Twenty-four articles now use the word "Radio" as a trade-mark, according to the Patent Office records, and still more applications are on file. The first use appears to have been in connection with a chemical compound registered by John B. Daniels, August 23, 1904, about six years before the United States Navy adapted the word to wireless telegraphy.

In 1911, the word, "Radio," was registered as a trade-mark for a make of hot-air fans and, also, a brand of varnish and paint. The

type and design of the letters in the word were, of course, different, and sometimes the background varied. In 1913 and 1914, "Radio" was employed to designate certain forms of chemicals, medicines, insecticides, leather, threads, yarns, and furniture polish.

What was probably the first registration of this trade word for an electrical contrivance was taken out for batteries and apparatus early in 1915. A little later, came a type of "Radio" ball-bearing, and, in 1918, the "Radio" golf-ball was trade-marked. A non-intoxicating beverage took on the name in 1918. During the next two years, it was used to designate certain flower and garden seeds, auto lenses, phonographs, tires, and a brand of canned fish. The past two years saw "Radio" applied to watch chains, writing paper, skirt braid, playing cards, cigarettes, and dyes. It was March 14, 1922, before a piece of wireless apparatus was trade-marked

"Radio," although before then it had been combined with other words to designate many things. Silks, pens, tonics, a magazine, and tea had been branded with the mystic letters. Both "radiofone" and "radiophone" were used in 1920. In 1922, came the terms "super-Radio" and "Radio Rex."

Many articles bear the name which seem not to be trade-marked, among them the recently advertised "Radio Boot"—"on and off in a flash." The radio overcoat, with weather-resisting qualities, has also appeared. The other day, the name was assigned to a ship which, curiously, carries no wireless apparatus. In the field of sport, the name has been appended to a race horse. "Wireless," another horse, is also pretty well known. Apparently "Radio" is a popular name, taken by and large, for use in any field; but there are those who would like to see it confined to matters connected solely with the art.

Back-Wound Coils

By R. L. Dougherty

DURING the past few months the bank-wound coupler and inductance coil have come into general use in receiving circuits. Many amateurs have tried to wind their own coils and have had to give up in disgust after the first attempts.

In the first place, bank winding will permit the amateur to wind from three to five times as much wire in a given space as would single-layer windings. Before starting to wind a coil the tube on which the coil is to be wound should be slightly roughened with semi-coarse sandpaper. Some firms making bank-wound coils use a base of sandpaper on which to wind the coil; but this should not be employed by the amateur as he is likely to run into difficulties and experience a short circuit due to the insulation being scraped off the wire.

In Figure 1, I show two types of bank winding. A is a double-bank and B is a triple-bank winding. In A you wind four turns on the tube, being sure to keep a good tension on the wire so as not to have it slip when you wind Nos. 5 and 6, which (see illustration) are wound on top between turns Nos. 2 and 3. After winding four turns on the tube proper, make a bend in the wire and

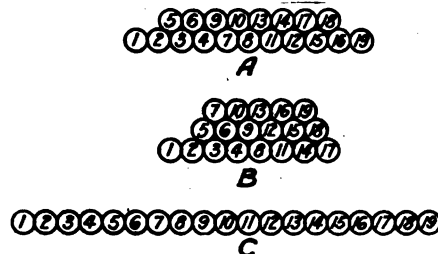


Figure 1—How a bank-wound coil would appear if the coil were cut in half. This gives also a comprehensive idea of the correct method of winding two different types of coils. A is an illustration of double-bank winding. B of triple-bank winding. C is the single layer, 20 turns.

wind No. 5 between and on top of 2 and 3; then No. 6 on top of 3 and 4. Then bring Nos. 7 and 8 down and wind them on the tube, and wind Nos. 9 and 10 as you did Nos. 5 and 6. If you wish to tap off at, say, every fifteenth turn, bring No. 15 down to the tube and make a loop in the wire. Next start in winding as you did before, using No. 15 as No. 1 in the first winding.

In illustration B, you see a triple bank-coil. Greater care must be used in winding these as there is more liability of the top turns slipping off due to the tension on the wire. The same method should be employed as in A, except to add one extra layer on top. The taps can be taken off in the same manner.

Before attempting to wind the coil for use in your set, practice winding

Damped Waves

By George W. May, R.E.

THE radiophone of to-day cannot use the so-called damp wave. The wave trains which quickly die out are available for use in sending signals only and correspondingly to the action of the waves in water which quickly subside after a stone is dropped; or they may be compared to the sound from the piano wire which, also, quickly dies out.

them with some spare wire in order to get the knack of the thing.

For the man who wants to know facts, I am giving the inductance values of the two bank windings as compared with a single-layer coil. The constants were taken with coils wound with twenty turns of No. 18 wire wound on a 4-inch core.

The diagram is as follows:

A—Double bank, 20 turns, 50 per cent. space, 120 per cent. inductance.

B—Triple bank, 20 turns, 40 per cent. space, 135 per cent. inductance.

C—Single layer, 20 turns, 100 per cent. space, 100 per cent. inductance.

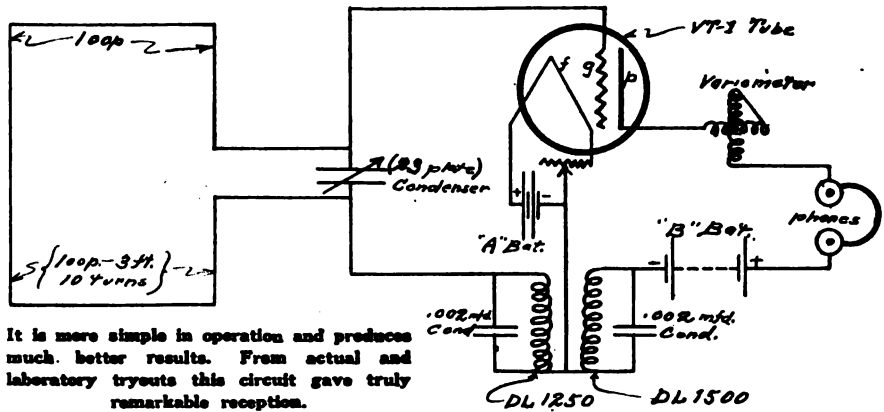
Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C. (Adv.)

My Simple Inexpensive Receiver

By C. White, Consulting Engineer

EVERY field of commercial endeavor is rigidly governed by two considerations: first, the desire to reach the pinnacle of scientific perfection; second, the desire to meet the capabilities of the average pocket-book. In other words, science and economy form both limits. If we make a certain article too cheap it will utterly fail to come up to the popular scientific standard; if we make it so perfect that its selling price must be high, we challenge the purchasing power of the average man, and cut down the market. In radio, as well as elsewhere, these are facts. We actually know of certain circuits that are much superior to anything on the amateur market, yet it would be next to impossible to place them before the public at a reasonable cost. Recently, I have been working out various simple circuits in an effort to produce something that will be very inexpensive, simple to operate, and have definite scientific merit. The new method I recently developed to try out new circuits has greatly aided me in getting a good relative value of performance within the narrow confines of a laboratory. I briefly outlined this method in RADIO WORLD, No. 34, dated November 18.

The circuit illustrated herewith in Figure I is generally known as a one-tube superregenerative, or "ultraregenerative" receivers. The circuit is a modification of the common type of single-tube "supers" in that it uses the inductance of the loop as a tuning element. A variometer in the plate circuit enables much finer adjustment than the ordinary type that employs a rotor of a vario-coupler to obtain the same results. The coupling between the two D-L coils should be variable. Since the loop performs the double function as an antennae and a tuning coil, it is quite necessary that it be made the proper size. From experimentation, I found that a loop about 3 feet square, having 10 turns, gave much better results than any of the other sizes tried. A 23-plate air variable is shunted across the terminals of the loop; it is recommended, although it is not absolutely necessary, to use a vernier attachment of some sort with this condenser if it is desirable to get the maximum results from long-distance telephone reception. A Western Electric V-T 1 tube is recommended for this circuit.



It is more simple in operation and produces much better results. From actual and laboratory tryouts this circuit gave truly remarkable reception.

In the actual tryout it was the only tube using a low-plate potential that gave fully satisfactory results. This tube requires 4 volts on the filament and 22½ on the plate; the normal filament current is around 1 ampere. A Bradleystat, or any other type of fine, or vernier-adjustment rheostat, should be used, since this circuit must operate the tube at a critical and efficient point on the characteristic curve. In the actual construction, I advise the amateur to carefully shield the panel against body-capacity effects which virtually result in cutting down the range of reception by making it next to impossible to selectively tune.

I would like to call particular emphasis to the fact that this outfit is extremely cheap. It is also equally efficient; because with quite unfavorable conditions in a steel

building in New England, I was able to hear Chicago. Of course, it is not the most efficient set to operate. No single-tube receiver can dare claim such distinction; but, with the man who exercises care in his work, it is surely a set that brings in the distant stations with volume. The only point that would most likely give the average amateur a little trouble is the coupling between the two D-L coils which must be carefully adjusted. A good mounting for these coils will materially aid in operation. After a few trials, it may be observed clearly that there are certain values and settings that give much better results than others. Learn to tune your receiver carefully and in a systematic, scientific manner. Don't simply turn the dials until something happens. Study conditions, settings and results.

New Broadcasters Licensed

ELEVEN limited commercial stations broadcasting on 360 meters were licensed by the Department of Commerce during week ending December 8.

WQAK—Appel-Higley Electric Co., Dubuque, Iowa.

WOAS—Bailey's Radio Shop, Middletown, Conn.

WRAN—Black Hawk Electric Co., Waterloo, Iowa.

WPAJ—Doolittle Radio Corp., New Haven, Conn.

WOAT—Boyd Martell Hamp, Wilmington, Del.

KFDL—Knight-Campbell Music Co., Denver, Colo.

KFDJ—Oregon Agriculture College, Corvallis, Ore.

WQAB—Southwest Missouri State Teachers College, Springfield, Mo.

WOAU—Sowder Bolling Piano Co., Evansville, Ind.

WPAR—R. A. Ward, Beloit, Kans.

WOAX—Wolff, Franklyn J., Trenton, N. J.

Three limited commercial class-B stations broadcasting on 400 meters were transferred from the A list during week, as follows:

WHAS—"Courier Journal" and Louisville "Times," Louisville, Ky.

WLAG—Cutting & Washington Radio Corp., Minneapolis, Minn.

KGW—Portland "Oregonian," Portland, Oregon.

* * *

Six New Canadian Stations

With the primary object of keeping federal officials in touch with one another six new radio stations are proposed to be erected by the government of Canada. The following sites are mentioned: Fort Smith, Fort Resolution, Fort Simpson, Fort Norman, Fort Macpherson (all on the Mackenzie River) and Dawson City, Yukon.

At any rate, radio seems to be the eighth wonder of the world.

—Sir Arthur Conan Doyle.

The Radio Primer

For Thousands of Beginners Who
Are Coming into Radio Circles

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

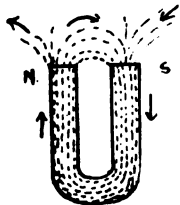


Figure 1—Schematic diagram showing the invisible lines of force surrounding horseshoe magnet.

DESCRIBE an electromagnet? If we take a bundle of soft iron-wires, or a soft iron-bar, wind it with concentric layers of wire, and then pass an electric current through it, we will find that we have a magnet. An electromagnet, therefore, is a magnet only when an electric current is flowing through the wires, whereby it differs from a permanent magnet.

* * *

What is a solenoid?

A solenoid is a hollow metal tube wound in the same manner as an electro magnet. When a current is run through the tube the wires will, through the agency of magnetism, have a sucking effect on a piece of iron or steel, and will tend to draw them into the middle of the tube so wound.

* * *

What is the difference between the lines of force in a permanent horseshoe magnet and an electromagnet?

In Figure 1a we see the lines of force in a permanent horseshoe magnet, which take the direction shown. In 1b, we see the lines of force in an electro magnet.

* * *

On what does the strength of an electromagnet depend?

The strength (attractive power) of an electromagnet depends on two

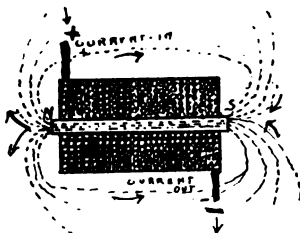


Figure 1-B—Schematic diagram showing the invisible lines of force surrounding an electromagnet.

main factors: 1—The number of turns of wire wound on the electro magnet. 2—The current sent through

the wire. The more turns of wire wound on the magnet the more attractive power it has and the more current sent through the windings the greater the attractive power. Therefore, if a magnet has 250 turns of wire and 5 volts is sent through it has more attractive power than a magnet of 100 turns of wire with the same voltage being sent through it.

* * *

What is meant by electromagnetic induction?

If we take a coil of wire and place it within the electromagnetic field of an active-electromagnet, and then rapidly break and make the current running through the magnet, or pass the coil of wire in and out of the magnetic

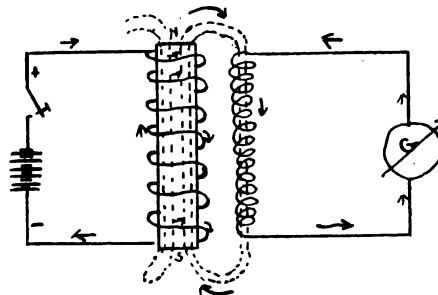


Figure 2—Diagram showing how an electric current is induced in a coil by the principle of electromagnetic induction. The two coils are not connected.

field at right angles, a current of electricity will be found to flow in the second coil. We therefore find that by cutting a coil of wire in a magnetic field we can induce a second current in the wire that is not connected in the original circuit, as shown in diagram No. 3.

* * *

Show how the lines of force may be determined in a single conductor-

current if the direction of the current flowing in the conductor is known?

The answer is fully explained in Figure 3.

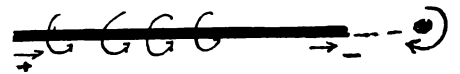


Figure 3—If you grasp the wire with your thumb pointing in the direction of the flow of the current, your fingers will follow the direction taken by the lines of force surrounding the wire.

What is the effect of reversing the current in a single conductor as applied to the lines of force?

When the current in a conductor is reversed, the lines of force take the directly opposite direction. As in illustration No. 4, when the current is flowing to the north the lines of force flow downward toward the West up and around to the East. Reverse the current and the lines of force are reversed in direction.

* * *

What is the most important commercial use that electromagnetic induction is put to?

If it were not for electromagnetic induction, electricity, as we have it today, would not be so common. This agency when applied to a generator creates electricity.

* * *

Describe briefly the fundamental principle of a generator dynamo?

Whenever a coil of wire rotates through a magnetic field of uniform strength in a manner so as a number of lines of force enclosed by the coil increase or diminish uniformly, a current of electricity will be induced in the coil, the strength of which, at any time, is proportional with the number of lines of force that are cut by the coil and the speed with which this action takes place.

* * *

What are the main essentials of a dynamo?

The essentials of a dynamo are briefly: 1—A magnetic field of constant strength. 2—A number of coils mounted so that they can be rotated in such a way as to cut through a magnetic field. 3—Means for conducting the current induced in the rotor (rotating coils) to an outside conductor.

Why the Radio Primer Is Appreciated

Extract from a Letter to the Editor of Radio World from E. F. Stettler, Twin Falls, Idaho

FOR almost a year, I have been buying at the local newsstands your very fine publication and reading and studying every issue with a great deal of interest. When I first started reading RADIO WORLD I knew absolutely nothing about radio; and although it would be egotistical to say I know a great deal now, yet I do feel as if I had a fair knowledge of the fundamentals—thanks to RADIO WORLD."

A New Application of the Power Amplifier

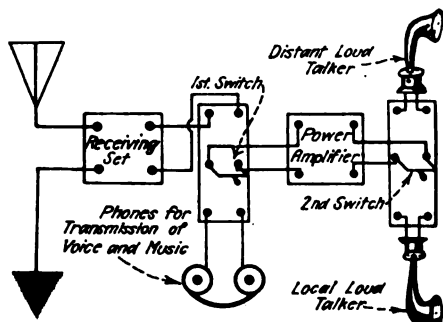
By *Frederic W. Procter*

THE interest taken by amateurs in perfecting their transmitting and receiving apparatus has led me to believe that the plan I shall outline herewith will interest more than a few as it lays open a varied field for experimental work. This plan has been put into practice with most satisfactory results and has added greatly to the interest and pleasure to be obtained from receiving.

Quite frequently the amateur station is located in a study and broadcast reception is desired in the bedroom or some other part of the house; or the amateur may desire to transmit his own voice, or phonograph music, from one part of the house to the other. Also, by this plan, the amateur can give his family the pleasure of listening to broadcasting concerts in the living room of his house without necessitating the extreme annoyance of placing his receiver there. While, in the latter case, the power amplifier is doing no more than executing its normal duties it can also be used to transmit audio-frequency impulses other than radio signals as previously mentioned, it being necessary only to connect a pair of headphones to the input, and the distant loud-speaker to the output. The amateur should speak clearly and distinctly into one of the phones, taking pains not to moisten the diaphragm of the phone more than is possible. The actual wiring is very simple. The following only is necessary:

Purchase double-twisted insulated wire that will give the two connections needed, and run it under the carpets and doorsills to the point in the house where the loud-speaker is desired, keeping the wires well concealed, and connect them to the two terminals of the instrument. The output of the receiver is connected to two of the poles of a double-throw double-pole knife-switch, the other two poles being connected to the headphones for voice transmission, the blades being connected with the input of the power amplifier. The output of the power amplifier is connected to the blades of another similar switch, the two loud-speakers being wired to the four poles as shown in the accompanying hook-up.

The principle involved in voice



Schematic diagram showing how the power amplifier can be adapted so as to hear music and signals in any part of a house.

transmission by means of a headphone is as follows:

The telephone consists of a winding about the poles of a permanent magnet, forming a magnetic field which not only includes the pole pieces and magnet but the diaphragm as well. This leaves two air-gaps in the magnetic circuit, both of which are varied in length by any movement of the diaphragm. Therefore, when sound waves strike the

disc, the reluctance of the magnetic circuit is changed and corresponding variations of current are produced in the windings when the circuit is closed. Thus it is possible to use the headphone in conjunction with the power amplifier in order to transmit sound over wires to a distant point. It has been found very satisfactory to detach one phone and place it in the small end of a megaphone, supporting the megaphone on a tripod, or some similar standard, so it may be placed before a phonograph should the transmission of music from that instrument be desired. The megaphone permits very few sound waves to escape.

An ingenious amateur should be able to do not only some interesting experimental work with this hook-up. The author would appreciate a letter, sent in care of RADIO WORLD, from any amateur who considered the plan worth trying or made any experiments with the accompanying diagram.

Loose-Coupler Set of 14-Year-Old Boy



(C. Kadel & Herbert)

The accompanying photograph shows Edmund C. Kean, fourteen-year-old radio enthusiast and the loose-coupler crystal receiving-set he has constructed and with which he has heard phone stations over 175 miles. If you will study the loose coupler closely, you will note that he has even used wooden rods instead of the usual brass ones. This goes to show how money can be saved by young builders. Also note the 4-plate condenser mounted in a pasteboard box. No panel for this young builder! His motto was, "As cheap as possible." Master Edmund is here shown trying to tune in Schenectady for the benefit of the photographer and with the frown of annoyance on his face, must be running into difficulties with WJZ. It is worthy of note that young enthusiasts are quite careful in their construction. The loose-coupler, while not a prize winner for beauty, will probably give him satisfactory results. Then he also can say with pride, "I built it myself;" and that counts a lot.

Radio Legislation Urgently Needed, Says Secretary Hoover

Growth of Radio in Past Year, Beyond Expectation. 5999
Amateurs Added in Seventeen Months

WASHINGTON, D. C.—Extension of the regulatory powers of the Department of Commerce over radio seems imperative. This is the belief of Herbert R. Hoover, Secretary of Commerce, who has become a sort of foster-father to radio, and he emphasizes that belief pretty thoroughly in his annual report. The development of the radio art will be greatly retarded, he explains, if his department does not take a hand. The sudden increase of radiotelephone broadcasting during the past seven months of the fiscal year, from 5 to 382 transmitting stations, and the increase from about 200,000 to 1,500,000 receiving stations, resulted in so much "interference" between sending stations, the Secretary of Commerce reports, that the destruction of the usefulness of this very important invention was threatened. A conference of experts, manufacturers, and government, public and amateur representatives, which was called by Mr. Hoover in February, unanimously recommended the immediate extension of the regulatory powers of the Government and drafted a set of technical provisions for submission to Congress.

What Ails the White and Kellogg Bills?

Identical radio bills were introduced in the two houses of Congress, last session, by Senator Kellogg and Representative White, but apparently they are pigeon-holed, awaiting, perhaps, the demand of the radio public itself before any action will be taken. Department of Commerce officials handling radio matters have cherished the hope that early action would be forthcoming for some time and continued to license all broadcasters every three months, while awaiting a definite law. New legislation would aid the Secretary of Commerce in enforcing the laws and bring about a more satisfactory condition for both operators and "fans," they point out. Authority for the appointment of the advisory committee of six governmental and six outside civilian members, would assist Secretary Hoover in reassigning definite wave-lengths and in the allotment of more bands for commercial and private uses. Congressman White's

By Carl H. Butman

bill, it is expected, will be pushed, but action is not assured this session of Congress.

Hope for Discretionary Assignment of Waves

Recommendations of the radio conference were for one exclusive governmental broadcasting wave-band, two bands for private and toll broadcasting, and four for use by both governmental and private broadcasters, which would give such transmitting stations broader scope and prevent interference to a great degree. To-day, only two public broadcasting waves are available—360 and 400 meters—while the government wave is 485 meters, confining a very large amount of matter broadcast by many stations to only three wave-lengths and necessitating time schedules and silent periods. The assignment of waves under these recommendations, as well as other technical problems, would devolve upon the advisory committee. It is very likely that Secretary Hoover would secure the aid of the present Interdepartmental Radio Committee, or at least six of these technical experts as the governmental representatives on his new committee.

Another feature planned if new legislation is secured is to make the wave band between 600 and 1,600 meters, now assigned for governmental use, available to commercial and public stations. Details such as these, however, it is expected, will be left to the discretion of Secretary Hoover. The art of radio is developing so rapidly as to demand constant changes and the permanent or specific designation of every wave or band of waves by law would be a hindrance.

Situation Worse To-day Than on June 30

Interference is actually far worse to-day than it was five months ago, when Mr. Hoover's report closed at the end of the fiscal year, June 30, 1922. Instead of there being 382 broadcasting stations on 360 and 400 meters, there were actually 565 such stations in operation on December 1, or 179 more than existed on June 30. During the fiscal year, seven commercial transatlantic stations

were placed in operation, providing for better communication with Great Britain, France, Italy, Japan, Norway, Poland, and Germany. Another commercial station opened for business with Central America, and plans for circuits to South America and China were also under way. In the fiscal year, commercial land stations, excluding broadcasters, increased from 161 to 345.

Value of the Amateur to the Country

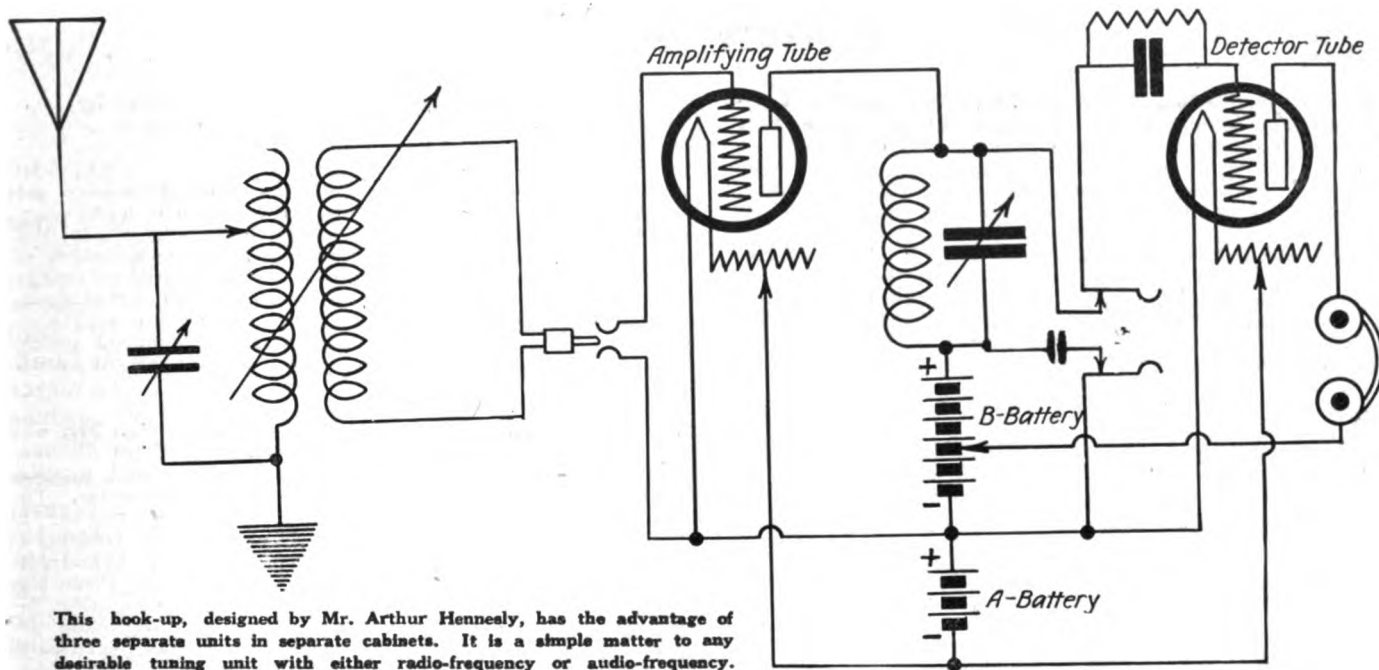
Amateur-station licenses increased from 10,809 to 15,504 between June 30, 1921 and June 30, 1922. In the past five months, however, 1,304 more stations have been licensed, bringing the total amateur sending-stations to 16,888 on December 1. The increase in amateur interest by 5,999 is gratifying to the officials of the government; for, they say, these young men constitute a reserve of trained operators some of whom have already contributed to radio art. During the World War, many amateurs were found to be superior to the average commercial operator in resourcefulness and technical knowledge.

The necessity of an international conference on radio communication for the adjustment of international radio wave-lengths, especially those used between ship and shore stations, is pointed out by Secretary Hoover in his report, attention being called to the fact that the last conference was held in 1912 when the United States had but one transoceanic station in operation. This matter, however, has the attention of the State Department, which is now organizing the personnel of a representative governmental committee to draw up agenda for the next international convention on electrical communication, to be held at Paris next spring.

In summing up Mr. Hoover says: "To close an efficient administration of the radio service is imperative if we are to maintain its efficiency as a life-saving agency on shipboard, a means of commercial communication, and of instruction and entertainment for our people. To perform this work we must have an experienced and expert personnel. To secure and retain such men the service must be provided with adequate funds.

Simple Hook-up Keeps Table Clean

By Arthur Hennesly and John Kent



This hook-up, designed by Mr. Arthur Hennesly, has the advantage of three separate units in separate cabinets. It is a simple matter to any desirable tuning unit with either radio-frequency or audio-frequency.

A LETTER from one of our readers, Mr. Arthur Hennesly, Kansas City, Missouri, contains the accompanying hook-up and an idea that, to us, seems of considerable merit. Mr. Hennesly says:

"I have noticed that there are a lot of amateurs who like to try out new hook-ups, and whenever you visit them you invariably will find a lot of apparatus scattered indiscriminately over the table. This looks very messy; besides it is not efficient.

"I like to experiment with new

hook-ups and have solved the problem in this way: I make up the tuning unit, detector unit, radio-frequency amplifying unit, and audio-frequency units in separate cabinets, with all the connections brought to outside binding posts that can be conveniently bridged with small pieces of copper wire. For the main connections I use jacks and plugs. It is a simple matter, therefore, to hook up any desirable tuning unit with either radio-frequency or audio-frequency and the table always looks neat and businesslike.

"Another advantage is that after having built a radio-frequency unit, or a detector unit, and tried it out you know that it works and how it works, so that when you hook it up you know just what results to expect. I am enclosing a hook-up to show how it is done—in Missouri where you have to show ~~us~~."

This is a practical idea. Besides its neatness, it is an instance which proves that the everyday amateur is getting down to the serious business of real work and is not playing with a lot of radio apparatus just to pass the time.

Why Is It—

THAT every time you have company at the house someone who knows nothing about radio will always ask some question you can't answer and make you feel like a quince the rest of the evening?

That every time you buy a bulb, and your friend is with you and he buys one, he always gets the better bulb, while you generally get a "cluck"?

That every time you want to put up a good aerial, and you have all the inclination and time in the world to do it, it rains?

That the set worked like a charm in the store and you can't even get a chirp out of it, and everybody in your family gives his or her advice as to just what the trouble is, and you don't even get a chance at it till everybody else is disgusted with "that fool thing"?

That people insist on thinking of radio and wireless as two different and distinct things?

That everybody who has made his own set thinks he has evolved an original idea which he must keep a deep, dark, dank secret?

Don't Miss Him!

Santa Claus Will Be at WGY During National Radio Week

HELLO up there! Is this Mr. Santa Claus? How do you do, sir! This is radio station, WGY, speaking. Suppose you're awfully busy just now? Too busy to talk to the thousands of little people here in the U. S. A., who will be counting on you on Christmas Eve? Yes, sir, actually talk to them . . . all of them at once, too! What's that, you say? Never got such an invitation before? Wouldn't miss a chance like this? That's fine, Mr. Santa Claus! Then let us tell you what we've got in mind."

Yes, boys and girls—big and little, young and old—that is part of a conversation that took place the other day over the private wireless-telephone of WGY, the General Electric radio station at Schenectady, New York, with Santa Claus himself as the other speaker!

And here's what came of it! Santa Claus is actually going to talk to you by radio! To all of you—that is, to all who are able to listen in! And not only one

night, but every night for a whole week, from December 18 to 25 inclusive! Think of that!

And here's an even bigger surprise!—It's for the same week! Santa Claus is going to introduce all of you to another member of his household, someone who hasn't ever been heard from before! It's the vivacious, jolly little step-daughter of the whiskered saint—it's Mary Christmas!

And Mary Christmas is also going to talk by radio to all youngsters on the three last nights of the same week, December 22, 23, and 24. She's promised to tell just what she does in Santa Claus House—how long she's lived there and what she thinks about Santa Claus and, especially, about boys and girls! A special program will be given by WGY on Christmas Eve, December 24.

There's a particular reason why Santa Claus and Mary Christmas will give talks by radio during the week of December 18, to 25. Of course it's Christmas week. But it's also National Radio Week, when for eight nights steadily more than five hundred radio broadcasting stations all over the United States will give special programs of novel features.

Radiograms

The Latest Important Radio News Briefly Told for the Growing Army of Radio Fans

WGY, broadcasting station of the General Electric Company, Schenectady, New York, has been heard in every State in the Union. Although programs have been regularly sent from this station for the last nine months, two states—Idaho and Nevada—had not been heard from until a few days ago. Because of the great confusion caused by so many stations operating simultaneously, only such replies naming artists and the time heard which accurately check with the WGY log, are considered. The greatest points reached in all directions are:

West.—Oakland, California, 2550 miles; Kingman, Arizona, 2175 miles; Enterprise, Oregon, 2170 miles; Hillyard, Washington, 2150 miles; Midas, Nevada, 2200 miles. In a special test, WGY operating on its experimental license 2X1, has been heard at Hilo, Territory of Hawaii.

North.—St. Johns, Newfoundland, 1075 miles; Calgary, Alberta, Canada, 1950 miles.

East.—By a steamer, 2017 miles in the Atlantic ocean.

South.—By steamer "Luckenbach," 150 miles south of the Panama Canal, or a distance of 2450 miles; Mexico City, 2150 miles; San Juan, Porto Rico, 1700 miles; Pela, Honduras, Central America, 2000 miles.

* * *

Arrangements to establish a university extension course for the people were made between the Society of Radio Artists and Audiences and the Lecture Bureau of the New York Board of Education whereby selected lecturers broadcast tabloid lectures from the WHN station, Ridgewood, Brooklyn, New York.

Another chance for DX fans! Daily transmissions of telephony from Konigswusterhausen, Berlin, are on a wave length of 2,800 meters, and the times are 6 to 7 a. m., 11 a. m. to 12:30 noon and 4 to 5:30 p. m., middle European time.

Disabled men will get radio for Christmas. Members of the auxiliary of the Bill Brown Post at Sheepshead Bay, New York, are devoting considerable time to the welfare of the disabled veterans in the Manhattan State Hospital on Ward's Island. Through the efforts of this auxiliary the men will be presented with a radio set on Christmas Day. Mrs. Mary E. Hartt, president of the auxiliary, arranged with several of the members to conduct card parties and social functions for the purpose of raising the money necessary for the purchase of the set. The complete outfit will cost \$450.

* * *

Former Postmaster General Frank H. Hitchcock, who is devoting much of his energy to the wonders of radio these days, was the guest of honor at a luncheon at the Bankers' Club, New York, to some of his old friends connected with New York newspapers, a number of whom are now writing on radio subjects. Others who edit the wireless departments of papers

met him for the first time. The luncheon was given by L. S. Byers, executive secretary of the American Radio Exposition, of which Mr. Hitchcock is president.

* * *

One of the radio subjects recently discussed in Chicago and Minneapolis was a broadcasting policy designed to initiate and support broadcasting programs of the highest type. In this connection it is proposed to enlist the active cooperation of the public press, educational institutions, boards of trade, churches and, what is of utmost importance, to obtain the active cooperation and assistance of the users of listening apparatus, whose rapidly growing investment in radio equipment makes them greatly concerned with the proper maintenance of broadcasting.

* * *

Mr. and Mrs. Samuel Franklin, of Lansdale, Pa., Mr. and Mrs. H. L. Shellenberger and daughter, Miss Ethel Shellenberger, recently heard the voice of their son and brother transfitted through the air from a distance of 1,500 miles. The signal is Charles Shellenberger, former baseball pitcher at Ursinus College. He is now boys' secretary at the Denver Y. M. C. A. He sang at a radio concert in Denver. When Mr. Shellenberger, Sr., who is assistant cashier of the First National Bank, received a letter from his son, stating that his solo would be broadcast from Denver, the father made arrangements to "listen in." The singer's voice was heard as if it came from an adjoining room.

* * *

A marriage performed by radio is illegal, according to a construction of the Domestic Relations Law by Attorney General Newton, in New York State. The words, "in the presence," in the law mean an actual and not a constructive presence, the Attorney General held. The question was raised by the proposal to have a San Francisco clergyman broadcast the ritual to contracting parties in Grand Central Palace, New York City, the bride and groom broadcasting their responses.

* * *

The sixteenth radio station for the Air Mail-Service has been put in operation by the United States Post Office Department.

* * *

It is nothing new for the Boy Scouts to use radio apparatus. Various troops long ago made and purchased receiving instruments, and even before the advent of broadcasting the scouts numbered among them some well-known radio amateurs. Now that broadcasting is here, however, they are finding new fields for the use of the radio. Instead of using it only for their own instruction and recreation, as they virtually were compelled to do in the days when only code could be heard, now they are placing it before others who need to enjoy the radiotelephone but for obvious reasons are unable to do so.

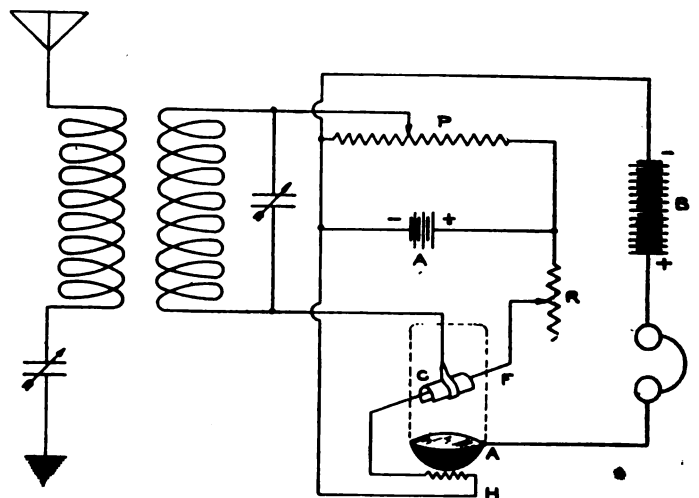
New Noninterfering Detector by H. P. Donle

H. P. DONLE, radio inventor and experimenter, after years of research and the building and study of thousands of bulbs, has developed a new vacuum tube. This tube is an exceedingly sensitive detector. Without regeneration, Mr. Donle claims it gives responses as loud as a good regenerator using the usual grid form of tube. Used in a plain circuit, it cannot produce interfering oscillations; it consequently should be strongly welcomed in broadcasting circles.

Mr. Donle's tube is known as an intensifying detector. It contains no grid. One form uses a short straight filament above which is supported a trough-shaped collector electrode. Under the filament is a main anode consisting of a piece of metallic sodium. The best circuit is shown in the diagram reproduced herewith. The action of the tube involves controlled ionization and a peculiar construction which gives not only extreme sensitiveness, but stability of adjustment.

This tube has been tried out. Its sensitiveness in a plain receiver, if anything, is claimed to be a little higher than that of a good U-V 201 in a high-grade regenerator. It is also claimed that they are incapable of radiating so as to produce interference.

At the meeting of the Institute of Radio Engineers, held at the Engineering Societies Building, 29 West 39th street, New York City, on December 20, Mr. Donle described the new tubes and showed them in operation.



Schematic diagram of Mr. Donle's new tube, showing trough-shaped collector electrode.

Radio and the Woman

Crystal D. Tector Tunes in with a Variety of Radio Topics on Matters of Interest to the Gentler Sex

D ID it ever occur to any of the young women reading this department that a number of you who are talented could apply to the broadcasting station in your vicinity and be heard over the air? Just imagine what your friends will say when they hear something like the following being broadcast from station XXZ: "Miss So and So will now render a selection from 'Traviata'? Miss So and So is one of the growing number of women radioists." Wouldn't they just die of envy? And look at the publicity you would get at the next meeting of the Neighborhood Sewing Association.

I WONDER why the Hairdressers' Association doesn't put up a resolution to change the term, "permanent wave," to the up-to-date radio term, "continuous wave." Imagine their advertisements then—something like this: "Continuous wave. Guaranteed by the latest methods. Only \$50.00."

I SEE where those French hussies are trying to get their names in the paper all the time! Their latest fad is to carry a parasol with a receiving set in the handle. Well, we'll have to go them one better. What modiste is going to be the first to name the "Chapeau Radio"? Then we could listen to the broadcasting while shopping with one of the latest creations on our heads.

FRIEND HUSBAND tried to pick a quarrel with me the other morning—in an entirely new and original way. He said that I forgot to turn off the filament current on the set! Imagine that, when I distinctly remember that he was the last one to listen in.

AT last the neighbors have stopped borrowing my phones. I designed a plug that won't fit their set, and they can't use them any more.

AND I have also hit on the ideal way to make the wash-woman hurry up. Mine happens to be colored; and, like many colored folks, she is slow. I took my loud-speaker and

put it near the kitchen door, turned it on, and, as luck would have it, WGI was broadcasting a particularly lively jazz. It worked fine. She had the wash done almost an hour and a quarter earlier, and remarked when leaving: "Dem dare radios sure do put lots of pep into a pusson, missy."

I'VE a surprise for you. Of course, you mustn't tell anybody that I told you this, but there is a big hairdressing establishment in this city that is going to have a radio set in it with a loud-speaker in every booth so that everybody (men included) who ask to have their permanent wave developed may have something to listen to besides a lot of shop talk about hirsute adornment. I know this will be a treat; because, from my experience, I am fully convinced that I know more about the care of the hair than any four hairdressers put together.

I WENT radio bargain-hunting with a friend the other day. Just as I was entering the radio department my friend spied some imported lacey house-dresses at a really astounding price. Well, Friend Husband will have to wait for those vernier rheostats until next week. It really would have been a shame to let that opportunity go—don't you think?

AN anxious mother writes me that since a certain little boy—"Johnnie"—acquired a new set as a birthday present she has trouble getting him to bed at night, and that his excuse is that all the long-distance stations don't come on until after the local broadcasters have closed up. She wants to know if this is so and if I will advise some remedy. Well, I am not sure; but, as the young man seems to have acquired the habits generally attributed to "night owls," the only remedy I can suggest is to let him sleep all day so that he can listen all night. As you probably know, a "night owl" is generally incurable, and it is but wasted time on the part of certain physicians to insist that every one needs at least eight hours' sleep each night. A "night owl's" inherent determination recognizes no doctor—only his own desire to get the most distant points possible. And, of course, from what I have heard, this is most probable in the "wee sma' hours."

QRM Preventers

By Patrick Nichols

Quizzes and Queer Remarks a Ham MUST Hear!

WHAT does that thingamajig do?"

"Can't you get an opera on?"

"Why isn't PJX on to-night?"

"I came over especially to hear Havana."

"Why is a spark station?"

"Won't you teach little Willie the code. He's such a bright boy, I'm sure he will learn quickly?"

"Say Bill, let's try this hook-up, Willya?"

"Why ain't it working?"

"Can you show me how to do it?"

"I've got a friend out in California.

Can you connect me with him?"

"Is a wireless wave anything like a permanent wave?"

"Can't you make it any louder?"

"Surely, you didn't make it all yourself. I can't believe it."

"Does it come through the air?"

Radio Hams We Meet

THE fellow who goes "up in the air" when you sit down to his set and disturb the pet adjustment that took him all of one-tenth of a second to make, and

then goes around threatening to lock up his set so that no one can touch it. Augh! The first hundred years are the hardest! You get used to them by that time!

Signing Off!

IF the rheostat offers resistance will the lightning arrester?

If the battery gets "charged" will the crystal detector?

How can I stop WJZ from coming in so loud.

If we'll all have to learn to talk French when we get in daily communication with Parisian amateurs, or if they will have to learn English?

Famous Sayings of Radioists

ILL get this thing fixed to-night or bust it so no one else'll ever fix it."

"I'm not kiddin' you! Fact, I heard him say PWX as plain as I hear you—and on the loud-speaker, too."

"I don't know—it never did this before." "Oh! I haven't any time for girls now; I'm building a new set."

"And the funny part of it is, I didn't have the aerial connected."

"Say, did you every try—?"

"Oh, say, have you just discovered that?

I used to do that back in 1913, with a crystal set."

Has It Ever Happened to You?

THE night was cool, the moon was full, not a cloud was in the sky;

The folks sat round the radio set—to get signals, he did try!

The folks had come from out of town—best type of country cousin;

But the dad-blamed-onery-junk—he couldn't even get it buzzin'!

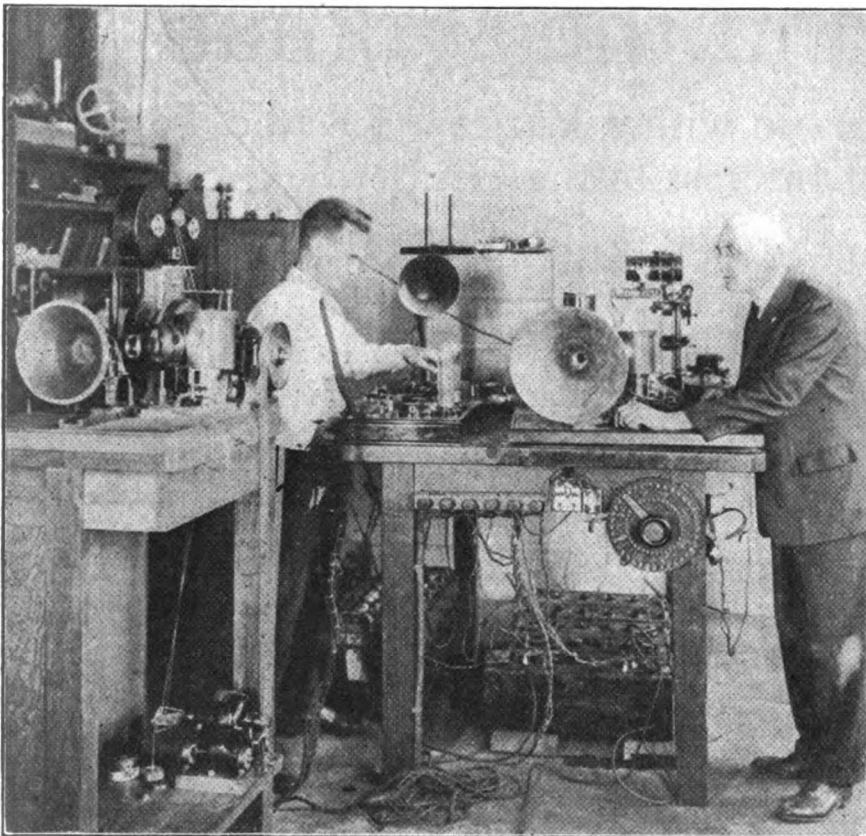
And needless to say that inside of an hour he had every piece of apparatus out and back again, and couldn't locate the trouble until the morning sun showed his aerial grounded.

A Boy's Work

Description of Regenerative Receiver on Radio World Front Cover, This Week

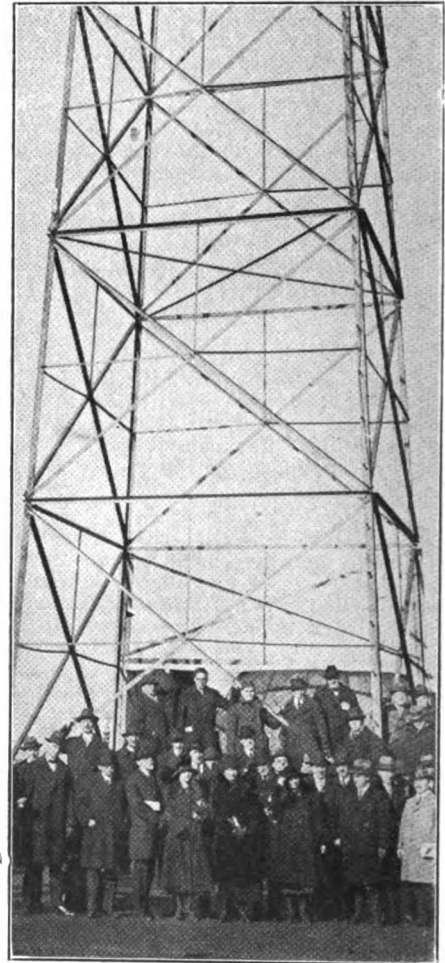
THE photograph on the front cover of this issue of RADIO WORLD shows how Young America is taking up radio. David Orgain, a youngster of thirteen summers, is photographed putting the finishing touches on a single-circuit regenerative receiver of his own construction. You will notice that he is using the familiar hook-up in which the rotor of the coupler—which, by the way, is bank wound for reception up to 3,000 meters—acts as the tickler. While the panel is made of wood, and there is nothing elaborate about the set, it is certain that when it was finished some good DX work was done on it.

Late Novelties Radio Week the Phonograph



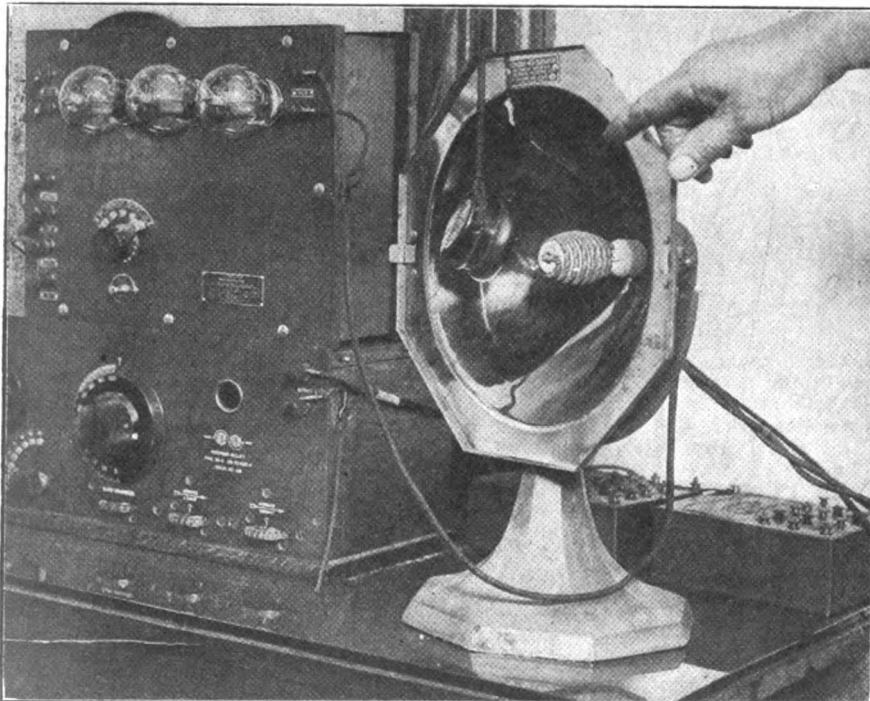
(C. "P. & A. Photos")

(Above) The human voice photographed. A new device known as the pello-photophone has been perfected by Charles A. Hoxie of the General Electric Company. It permits the photographing of the human voice and reproducing it, not as a picture but as the actual sound of the voice itself. A reproduction from the Hoxie machine was declared perfect after several experiments. It is regarded as the apparatus which will make talking movies a successful reality and has introduced into radio broadcasting an entirely new element—the possibility of making a master record from which copies can be made and reproduced in the four corners of the world. Mr. Hoxie (at right) is shown demonstrating the machine and incidentally taking an indelible lasting record of the voice of the man standing before the reproducer.



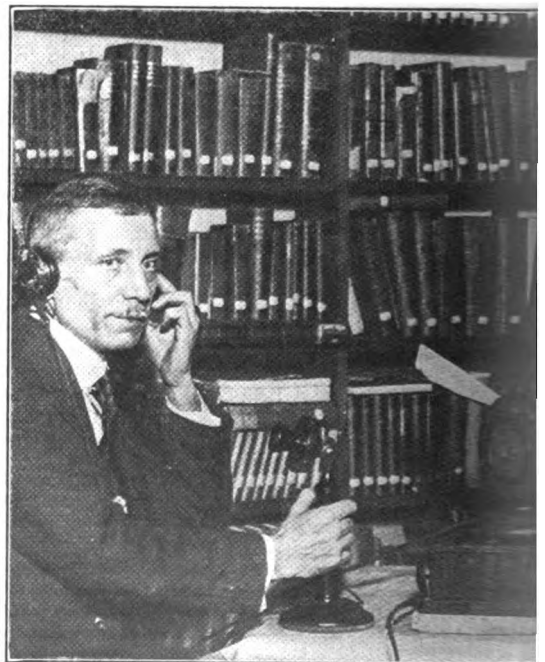
(Left) all over States, the for convent: America Mechanical took as the Ne phone Company casting one of t tions in graph s gates s steel tower port th the stat ers are twenty

(C. Wide World Photos)



(C. Kadel & Herbert)

(Above) A loud-speaker with the aid of your electric heater. Try this and see if it doesn't make a fine loud-speaker. Take your electric heater and place your receiver as shown in the photograph. You will be surprised at the results. It may be carried out with an old dishpan or any parabolic metallic object large enough to throw the sound. If you desire to use the heater, be sure that you don't turn on the heat, or disastrous results may ensue. You will have to do a little experimenting to find the best location to hang the phone so that it will throw the sound, as simply hanging it before the heater will not do. It is best, perhaps, if hung six inches from the heater or when placed almost before its center. Only experimenting can tell, as in the manufacture of all heaters and dishpans you have to take into consideration the different thicknesses of the metal used.



(C. Wide World Photos)

(Above) Room above the Great Hall of the College of the concert given by the Philharmonic Orchestra was transmitted of the American Tel. and Tel. Company. Left to right: C erick D. Robinson, director in char.

is for National Recorded by ographers

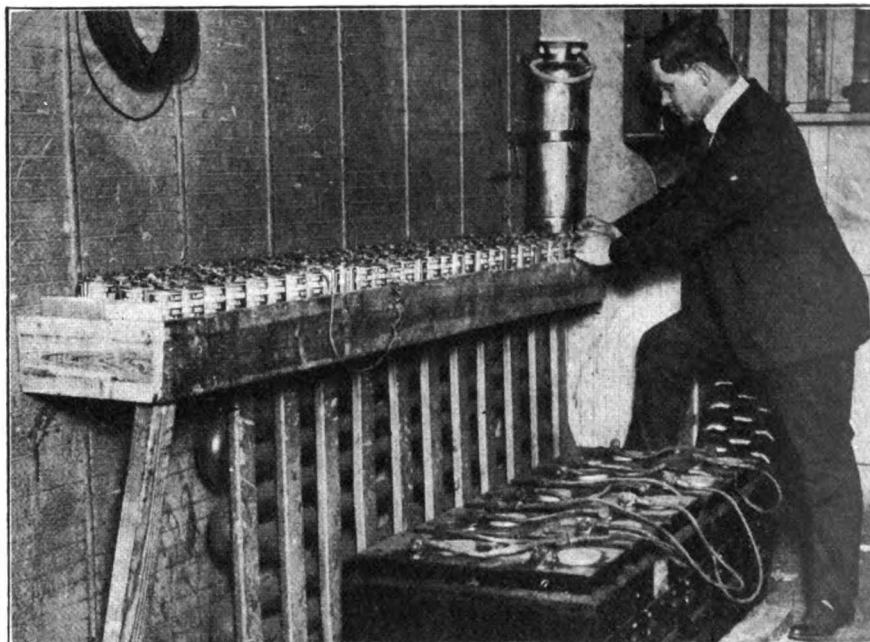
... from
the United
to attend
third annual
of the
Society of
Engineers,
excursion to
York Tele-
graph
radio broad-
cast WEAF,
highest sta-
tion. Photo-
graph the de-
tails base of
which sup-
port the
The tower
the roof of a
four-story
building.



(International Reel Photos)
(Above) The new radio broadcasting station in the basement of the Capitol of the United States, Washington, D. C., which broadcast the President's speech before Congress recently. This is the first time in history that the general public has been able to hear a President addressing Congress. This is one of the most important improvements that has been made in the radio field lately, as it practically puts the Executive of this great nation in personal touch with all the people.



... of New York, from which the
... to the radio broadcasting station
... electrician and Professor Fred
... of concerts.

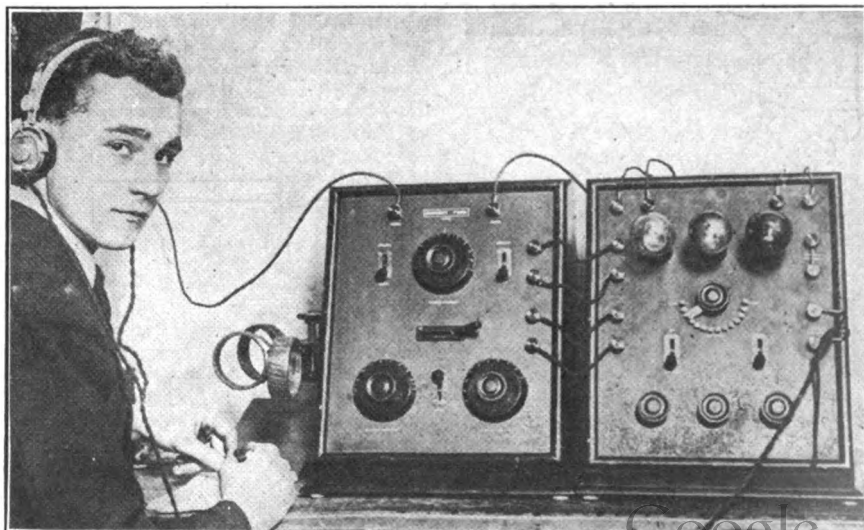


(C. Kadel & Herbert)
(Above) Radio music while speeding sixty miles an hour. Many of us think that radio on a fast-going train needs little equipment but here's an example of how many batteries are used on a D. L. & W. Buffalo special that brings in radio music for the passengers.



(Above) Ed Wynn, known to all theatregoers as "The Perfect Fool" is a pioneer radio fan. This is his own motor-car radio equipped. Note the spiral aerial!

(Right) J. H. Ridley, chief test room operator of Burnsept, Ltd., Blackheath, radio engineers of London, England, who while listening in on his receiver heard no fewer than nine American wireless amateur stations talking to one another, and also a broadcast concert in America. This is the first time on record that a wireless concert in America has been heard in England. Photograph shows Operator Ridley at his instruments.



(C. Wide World Photos)

With the DX Night Owls

Who Can Beat This?

EDITOR, RADIO WORLD: I am not claiming a record, but I have all those beat that I have seen. I have a home-made regenerative set, with two-stage amplifier, using honeycomb coils. Can't be beat! I hear WGR, Buffalo, New York; KDKA, Pittsburgh; WSB, Atlanta; WMAT, Duluth, Minnesota; WOC, Davenport, Iowa; KSD, St. Louis; WFAA, Dallas, Texas; WBAP, Fort Worth, Texas; WEAY, Houston, Texas; KDYX, Honolulu, Hawaii, and enough stations in mountain and Pacific time districts and in Canada to run my list to over a hundred stations broadcasting concerts. Let's hear from some one who has this beat.—N. E. Parr, Albany, Oregon.

Get Your Knees Wet

EDITOR, RADIO WORLD:—With the diagram of connection I enclose, I have done some remarkable work. I can get Newark (WJZ) almost every night. Out here we have some very funny weather at times—that is, so far as radio goes. Sometimes everything will breeze along fine. Then, the same day, you won't be able to get anything worth talking about. They don't seem to fade; they just don't come in. At first, I thought it was my set; but by comparing notes with a couple of other amateurs around town, I find that they have the same trouble.

I have put a variometer in series with my coupler. Although it is not absolutely necessary to the circuit, I find that it gives me much sharper tuning. I am using a home-made coupler modeled after the all-wave, and I'll say that bank winding is no cinch.

This hook-up is very selective and you have to get used to the tricks of it before you can get any definite results. With this circuit working properly and a good clear night, remarkable work has been done by a number of fellows out this way. In tuning this set, you have to get used to using the rotor of this coupler as a regenerator. On some stations, this is rather tricky because where you may get one station at 10 degrees another on the same wave length may come in around 160 degrees. I have overcome this to some extent by the use of the variometer and the variable condenser in the



Schematic design of Mr. Jack Lyons, Tucson, Arizona, who signs himself "Grand-daddy of Night Owls," and described in his letter.

The Editors of RADIO WORLD will be pleased to receive sketches of hook-ups of the various "DX Night Owls" sending in records, with a view of publishing them.

Other letters from the DX "bugs" will be published from week to week.—The Editor.

secondary circuit. I find that it works well without the secondary condenser; but, as the variometer, it all tends to make the tuning more selective.

With this hook-up and a fairly soft tube with variable B-voltage (which, by the way, is very necessary) I have no trouble in bringing in WJZ, WGM, and a score of others.

"Step up and get your knees wet with this one!" is my motto. Come on you DX boys.—Jack Lyons, Tucson, Arizona, "Grand-daddy of Night Owls."

An Idaho Record

EDITOR, RADIO WORLD: Having noticed in a recent issue of RADIO WORLD that a radioist in Chicago had been getting unusual results I wish to submit my report. When using but one old-type Cunningham audiotron with an inverted-L aerial 45 feet high and 110 feet long, directed to the east, I have heard the following stations:

KFAF, Denver; KDYL, KZN, Salt Lake; KFI, KWH, Los Angeles (KFI every night for a week); KLP, Los Altos, California; WBAP, Fort Worth, Texas (very clear music at about 7 p. m.); KFV, Yaking, Washington; KFZ, Spokane, Washington; KGO, Portland, Oregon; WHB, Kansas City, Missouri, and Calgary, Canada.

Close tuning is done with an aerial conductor and a grid conductor.—Kenneth Jones, Blackfoot, Idaho.

Connections Not Soldered

EDITOR, RADIO WORLD: I am sending my receiving record of the past month. I am using a home-made set built by a friend and myself. None of its connections is soldered. It consists of a vario-coupler, variometer, 43-plate variable condenser, and two stages of amplification.

The first record I want to mention I received on my inside aerial which is 32 feet long. On this aerial I received WOC, Davenport, Iowa; KBAP, Fort Worth, Texas; WHB, Kansas City, Missouri, very plainly. The stations that I have received on my outside aerial, which is 100 feet long and 25 feet high are as follows: KZN, Salt Lake City, Utah; KWH, KFI and KHJ, Los Angeles. KHJ has been received so loud I have heard it all over my house on a King amplitone. WBL, Anthony,

Kansas, also very clear. WHB and WDAF, Kansas City, Missouri; KFBB, Havre, Montana; KFAA, Dallas, Texas; WOI, Ames, Iowa; 6XB, San Francisco, and KSD, St. Louis. I have received also the following stations in Canada: CFA, Calgary (very plainly); also CSCN, Calgary; CJSC and CJCD, Toronto; and CJCG, Winnipeg.

Here's hoping I soon hear KDKA and WJZ, and then I will be very much satisfied with my set.—George C. Franz, 268 South Clarkson Street, Denver, Colorado.

From Troy, New York

EDITOR, RADIO WORLD: I am using honeycomb coils and three tubes with jacks. I noticed the records in RADIO WORLD. Here is mine:

WNAC, WDAP, WOS, WDAF, WSO, WLW, WHAS, WGR, WAAH, WIN, WEP, NOF, WJAX, WHB, KSD, WGM, 9XN (9XJ, WRM), WSB, WDAF, WWJ, WOC, WOH, KYW, KDKA, WLW, WBR, WEAK, WPO, WRB, WRS, WUR, WAAP, WNAO, WHAG, WWI, WMAM, WSP, WNG, WSC, KYS, KOW, KDOC, KDOS, KDOW, KDKC, KDBC, KDA, WDOD, NNE, NNK, NOM, WHAL, WBA, WAR, KWZ, WDAK, POZ, WBAD, and WDAP on November 9, 16, 19, 28, and December 4.

I have a large number of other nearby and distant stations including amateur.

The ARRL call, November 30, was heard at noon. No call number was received.

Wireless on ships and land at a distance of 1,500 miles have been heard.—E. B. Missenger, Route 3, Troy, N. Y.

Doesn't Claim a Record

EDITOR, RADIO WORLD: Having read the various records set up by different radio "bugs," I thought I would send in mine. I don't claim a record as I have pals here doing the same thing every night, but I do think I have Mr. Merklein beat a little, as I am 75 or 100 miles farther northeast. I hear the following station with a home set:

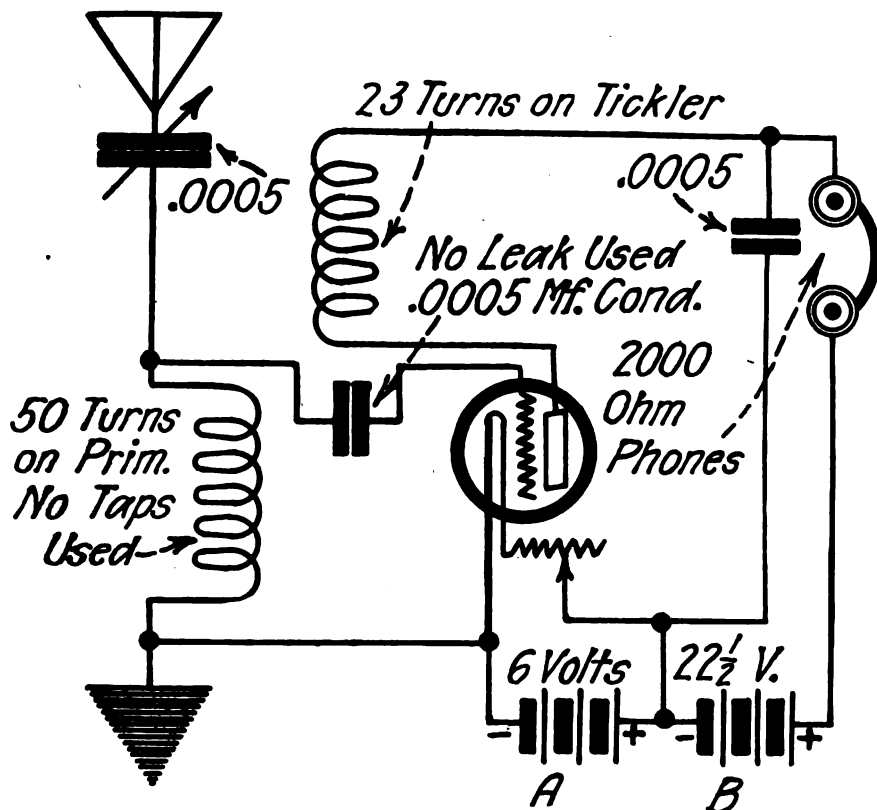
WOC, Davenport, Iowa; KSD, St. Louis; WHB, Kansas City, Missouri; WOS, Jefferson City, Missouri; KYW, Chicago; WGAS, Chicago; WDAP, Chicago; WMAQ, Chicago; WLK, Indianapolis; WHAS, Louisville, Kentucky; WWJ, Detroit; WJAX, Cleveland; WDAJ, College Park, Georgia; WSB, Atlanta; WGM, Atlanta; PWX, Havana, Cuba; CKAC, Montreal, Canada; WGR, Buffalo; WHAZ, Troy; WHAM, Rochester, New York; WLW, Cincinnati; WNAC, Boston; WGI, Medford Hillside, Massachusetts; WBZ, Springfield, Massachusetts; WGY and QXI, Schenectady, New York, and a great number in Philadelphia, Washington, New Jersey, Pennsylvania and other New York stations.—Herbert L. Wheeler, 10 Lincoln avenue, Milford, Conn. Station 1 BUW.

32 Stations in 2 Hrs., 45 Min.

EDITOR, RADIO WORLD: December 4th, beginning at 8 o'clock p. m., I started in to see how many phone stations I could get on my home-made regenerative set, using only one bulb. At exactly 10:45 o'clock, I had heard and listed 32 stations. I listed them as I received them. It must be remembered

With the DX Night Owls

(Continued from preceding page)



Schematic design of Mr. Earl A. Wright's hookup. A Workrite coupler is used. The tickler turns 80 degrees. The primary condenser is very critical. A vernier may be used to advantage. The tuning is done with tickler between maximum and minimum. All tuning is done with primary condenser.

that this was accomplished in only 2 hours and 45 minutes.

Other stations were still coming in when I quit. No doubt this number would have been increased from 5 to 10 more, if I had set up later. I had a list of 125 phone stations that I had heard at different times. It has been almost two months since I last listed in it. I was getting so many stations I did not

take time to make a record of them all.

Listing the 32 stations was not difficult. I have received stations from almost every State in the United States, also Cuba. My hook-up is my own, so far as I know. I am giving it here for other owls to try out. The closest station received on December 4 was 90 miles. Come on and wade in, DX.—Earl A. Wright, Cole Camp, Missouri.

* * *

Good for Dry-Cell Set

EDITOR RADIO WORLD: I have a "peanut-tube" regenerative set with no amplification. Since November 25 I have heard distinctly Minneapolis, Chicago, Atlanta, St. Louis, Kansas City and Denver. I consider this very good for a dry-cell set. My set is something like Mr. William A. Bruno's set in *RADIO WORLD*, No. 30, dated October 21. I also use the 22½-volt B battery. I use a vario-coupler bank wound with 150 turns, 11-plate variable condenser, vernier-filament rheostat, grid condenser, grid leak, and W-D 11 aeriotron tube. I intend to add one stage of amplification and note the results that follow.—J. E. Bradley, Justin, Texas.

6BNQ Tunes In

EDITOR, RADIO WORLD: In *RADIO WORLD*, No. 36, dated December 2, Mr. E. Sherow, New York, claims the record for 1-tube DX reception. I think I have him beat. Here is my list to date:

WBAY, New York City, good; WGY, Schenectady, New York, faint; KDKA, Pittsburgh, good; KOV, Pittsburgh, good; WSB, Atlanta, Georgia, good; WOC, Davenport, Iowa, loud; WOI, Ames, Iowa, good; WHB, Kansas City,

Missouri, good; WBAP, Fort Worth, Texas, good; KLZ, Denver, Colorado, good; KFAF, Denver, Colorado, good; WFAA, Dallas, Texas, good; KOB, State College, New Mexico, good; KZN, Salt Lake, loud; KDYL, Salt Lake, loud; KFBF, Butte, Montana, good; KDYS, Great Falls, Montana, good; KFBJ, Boise, Idaho, good; KGG, Portland, Oregon, loud; KGW, Portland, Oregon, good; WOAI, San Antonio, Texas, good.

This is not the complete list—only stations over 400 miles away. My receiver is a home-made Grebe CR-5 with detector only. The aerial is 35 feet high and 50 feet long, 3-wire inverted L. Please publish this and give other "bugs" something to think about.—Merle Schilling, Opr. 6BNQ, Box 297, Beaumont, California.

Timely N. R. W. Hint

EDITOR, RADIO WORLD:—Could not the broadcasting and amateur stations be pressed into service to advertise National Radio Week? May I suggest that you mail a few letters along this line to start things going. I am for National Radio Week and do not want to overlook anything that will help the good cause.—R. C. Connor, 931 North Fourth Street, Camden, New Jersey.

Why Magnavox is the Reproducer Supreme

OFFICIAL tests with the oscillograph prove that the Magnavox electro-dynamic receiver reproduces incoming wave forms with maximum accuracy.

The Magnavox can be used with any receiving set—the better the set, the more Magnavox can do for you.

When you purchase a Magnavox you possess an instrument of the very highest quality and efficiency.



R-2 Magnavox Radio with 18-inch horn (as illustrated)

This instrument is intended for those who wish the utmost in amplifying power; for clubs, hotels, dance halls, large audiences, etc. It requires only .6 of an ampere for the field.

Price \$85.00

R-3 Magnavox Radio with 14-inch horn

The ideal instrument for use in homes, offices, amateur stations, etc. Same in principle and construction as Type R-2. Price \$45.00

Model C Magnavox Power Amplifier

For use with the Magnavox Radio and insures getting the largest possible power input.

2-stage \$ 80.00
3-stage 110.00

Magnavox products can be had of good dealers everywhere.

THE MAGNAVOX CO.

Oakland, California

N. Y. Office: 370 Seventh Ave.

Latest Radio Patents

To Detect Minute Values of Energy

Earl C. Hanson and Wendell L. Carlson Put Heterodyning to Important Use

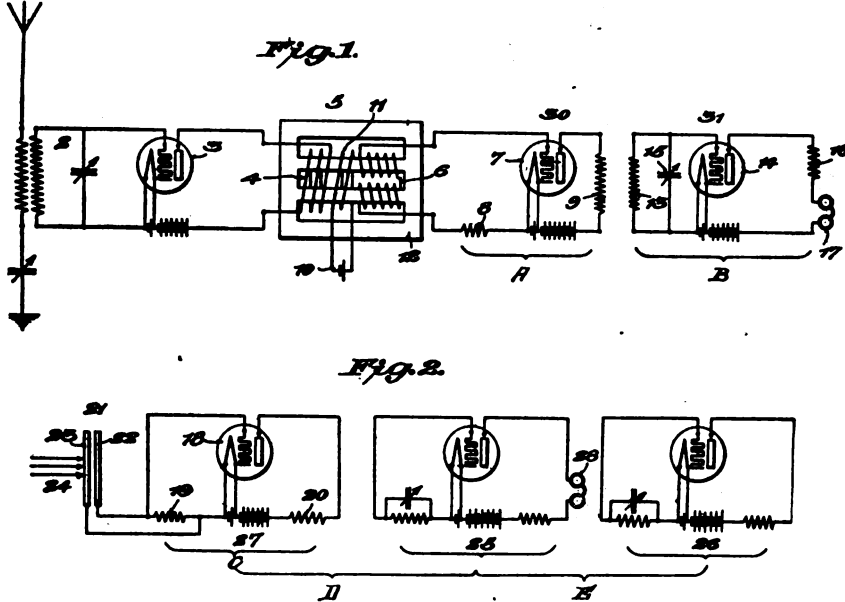


Figure 1 shows diagrammatically the invention utilized for the reception of radio signals. Figure 2 shows the invention adapted for measuring the luminosity of a source of light

No. 1,437,246, Patented November 23, 1922. Patentes: Earl C. Hanson and Wendell L. Carlson, New York City

TWO of the foremost radio experimenters in the United States have been granted letters of patent on what seems to be an entirely new method of detecting and amplification of radio currents—an invention to provide suitable apparatus for detecting slight variations

in the frequency of an oscillating current. The fundamental principle on which this invention is based is the "heterodyning" of two or more oscillating electric currents to produce a beat, the frequency of which will be determined by the natural constants of the circuits and the external influence of an interference acting upon one of the circuits.

* * *

Kills Undesired Oscillations

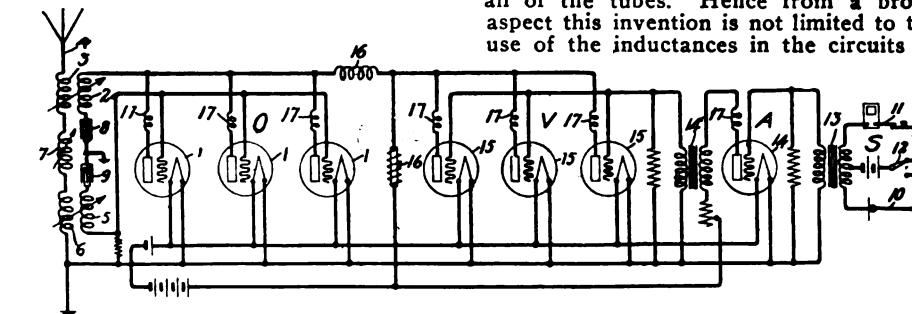
No. 1,437,221. Patented November 23, 1922. Patentes: John C. Schelleng, East Orange, N. J.

AN invention to prevent vacuum tube systems from generating undesired oscillations. It is particularly applicable in the case of radio-transmission systems utilizing electron discharge devices having plate, grid, and filament electrodes for transmitting electromagnetic waves of high power.

In such vacuum tube systems, especially systems comprising a plurality of high power tubes in parallel, troublesome oscillations of undesired frequencies often occur. In many instances these oscillations are of a frequency much higher than the frequencies normally used in signaling. These undesired oscillations often result in failures to operate at the

proper frequency, or in the capricious alternation of the frequency from one value to another, particularly during modulation. In some cases, these exceedingly high-frequency oscillations manifest themselves by periodic or irregular variations or phenomena which occur at lower frequencies or irregular periods respectively. In certain cases, waves or impulses occur of such frequencies as to produce audible sounds which are especially objectionable. These high-frequency waves may cause excessive differences of potential between certain closely placed parts of the apparatus.

Where undesired oscillations occur as a result of a cyclic transfer of energy through several tubes, it may be possible to prevent these by including inductances in the circuits of one or more but not of all of the tubes. Hence from a broad aspect this invention is not limited to the use of the inductances in the circuits of



In Figure 1. Reference character 1 designates a tuned radio-frequency antenna-circuit, which is coupled magnetically to the resonant circuit 2. The thermionic vacuum-tube amplifier 3 has its input connected to a circuit 2 and its output connected to the input winding 4 of the well-known magnetic amplifier 5

every tube of a parallel group. The use of the words, "plate, grid, and filament" in describing the elements of discharge devices are to be understood in their generic sense as referring to anode, control, and cathode electrodes of any form and construction.

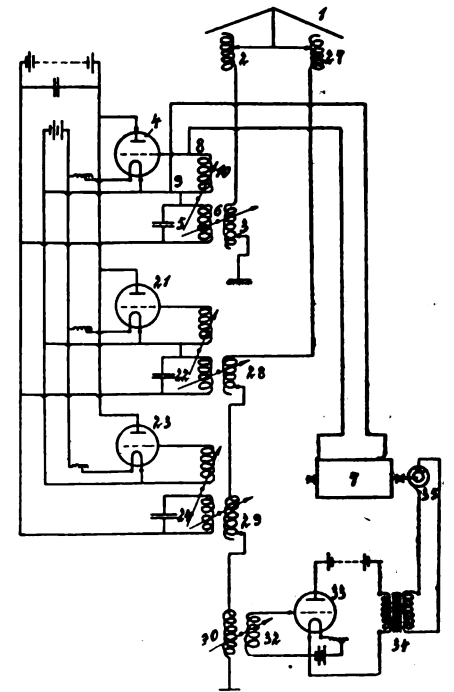
It is to be hoped that if this system of Mr. Schelleng's comes into general use; it will allow more powerful stations to operate at a closer wave-length range without causing the interference that is now so noticeable.

* * *

Pictures by Radio

No. 1,436,676. Patented, November 23, 1922. Patentes: Magnus Hermod Petersen, Christiania, Norway

MR. PETERSEN'S invention is intended for the transmission by radio of pictures, writings, or other similar matter. In this device, part of the current circuit of an alternating current generator connected to the transmission leads is short-circuited by means of a contact arrangement, which is so actuated by means of the writing at the



Diagrammatic illustration of a form of Mr. Petersen's invention, located in the sending station.

sending station, that the short circuiting is started or interrupted by means of a contact needle passing over the written lines. His method is also adapted for solving the wireless synchronizing problem. The inventor claims that by his method of transmitting photographs by radio, perfect detail is maintained and that, according to the advance in radiophotography it has been the most difficult phase of development in the new science, to perfect.

How to Buy

WHEN you decide to buy an auto-mobile, you don't just go out and buy the first one you come across. You look at a number of them and then decide on the one you think will give you the best service for the money you spend. Then, why do you buy radio goods and sets just the opposite? Don't take the first thing that the salesman offers you and then be dissatisfied and grumble about getting "stuck." Buy radio goods as if you were buying a motor-car. Determine just how much money you can afford to spend—and then get the best set you can within your price.

Hoover May "Control the Air"

He Asks for That Power in Appeal from United States Courts Order to License New York Radio Company

ON another page of this issue of RADIO WORLD, Mr. Carl H. Butman, our Washington correspondent, contributes a timely article based on the suggestion of Herbert C. Hoover, Secretary of Commerce, that radio legislation is urgently needed in the United States. This action may be stimulated by a suit just filed in the United States Court of Appeals, Washington, D. C. It seems that after having its hands tied for over a year, so far as the regulation and the control of radio communication between the several States and foreign countries are concerned, the United States Government has begun a fight in the Court of Appeals of the District of Columbia for a decision which will place Secretary Hoover in "control of the air."

On behalf of Secretary Hoover, District Attorney Peyton Gordon and Assistant Dis-

trict Attorney Vernon West argued that Justice Wendell P. Stafford of the District of Columbia Supreme Court had erred in compelling Mr. Hoover to renew the license of the Inter-City Radio Company, Inc., to operate a high-powered commercial wireless station at 110 West Fortieth Street, New York City, and also to fix a wave length at which the company might operate without interfering with messages from nearby stations.

The license of the Inter-City Company expired on September 22, 1921, and Mr. Hoover refused to renew it, acting on the theory that the law vested him with discretionary power in that respect. Complaints had been made by the radio communication services of the Government and others that it was impossible for their stations to send or receive messages while the Inter-City plant was working.

The appellate court took the case under advisement.

Radio Compass Uses

Should There Be Another War, It Will Play an Important Part

RADIO compass receivers, it is claimed, will be instruments of great importance in warfare. Any radio transmission of the enemy's fleet, for example, is subject to reception; and if so received, the direction from which it comes can be determined and the approximate location of the fleet, or ship, determined. For this reason it is practical, in war time, to keep the amount of radio traffic at an absolute minimum, using it only when absolutely necessary and then restricting the power used to that required for the communication carried on. The radio compass may be used also for locating hidden radio-transmitting stations on land.

As in other branches of science and engineering, the practical application of radio compasses has been accompanied by a number of difficulties and has required an enormous amount of research and development work to perfect a working system. This work has centered mostly on determining the type of transmitted signals which lends itself best to accurate bearings and to means for improving the calibration of the compass receivers. It has been found, for example, that the calibration, even of a fixed station with no moving objects nearby, is not permanent and must be corrected from time to time.

The compass receiver usually has more amplification than the receiver operating on a flat-top antenna, since the voltage generated in a loop is usually less than in an antenna.

The directive properties of a loop, are applicable to forms of reception other than compass work, and are frequently used for ordinary radio-reception work in vicinities where there are a number of transmitting stations. Rotating the loop makes it possible to secure maximum signal-strength from any one of a number of stations, provided they are not on the same line.

That Armstrong Circuit

So much interest has been displayed in the special article, "TESTED INVENTION OF MAJOR ARMSTRONG AMPLIFIERS SET 100,000 TIMES," by John Kent, that appeared in RADIO WORLD No. 13, dated June 24, 1922, the publisher decided to put aside a number of copies for those who were not able to get this issue when published. Copies will be sent, postpaid, on receipt of 15c, or send in your subscription, \$6.00, for one year (\$2 issues), \$3.00 six months, or \$1.50 three months, and subscription will be started with the issue containing the article about Major Armstrong's Amplifier.—RADIO WORLD, 1493 Broad-

B C M BROADCAST RADIO RECEIVER

Many people live in locations where an aerial is impossible. Others object to their premises being disfigured by poles and wires, and many doubt their ability to operate sets with such complications. Eliminate these features by using B C M Radio Frequency Broadcast receivers and inside aerial.

Dealers should write

B C M RADIO COMPANY
YPSILANTI, MICH.

Quality, Design + Workmanship + Material = RELIABILITY



Simple to Use

Just plug in at any 110 v. A. C. lamp socket—attach clips to battery—turn on current and you have your own charging plant.

A compact portable Recharging unit that will fully charge a 100 AH battery overnight for 5c. to 10c.

At your dealers or write

King Electric Mfg. Co., Inc.
1681 Fillmore Avenue Buffalo, N. Y.

Don't overcharge your battery. That is as bad as letting it stand without charging.

DELICATE SOLDERING

Both the manufacturers' and amateurs' problem on all fine work is readily solved by the instrument constructed for this particular purpose.

THE POST SOLDERING IRON

Platinum Heating Unit—Interchangeable Tip—Universal Current



One Half Actual Size

\$6.00

From Your Dealer or Write

Awarded Certificate of Excellency, N. Y. Evening Mail Radio Institute

POST ELECTRIC COMPANY, (Div. 509) 30 E. 42nd St., New York

THE ONLY GENUINE AND GUARANTEED

"All Wave" Coupler

TRADE MARK FLAT AND BANK WOUND

Wave Length, 150 to 3,000 Meters

Eliminates the use of all Variometers, Variocouplers and Loading Coils, inasmuch as it performs in one compact unit the functions of all of these devices combined.

For the Novice—The six efficient hook-ups given free with each "All Wave" Coupler enables the greenest novice to attain the same results attained by the expert in building the simplest, most compact and most efficient radio receiving set possible.

Be Prepared—For the higher wave lengths that have been and will be allotted to broadcasting stations because of their ever-increasing number. BUILT a set that cannot become obsolete.

Unusual Results Attained—Individual users of the "All Wave" Coupler have written us that in Rhode Island it is nothing unusual to bring in stations as far south as Havana, Cuba; while in Mobile, Alabama, Newark, N. J., is brought in daily.

Beware of Imitations—of the "All Wave" Coupler, which is guaranteed with a money back to operate as advertised. Look for the trademark, "All Wave," on the rotor, also the six efficient hook-ups in the box.

\$9.00 Six efficient Hook-ups sent upon receipt of 10c. stamps or Free with each "All Wave" Coupler

GUARANTEED WITH AN ABSOLUTE MONEY-BACK GUARANTEE
THOUSANDS OF SATISFIED USERS

Capitol Phonolier Corporation



Patents Granted and Pending

60 Lafayette Street
New York City

SEND US THE NAME OF YOUR RADIO CLUB

Also the names of your president and other officers. We want to add these to a list of radio clubs and officers we are preparing for publication in an early issue. RADIO WORLD, 1493 Broadway, New York.

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

Sustain Radio Injunction

Superior Court Reaffirms Decision to Stop "Bad-Faith" Radio Advertising

THE Appellate Division of the Supreme Court of the State of New York has confirmed the lower court's decision granting an injunction to the Freed-Eisemann Radio Corporation in its suit against the Wireless Specialty Apparatus Company. The injunction was sought to prevent the Wireless Specialty Apparatus Company from advertising and circularizing certain statements made in regard to radio patents.

This decision has a very important bearing, and is the first step in the solution of a great many patent tangles resulting from the sudden growth of radio.

Interesting developments are expected as a result of this decision in connection with the claim of the Freed-Eisemann Radio Corporation for \$150,000 damages, alleged to have been suffered by them as a result of the patent warning advertisements inserted in various papers, and in restraint of which the injunction was granted.

Business Is Fine

RADIO business is quite normal. It is the large number of retailers, manufacturers and jobbers that make conditions bad, says "The Mail," New York. The situation may be compared to the large number of thirty men standing about a good sized pail of water. Although the pail is large enough for ordinary purposes, there is not enough water in it to go around. As a result some of the thirsty ones remain thirsty. As the sifting down process of the radio industry continues the time will come shortly when there will be plenty of business for those who are able to last. The industry is simply adjusting itself. Although the retail trade is picking up splendidly, the good effects have not yet been felt by the jobber and the manufacturer to any great extent. After the Christmas period perhaps the manufacturers will get their share.

A Condenser for Superaccurate Tuning

THE Hammarlund Vernier Condenser was designed by experts and is manufactured by a concern twelve years in the business. The patented vernier-control moves the rotor plates by as little as 1-50th of a degree on the condenser scale, and is arranged to eliminate all interference due to body capacity. It is therefore possible to get on the exact wave necessary to receive at maximum efficiency, without the least interference from other stations broadcasting on the same wave length at the same time.

Its construction is so rugged that capacities at given settings always remain constant, making it impossible for it to get out of calibration, even though abused. The plates are the Bureau of Standards straight-line wave-length type, most suitable for wave-meter work. The capacity increases at a uniform rate and makes the most critical adjustments possible. The plates will withstand the high voltage used in transmission work and cannot become short-circuited.

The Electrical Testing Laboratory certifies an insulation resistance of 15,000 megohms, minimizing leakage and power loss; a phase difference of less than .01 at 750,000 cycles; and a zero capacity almost too small to be measured.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Hause Battery and Auto Electric Corporation, Jamestown, \$20,000; F. E. Roth, F. E. Hause, G. H. Zillig, Jr. (Attorney, W. B. Grandison, Jamestown, N. Y.)

Alcon Electrical Supply Company, Manhattan, \$7,100; J. H. Lyons, E. Dimin, M. Driscoll. (Attorney, S. B. Cardozo, 30 East 42d St., New York.)

Westchester Radio Distributing Corporation, Mamaroneck, N. Y.

E. R. Lemanquais Company, Plainfield, N. J., electrical engineers; K. N. Lemanquais, Harold Lemanquais, E. Ross Lemanquais, Plainfield, N. J.

General Electrical Protection, Brooklyn, burglar alarms, systems, \$5,000; E. S. Depasquale, H. Alexander. (Attorney, P. L. F. Sablatino, 291 Broadway, New York.)

Oranola Radio Corporation, Wilmington, Del., manufacture talking machines, \$1,000,000. (Corporation Service Co.)

G. & G. Electrical Corporation, Glens Falls, contractors, \$10,000; S. and W. I. Ginsburg, A. A. Goracoff. (Attorney, J. McPhillips, Glens Falls, N. Y.)

Bajon Electric Corporation, Wilmington, Del., mechanical and electrical apparatus, \$500,000. (Corporation Trust Co. of America.)

Crowther Electric Company, 310 Main Ave., San Antonio, Tex.

Electric Fixture & Radio Corporation, 234 Sixth Ave., North Nashville, Tenn. Incorporators: A. F. Anderson, Tom C. Sharp, E. M. Hudgins.

Clearstone Radio Supply Company, 5 Laura St., Providence, R. I. Albert E. Proffitt, prop.

States Radio Corporation, Wilmington, Del., manufacture radio, \$30,000. (Corporation Service Co.)

Realstuff Radio Company, 8815 Lane Avenue, Detroit, Mich.

Weld Square Radio Shop, 46 Weld Square, New Bedford, Mass. Frank S. Sousa and R. M. Russell.

Edison Electric Appliance Company, Inc., 412½ Stark Street, Portland, Ore. S. G. Stuart, proprietor.

CHANGE OF NAME

The Etna Radio Company, New York, has changed its name to Herald Laboratories.

CAPITAL INCREASE

Electric Specialty Company, Fairfield, Conn., \$25,000 to \$250,000.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31. Colwell & Korbell, Fiak Building, New York City, directors of publicity.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

FIRST UNIVERSAL EXPOSITION OF INVENTIONS AND PATENTS, Grand Central Palace, New York City, February 17 to 22, inclusive, 1923.

Heard at Radio Counter

A Conversation Between Customer and Radio Clerk

(Part VII)

"I HAVE a crystal receiving-set and am anxious to know if I can convert this receiver into a set employing a vacuum tube as a detector."

"Yes, sir. You certainly can do so. But tell me what method of inductance you are using; namely, tuning coil, loose-coupler, or vario coupler."

"Well, I believe I am using the loose-coupler, as it has a primary and secondary. The secondary operating in and out of the primary on a brass shaft."

"You are correct in your assumption that it is a loose-coupler. With this loose-coupler you can connect up a vacuum tube very nicely."

"Just what tube would you recommend with this loose-coupler?"

"That is a hard question to answer. Let me ask you just what vacuum tube you prefer to install. You know there are two kinds: the six-volt storage battery tube and the one and one-half-volt dry-cell tube."

"What is the difference between these tubes?"

"The difference is this: One tube operates on six volts supplied from a storage battery; the other tube operates from a single dry-cell battery."

"What is the effect on each tube so far as the reception of signals is concerned?"

"Wonderful results have been obtained with either of these tubes, the difference being the elimination of the troublesome storage-battery necessary for the six-volt tube."

"Well, on that advice, I guess I'll take the dry-cell tube."

"Very well, sir. Here you are."

(To be continued)



VARIABLE CONDENSER

23 plate Variable Condensers. Genuine brown Bakelite ends. Heavy Aluminum Plates. All brass parts nickel plated. Complete with Knob Dial and Pointer, \$1.75 Cash with order.

E. J. ROBE
620 W. Monroe St. CHICAGO, ILL.

AETACO

German set, complete with WD-11 tube and A & B battery. A special at...\$15.00

Federal Phones	\$4.75
Standard Variometers	\$1.50
"B" Batteries, 22½ volts.....	90c

A complete line of Charles Freshman Co. products always in stock. Variable Grid-leak and Condenser. Formica panels cut and drilled to order at lowest prices.

American Electro Technical Appliance Co.

225 Fulton Street (mail orders)
1987 Broadway New York City

Answers to Readers

RECENTLY I constructed a one-stage radio-frequency and detector set, but cannot get as good results or as loud signals as when I used a detector and one-step (audio). I am not using audio now. What is the matter?—J. Shack, Brewster Corners, New York.

You do not enclose any data as to just what you are using; but you will not get any appreciable amount of amplification, if any at all, from one step of radio. The ideal radio-frequency is a tuned two-step radio-frequency detector and from one to three steps of audio. Radio-frequency makes distance possible mainly by clearing the signals up before they are detected.

What is the best type of storage B battery for use in a receiving set (Grebe regenerative)? Where can it be purchased?—O. Christensen, Philadelphia.

We cannot recommend any specific type of storage battery, but suggest that you write to storage-battery manufacturers for their literature.

What are the W-D 11 tubes? Are they as good as the regular radiotrons? Can I use these in my set (Portaloop; 3-step radio-frequency, 2 audio)?—Charles Boukes, Muncie, Indiana.

The W-D 11 are now known as the 1½-volt tubes. They do not require a storage battery for their operation, a single dry-cell being sufficient. They are exceptional detectors and good audio-frequency amplifiers. They cannot be used as radio-frequency amplifiers; so, if you intend to utilize them in your set you must rewire the filament circuits or else put sufficient resistance in the line for detector and amplifier so that not more than 1½ volts would flow through the circuit.

Give me a diagram showing how to hook up the following apparatus: Vario-coupler, variometer, 43-plate condenser, 3 tubes, 2 transformers, A and B batteries.—Edwin O. Uhlig, Richmond Hill, N. Y.

If you will refer to the hook-up in RADIO WORLD, No. 32, dated November 4, in "Receiver for Amplifying Weak Signals," by Horace Beers, you will find a diagram suited to your purposes. It will be necessary only to place the variometer in the position of the coil marked "Tickler," in order to accommodate your apparatus. It is not necessary to have three separate B batteries. You can connect them together and tap off at 22½ volts for the detector, the other lead of the remaining 45 going to your amplifiers.

I am building the superregenerative set, by H. S. Potter, described in RADIO WORLD, No. 31, dated October 28. What are the best tubes to use in this circuit? Should I use a detector and amplifier, or two amplifiers?—D. Wilkes, Washington, D. C.

The regular U-V radiotron are the best tubes to use in this circuit, as it is rather critical. A detector and amplifier are sufficient.

I have a 180-degree coupler, primary wound with 60 turns of 22 S. C. C., on the rotor. Could I incorporate this in the 2-tube superregenerative described by H. S. Potter in RADIO WORLD, No. 31, dated October 28. Will an 18-inch loop work with this set and how many turns will be necessary? Will this loop be directional?—M. W. Rowell, East Orange, N. J.

As this circuit is very critical, it is not

advisable to change any of the windings to anything except explained by Mr. Potter in his article. It will be necessary for you to rewind the rotor and stator of your coupler. Make sure that the outside diameters of both are the same as that stated in the article otherwise you will not get the results that can be had with a set of this type. The 96 turns are on the rotor. It is very important that all instructions regarding the construction of any part be followed to the minutes degree. If you wind about 10 turns of wire on this loop, it will work satisfactorily. It will probably work on a smaller loop; but this is not advisable, as then the tuning is sharpened too much. When the loop is pointed in a direction, the signals will be received best from stations directly in the plane of the loop.

Is it necessary to use batteries in conjunction with an Aeriola, Jr., crystal set? I can't tune between WJZ and WEAJ when they are on together, like other sets I have heard, but hear both at the same time.—"Radio," Brooklyn, N. Y.

A battery would be of no help in a crystal set. Your trouble is characteristic of all crystal sets. A crystal set cannot tune as sharp as a bulb set and, therefore, you are able to hear both stations though there is a difference in the wave length.

I intend to construct a small regenerative coupler-set. I understand that I must use bakelite tubing, on which to wind my coils, for best results. Is this so? I have received satisfactory results from my tuner wound on a cardboard oatmeal box.—Jerry Hecht, New York.

While bakelite is a much better insulator than cardboard, it is not necessary to wind your coils on bakelite. Ordinarily, cardboard tubing shellaced and left to dry so that it will not warp or shrink, is sufficient.

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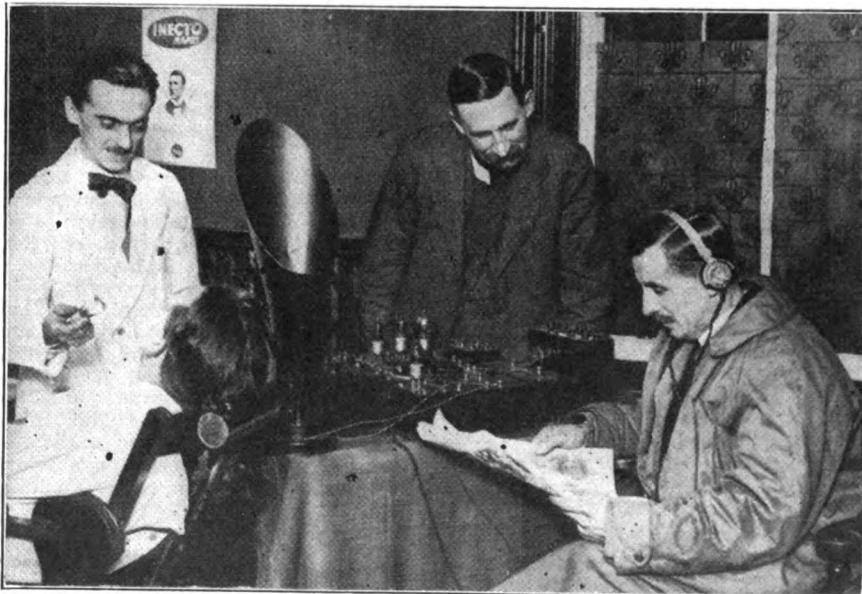
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The Great Silent Audience
By Rev. Claude J. Perrin, S. J.
Loyola University, Chicago

THE radio broadcaster who has had previous platform experience must change his whole mental outlook. He has been accustomed to "feel out" his audience. It may be cold, he must rouse it; it may be critical, he must ingratiate himself; it may be turbulent, he must calm it! it may be sympathetic and "go along" with him from the first applause.

Talking into a microphone is a good deal like making an impassioned appeal to a wooden Indian—the expended energy is all on one side. I imagine that as the broadcaster gradually builds up a new technique, he will draw powerfully on his imagination—and his success will be in proportion to his power to visualize, just as the success of the speaker today lies largely in ability to "sense" his audience.

He will stand in front of that steel transmitter in the solitude and tense silence of the KYW studio and a greater audience than ever gathered in the Athenian theatre of Dionysius or in the Roman Colosseum or on the hill of Tara will form in the prospect of his "mind's eye." He will visualize the dwellers in the city apartment, the street crowd that has drifted into the retailers shop, the farmer and his family gathered around the evening kerosene lamp in the living room, the lonely rancher on the western plain, the camping party with their outfit set up in the pine forests of Canada—did ever the human voice since man communicated his ideas to man have such an audience as this?

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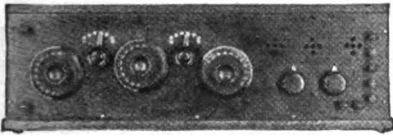
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Broadcast Bill's Radiolays

By William E. Douglass

OUR neighbor's son—I call him "Bub"
 —is only five years old, but sharp
 as tacks an' curious too, 'bout some
 things he's been told. Fer instance, he's
 had doubts of late regardin' Santa Claus,
 an' to his way of figgerin' our stories
 have some flaws. "He can't come down
 the chimney," Bub sez, "fer it's heaps
 too small; so if there is a Santa Claus he
 comes in the door, that's all." "How can
 Santa visit all the children everywhere?"
 I told him that wuz easy 'cause he travels
 through the air. "I wish that I could
 talk to him," Bub sez to me one night;
 an' then I sez, "I reckon we kin fix that
 up all right. "You know he lives away
 up North but maybe I kin get old Santa
 Claus to talk to you through this here
 wireless set." I told Bub to come over
 to our house on Saturday. "If we kin
 make connections we'll hear what he has



"I put the earmuffs on the lad and then
 I made a show of fussin' with the set."

to say." I'd noticed in the papers where
 they said that he would 'speak to all the
 children everywhere by radio this week.

Next day when Bub came over he sed
 he would like to hear what Santa (if
 there wuz one) had laid out fer him this
 year. I put the earmuffs on the lad an'
 then I made a show of fussin' with the
 set a bit to make it seem as though I
 really had "tuned in" that place that
 nobody kin see where Santa makes all
 his toys—The North Pole Factory.
 When every thing wuz ready an' Bub
 lis'nin' by the set, Saint Nick begun by
 askin' him what all he'd like to get.

But 'fore young Bub could answer he
 sed "how'd you like to have a sled or
 would you rather have me bring a 'lectric
 train instead? To every boy who believes
 in me an' tries to mind his dad, I'll bring
 a lot of presents; but fer any boy that's
 bad, who doesn't help to do the chores
 an' carry in the wood, I'll take his share
 of toys to the ones that have been good."

When Santa Claus quit talkin' Buz wuz
 quiet as a mouse. This radio's a handy
 thing to have around the house.

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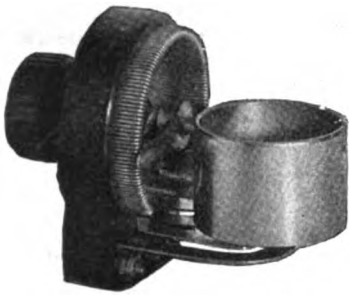
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How to Avoid Interference When a 360 Meter and a 400 Meter Station Are Operating Simultaneously, by C. W. Horn.

NOVEMBER 4.
Receiver for Amplifying Weak Signals, by Horace Beers.
How to Learn the Code, by Ortherus Gordon.
Detectors—and How They Work, by Donald Van Wyck.
One of the Most Delicate Parts of a Receiver, by George W. May.
Wave Meter for Amateur Operators, by United States Bureau of Standards Experts.

NOVEMBER 11.
How to Build a 100-Meter Concert Receiving Set, by Frederick J. Rumford.
Wide Field for Experimenting with Aerials, by Donald Van Wyck.
Single-Tube Superregenerative Receiver, by C. White.
Utilizing Ford Spark-Coils for Audio-Frequency Transformers, by Ortherus Gordon.
Why It is Necessary to Tune In, by Arthur G. Shirt.

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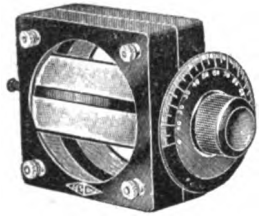
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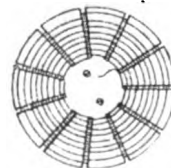
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Radio Makes Flying Safer

Bureau of Standards Developing New Type of Altimeter to Be Used in Conjunction With Radio

A MODERN airplane is fairly safe so long as the pilot can see the ground; but with the ground hidden by mist it is in a very dangerous predic-

ament, the Department of Commerce points out in relation to a new airplane altimeter being developed by the Bureau of Standards.

It cannot stay up in the air indefinitely, and when it tries to land it is quite likely to come in sight of the ground so quickly that there is no time to turn. Moreover, the pilot, out of sight of earth, has no way of telling where he is. He knows his own speed with relation to the air, but cannot tell the direction or velocity of the wind which may be an appreciable fraction of his own speed.

Recent inventions have done much to eliminate this hazard. Pilots of the United States Mail Service now make regular trips in all sorts of weather and land safely at their destinations.

Chief of these is the radio compass. With this device it is possible for the pilot to tell the direction of any station sending signals and to steer towards it. He has thus eliminated the danger of getting lost; and so long as there is a space of clear air under the clouds, he can get down safely. However, when the earth is blanketed in fog, the pilot must know not only his direction but also his altitude relative to the landing field. For these he must rely on his altimeter. Now, an altimeter is nothing more than an aneroid barometer with a scale in altitudes. Like any other barometer, it changes not only with the altitude but with the weather as well, and it gets these elements inextricably mixed. A change in weather may change its readings by an amount corresponding to a hundred feet or more in altitude.

This difficulty is largely eliminated in airplanes equipped with radio by a new altimeter being developed at the Bureau of Standards. This instrument has the usual fixed scale, and it also has a movable scale, the zero of which can be set at any point of the fixed scale. In approaching a landing field, the pilot gets, by radio the barometer reading at the field and sets the zero on his movable scale to that reading on the fixed scale. His altimeter will then tell him accurately how high he is above the landing field and will enable him to get down safely even in a fairly thick fog.

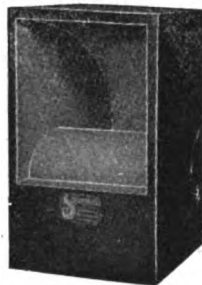
When airplanes become more numerous, it will not even be necessary for the pilot to have a radio-sending station on board in order to take advantage of these inventions. The radio compass itself is merely a special form of receiving set but little heavier than an amateur set; and this can be used for getting the barometer reading which could be broadcast at regular intervals.

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 SPIROLA SIMPLEX—for use with Baldwin or other unit. Black (SB), oak (SO) and mahogany (SM) finish, same price as DUPLEX.
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With every pair of Federal headsets at \$5.50 we will give **FREE** a good quality rheostat

No checks or C. O. D. Money order or cash with order. Mail order only. Merchandise shipped same day order is received.

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At Your Service!

There appeared in **RADIO WORLD**, dated April 1, 15, and 29, the following articles:
April 1—A 500-Mile Radiophone Employing a 5-Watt Tube, by Frank A. Mahnel. "Tell Me, Please, How Will This Set Receive?" by E. L. Bragdon. Short Cuts in Receiver-Circuit Design, by O. C. Ross. Making a Short-Wave Regenerator, by Fred. Chas. Ehlert.
April 15—First Principles of Electricity as Applied to Radio, by John P. Miles. Your Storage Battery, by E. L. Bragdon. What Makes Radio Possible, by Edward Linwood. Ground Connection as Vital as Antenna, by Fred. Chas. Ehlert.
April 29—Valuable Pointers on Aerial Construction, by Edward Linwood. What Is Meant by Tuning, by E. L. Bragdon. Radio-Frequency Amplification and Regeneration, by Frank Armstrong. Honey-Comb Coils and Condensers, by Edward Linwood. Charging the Storage Battery, by E. L. Bragdon. How to Construct the Variocoupler, by Frederick I. Ramford.
Each copy sent on receipt of 15c. per copy, or the three copies for 45c.; or better still, send your subscription beginning with any one of these numbers, and we will send this paper for 52 issues, and you will then have a complete file for ready and constant reference. **RADIO WORLD**, 1493 Broadway, New York.

And They All Work!

Radio World Reader Tries Out Every Hook-Up Published in These Pages

EDITOR, RADIO WORLD:—I have experimented with the hook-up published in **RADIO WORLD** No. 35, dated November 25, under the heading, "DX Hook-ups for the Novice," and have had wonderful success with it, bringing in stations that I could not get with a three-circuit regenerative set. I had some trouble at first to make it oscillate; but, by mistake, I put a 23-plate condenser in the antennae circuit and was surprised how easily it then oscillated over the entire range of the variometer. I always try out every hook-up published in **RADIO WORLD**, as I have found, from experience, that they are all hook-ups that work. Therefore, it is more fun to know that you are going to get results from them.

Yours for a DX Christmas.—William Buxton, Laredo, Texas.

P. S.—Maybe this will help out some of the fellows that have had the same trouble as I did with the above circuit.—W. B.

An Inexpensive Panel

WHEN a beginner is planning a set, frequently he figures up and decides to postpone the task another week; or else he asks dad if he won't give "a couple more."

One of the ways to save some money when building a set is not to use a bakelite panel. If it is not necessary that the panel be black and shiny, use a piece of good dry hardwood which has been soaked in boiling paraffin.

Place the wood in the paraffin until the little bubbles cease. Take it out and let it drip for a while, then immerse it again. If no more bubbles appear, the paraffin has soaked into the wood and it may be used without fear of either warping or becoming moisture soaked.

Ideal Radio Night

MOONLIGHT has no appreciable effect upon radio transmission or reception in the northern section of the country, says "The Times," New York, but operators who have sailed through the tropics say that the moon has a tendency to weaken radio signals in the southern climes. The effect is more noticeable in connection with spark signals. Fog generally weakens the strength of radio in that the air and objects enveloped by the fog are damp. The dampness makes them better conductors of electricity and causes them to absorb the radio impulses. The ideal night for established long-distance radio records is the one having the cold, clear atmosphere of winter, just after a storm with its low hanging clouds has cleared the air.



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Western Electric, 2200 ohms..... 9.25 12.00
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Attention! Fans and Amateurs!

- Have you built your own receiver?
- Are you experimenting with any particular hook-up?
- Are you improving your set?
- Are you doing any interesting constructive work in radio?

Why not share this knowledge with your thousands of brother fans who read **RADIO WORLD** every week?

We want pictures of receiving sets with descriptions of how you overcame some difficulty, or of any additional part or unit that you have added to obtain better results. These are the things that, probably, the other fellow is looking for. Send in your information; pictures or whatever you have done to improve the art.

Remember the beginner is looking for them.

We intend to print in this paper, each week, pictured information and description of value to radio amateurs. If you have found a newer or better way of doing anything, don't keep the secret but tell it to your thousands of brother fans.

Send in a photograph of your set with or without accompanying diagrams and measurement. State whether you figure in the picture yourself, or not, and without any expense whatsoever to you we will make an engraving and publish it. Be sure to write your name and address plainly on photograph.

Send in your picture at once, or if you have not made a set or done anything else in making radio material, tell the boy next door all about this offer.

Address Technical Editor

RADIO WORLD, 1493 Broadway, New York City, N. Y.

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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

PATENTS—Electrical cases a specialty. Pre-war charges. B. P. Flaburne, Registered Patent Lawyer, 386 McCOMB Bldg., Washington, D. C.

MILLER AUDIO FREQUENCY transformer eliminates howling. Entirely satisfactory on three stages. Price \$5.00 postpaid anywhere in U. S. RADIO SALES CO., Box 1144, Bethlehem, Pa.

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EXCHANGE JOLLY, INTERESTING LETTERS through our club. Stamp appreciated. Betty Lee, Inc., 4254 Broadway, New York City.

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NEWS AND GOSSIP OF THE STAGE—Send 50c. for specimen copy of NEW YORK STAR, the great illustrated theatrical weekly. \$4.00 year, \$2.00 six months, \$1.00 three months. New York Star Co., 1493 Broadway, N. Y.

A VALUABLE RADIO LIBRARY—The special articles in back numbers of RADIO WORLD from April 1 to date, make an invaluable library of information and reference for everybody interested in radio. Single copies 15c each. Any seven numbers for \$1.00. The entire thirty-seven numbers to date for \$4.25. Our issue of Oct. 18 contains a list of articles published up to that date. Sent on receipt of 15c. RADIO WORLD, 1493 Broadway, New York.

RADIO FANS: Have you read of the wonderful new all-wave Radio Frequency Amplifier invented by Doctor Miller of the Naval Radio Research Laboratory, Bureau of Standards, Washington, D. C.? We manufacture this device under license. May be added to your present set, giving wonderful results on distant stations, or may be made up into loop receiver sets with extreme range and beautifully clear reception, for home or automobile use. Besides being the best amplifier on the market, the Miller covers all waves at equal efficiency. Price, \$6.50 per unit. Details free. Coast Radio, Inc., El Monte, Los Angeles, Calif.

PATENTS

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WE NEED RADIO WORLD, dated April 22 and August 5. If you have copies you don't require, mail to this office and current issues will be sent you for them. RADIO WORLD, 1493 Broadway, New York.

EXCHANGE LETTERS with friends everywhere. Pleasant pastime. Information for stamp. Smith, Box 3125, M. Portland, Ore.

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WE WANT YOUR NAME—On a postal card. We would like to get the name of every RADIO WORLD reader, as we expect to send out a special message that will interest you. Be sure to send us your name on a postal card and address it, GIFT DEPT., RADIO WORLD, 1493 Broadway, New York.

HAVE YOU SEEN IT? My unusual, fully illustrated radio catalog is complete. Saves you money. N. E. Ristey, Spring Grove, Minn.

VACUUM TUBES repaired reasonably. Satisfaction guaranteed or cost nothing. Vacuum Elect., 108, 1621 Derr, Toledo, O.

A WORD TO THE WISE RADIO WORLD No. 30, dated Oct. 21, published my hook-up, and amateurs were astonished as to results obtained. Those using this hook-up cannot afford to be without its latest improvements. Those desiring a set SECOND TO NONE and one having unlimited receiving range should not overlook this opportunity. Hundreds report hearing stations over 1,500 miles distant on single tube. COMPLETE INFORMATION AND BLUE PRINT, \$60 (no stamps). Write W. Miller, Box 222, Southern Methodist University, Dallas, Texas.

MEMORIZE WIRELESS CODE by this 3-hour home study course. Price, \$1.00. Sent in advance of price, upon request. Corydon G. Snyder, 1161 So. Ridgeland Ave., Oak Park, Ill.

RADIO PARTS—Low prices. Write for lists. Geneva Radio Co., 32 Grant St., Geneva, Ohio. 1 .001 Variable Condenser, 43 plate, \$2.50; 1 Fada Crystal Detector, \$1.25; 1 Clapp-Eastham, Med. H.R. Detector, \$28.00, new; 1 Magnavox, \$35.00, new. Ben Becker, Oakford, Ill.

FOR SALE—Clapp-Eastham HR tuners and HZ amplifiers, Thirty Dollars each. Cash with order. Brand new original cartons. WIRELESS, Box 353, Calais, Maine.

DID YOU GET THE XMAS RADIO WORLD? This was our attractive issue of December 9. Mailed on receipt of 15c., stamps or coin—or subscribe and have your subscription begin with XMAS number. RADIO WORLD, 1493 Broadway, New York.

FOR SALE—No. A-1 Gorton Engraving Machine and set of Radio letters, in good condition. Will sell cheap or trade for radio supplies. L. S. Ritter, 414 Deaderick St., Nashville, Tenn.

TWO PAGES of 11 hook-ups of great value to RADIO WORLD readers appeared in our issues of Oct. 21 and 28. Both copies sent on receipt of 30c. in stamps or coin, or start your subscription with Oct. 21 number. RADIO WORLD, 1493 Broadway, New York.

Claims Radio Saved City

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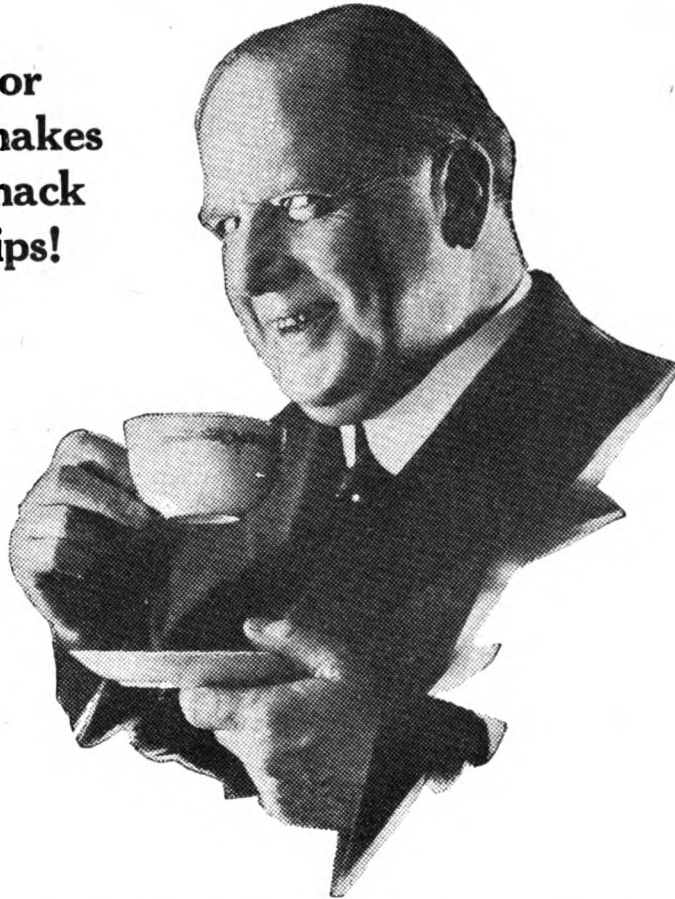
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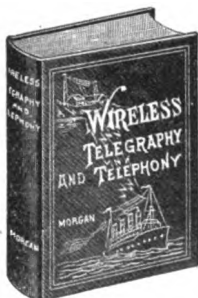
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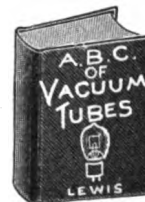


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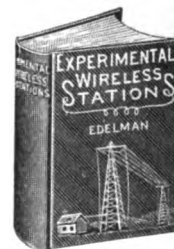
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VOLUME TWO OF
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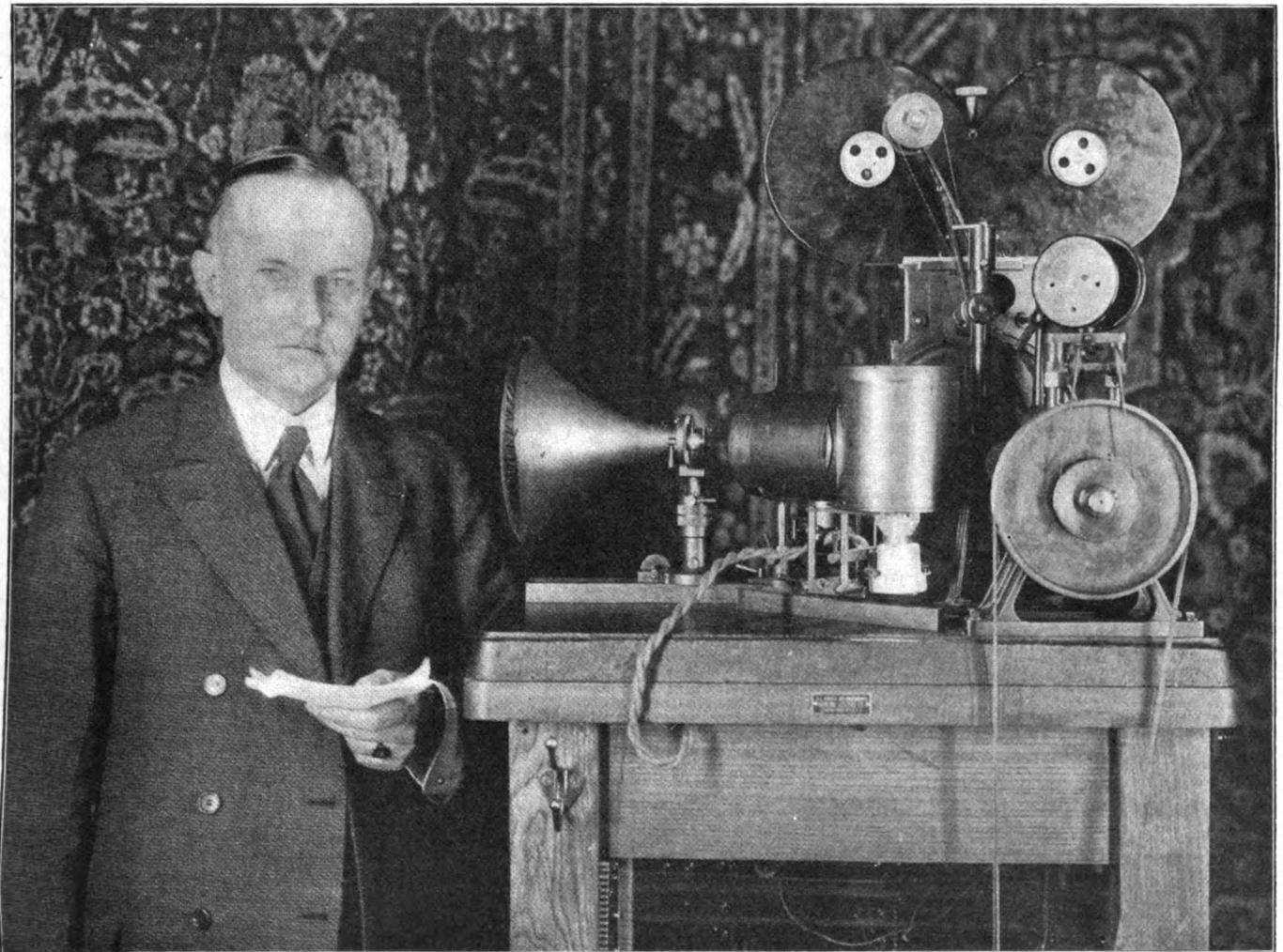
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The Vice-President Talks by Radio



Vice-President Coolidge standing by the machine which enabled his voice to be broadcast over the country. The device is fully described in the accompanying text.

ONE of the most notable radio events of recent date was the broadcasting of three important speeches to the people, by Calvin Coolidge, Vice-President of the United States; John S. Weeks, Secretary of War, and Edwin Denby, Secretary of the Navy. This was the first time that the spoken words of three of the nation's leading executives reached all corners of the country in one day. The broadcasting was done by WGY, of the General Electric Company, Schenectady, New York. This fact was made possible by use of the pallo-

photophone, a new device for photographing the voice and, later reproducing it with perfect clearness. The machine was set up in a hotel in Washington ten days prior to the speech-making. The Vice-President and the War and Navy Secretaries spoke into a small recording-horn. As they did, their voices caused a small diaphragm to vibrate to which is attached a tiny mirror, scarcely smaller than the head of a pin. This oscillation, or flickering, of the mirror reflected a beam of light upon a moving photographic film thus recording the

human voice accurately with the overtones, the delicate shadings of speech and other characteristics which make one voice sound different from another. The film was taken to Schenectady and was broadcast twice from the WGY studio, the first time at 7:30 P. M. and again at 10:30 P. M. for radio fans in the Western States. In reproducing, the film is passed before a strong ray of light and the zig zag markings on it which the sound waves photograph, create electric waves which pass through an arrangement of vacuum tubes.

How to Make a Single-Blade Vernier

By Ortherus Gordon

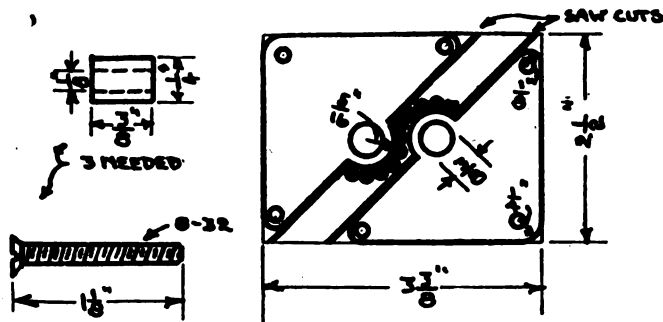


Figure 1—Complete details of the stator plates, bolts, and bushings for the panel mounting of a single-blade vernier.

THE reasons for presenting the workshop plans for a single-blade vernier condenser are many. In the first place, some amateurs may prefer such an instrument over an additional swinging blade on the regular variable, as suggested in a previous article. The present instrument has the advantage of being entirely independent and may be shifted about from circuit to circuit as needed. It has appeared in this form on the market. I have made one for myself and am satisfied that vernier control is necessary for sharp and efficient tuning.

Incidentally, I was curious to determine whether or not the vernier being separate from the main instrument made any difference. Some local amateurs were loud in their insistence that the distributed effect would be greater than the tuned-capacity effect; but I found out that, if such was the case, it was in no way noticeable.

The unit, as it is shown here, is a convenient and well-designed affair. Special pains were taken to make it as simple as possible. All the work may be done with the ordinary tool chest, vise and bench. When finished, the vernier condenser mounts on a panel with the other parts of the receiving set. Mine cost 54 cents, not counting the spare washers and pieces of brass found in my scrap heap.

The stator was made first. I took a piece of brass sheeting (although aluminum or copper will do) about 1/16 of an inch thick and marked it as shown in Figure 1. Owing to the semicircular lugs it was impossible to economize on brass. I cut out the two stator triangles with hacksaw and drill, then smoothed the edges and rounded off the corners with a file. When sawing plate brass, put the brass deep into the vise so as to prevent chattering. Protect the brass with wooden blocks, so the teeth of the

vise will not sink into the surface.

The two stator blades were then put in the vise together and drilled in the center with a 3/8-inch hole, and at the corners with 1/8-inch holes, as shown in Figure 1. Since I was designing the instrument for a panel, I cut three short lengths of brass tubing, 3/8 of an inch long, and large enough in inside diameter to take an 8-32 brass bolt with a flat head. In my case, with a panel 1/4

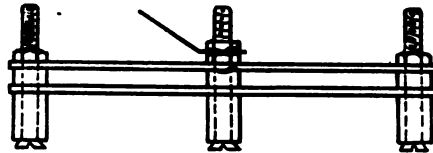


Figure 2—How to put the stator together.

of an inch thick, these bolts were 1 1/8 inches long. Then I took three aluminum washers (although brass or copper would serve just as well) 1/8 of an inch in thickness; and with these accessories, I put the stator together temporarily, as shown in Figure 2.

The rotor blade I cut out of thin brass with shears. It is semicircular, with a radius of 1 1/4 inches. A 1/8-inch hole is bored in the exact center of the blade, so that it will fit over the reduced diameter of the shaft, which is a 1/4-inch brass rod turned down to 1/8 of an inch at one end and threaded with the popular 8-32 die. The making of this shaft, by the way, is one of the jobs of the

instrument. There are three in all; the other two are the making of the fiber space-washers. Everybody isn't lucky enough to have access to a high-speed lathe, but that needn't discourage anyone. The shaft may be built without a lathe in this manner.

Take a short length of brass tubing, instead of brass rod, and tap one end for about 1/4 of an inch down. Then get hold of the ever-needed 8-32 bolt and screw it in until it is solid. Then saw off the head at the required length from the tubing, and presto! the job is done! See Figure 3.

Now, the two fiber washers, or bushings, are problems. It is too bad they cannot be dispensed with entirely; but unfortunately, they are vital parts of the instrument. The rotor must be insulated from the stator. Fiber, or hard rubber, or composition of some other kind are the only materials suitable for making the bushings as shown in Figure 3. I worked many hours to redesign the instrument so that these washers could be omitted. Although I succeeded, I always returned to the washer idea as the easiest way in the end.

I rummaged around in my "odd bits" box and finally came across some old fiber-washers which could be patiently filed until they had something that resembled a shoulder on them. If I remember rightly, it took me two hours to fit those fiber bushings the way I wanted them—to drill them so No. 1 would slide over the 1/4-inch part of the shaft and No. 2 over the 1/8-inch diameter.

The other details, such as the connecting lugs, explain themselves. The assembly was very simple. The washers go in place as shown in Figure 4, and the rest of the parts placed in the one and only way a variable condenser may be put together. Then it is mounted on the panel as shown. A graduated dial,

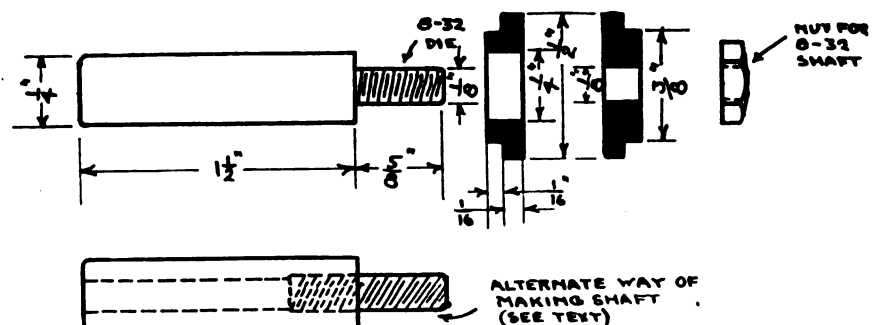


Figure 3—Schematic details of rotor and rotor shaft.

The Ossiphone an English Device Not Sold Here

IN RADIO WORLD No. 35, dated November 25, there appeared an article entitled "With the Ossiphone Even the Very Deaf May Hear Radio," by Ortherus Gordon. It described the invention of Mr. S. G. Brown, London, England—a simple instrument which, it is claimed, conveys sound to the brain by enlisting the aid of the bones in the body of the deaf person, hence its name.

So many inquiries have come to the offices of RADIO WORLD, since the publication of this article, from deaf persons who want to know where the device may be purchased, that the editors wrote Mr. Gordon for further information on this on this point. We publish his letter herewith.—THE EDITORS.

EDITOR RADIO WORLD: In reply to your query regarding the ossiphone, I am glad to give what further information I can about that instrument.

The ossiphone was invented over a year ago by Mr. S. G. Brown of London. He designed it for use with an instrument which he called an "aural box" into which a person desiring to converse with a deaf person spoke. This aural box was nothing but a sound-box and microphone, which relayed its vibrations to the ossiphone which the deaf person held in his hand with the knob pressed tightly against a knuckle. Then it was discovered that a radio receiver could be substituted for the aural box with wonderful possibilities for the deaf.

As far as I know, the ossiphone has

Radio-Wire Tables

By Frederick J. Rumford, E.E., R.E.

No. 5—Double Silk-Covered Wire

Showing the Number of Feet in a Pound and Fractions of a Pound

APPENDED is the fifth of a series of five tables of radio wires which the amateur will find useful for many purposes.

Size	1/8 lb.	1/4 lb.	1/2 lb.	3/4 lb.	1 lb.
20	39	78	156	234	312
21	48	96	192	288	389
22	61	122	244	366	493
23	78	156	312	468	631
24	99	198	396	594	779
25	129	258	516	774	1032
26	159	318	636	954	1272
27	192	384	768	1152	1542
28	239	478	956	1434	1917
29	310	620	1240	1860	2485
30	363	726	1452	2178	2900
31	468	936	1872	2808	3744
32	581	1162	2324	3484	4644
33	711	1422	2844	4266	5688
34	888	1776	3552	5328	7111
35	1066	2132	4264	6396	8534
36	1254	2508	5016	7524	10039
37	1333	2666	5332	7998	10666
38	1777	3554	7108	10662	14222
39	2064	4128	8256	12384	16516
40	2666	5332	10664	15996	21333

The following tables have already been published:

- No. 1—Enameled Magnet Wire, RADIO WORLD, No. 34, dated November 18.
- No. 2—Single Cotton-Covered Wire, RADIO WORLD, No. 35, dated November 25.
- No. 3—Double Cotton-Covered Wire, RADIO WORLD, No. 36, dated December 2.
- No. 4—Single Silk-Covered Wire, RADIO WORLD, No. 38, dated December 16.

not yet appeared on the American market. I have reasons to believe that it is on the market in England; but an examination of English periodicals does not reveal an advertisement to that effect. I had some inquiries from readers of the RADIO WORLD in regard to the manufacture of the ossiphone, and I

cautioned all to be careful of patent infringements. Such an invention as the ossiphone is certain to be protected in every civilized country in the world.

There is one man in England who, perhaps, could give information on the commercial aspect of the ossiphone. He is Mr. Philip R. Coursey, editor of "Wireless Age," London. He may even put a correspondent in touch with the inventor.

I realize the immense utilitarian benefit of the ossiphone.

(Continued from preceding page)
or a plain knob, is added as desired. The instrument is connected either in series or in parallel, the result

being the same. I have no idea what the capacity of this home-made instrument is, but it is small enough to make tuning a critical function.

Damped Waves in Spark Sending Waves

By George W. May, R. E.

FOR radio telegraphy, sending is accomplished with a high-voltage spark capable of producing from 150 to 200 sparks a second. Each of these sparks produces a radio-wave train having from 15 to 25 waves which have a frequency of about 1,000,000. Imagine a space of 300,000,000 meters containing 150 or 200 short-wave trains, equally spaced, the length of each little wave train being very short compared with the space between them.

The radio signals would then consist of dots and dashes containing a large number of noises made on the receiving apparatus by a larger number of these wave trains; while the dots would consist of a smaller number of wave trains which would produce the buzz for a shorter time.

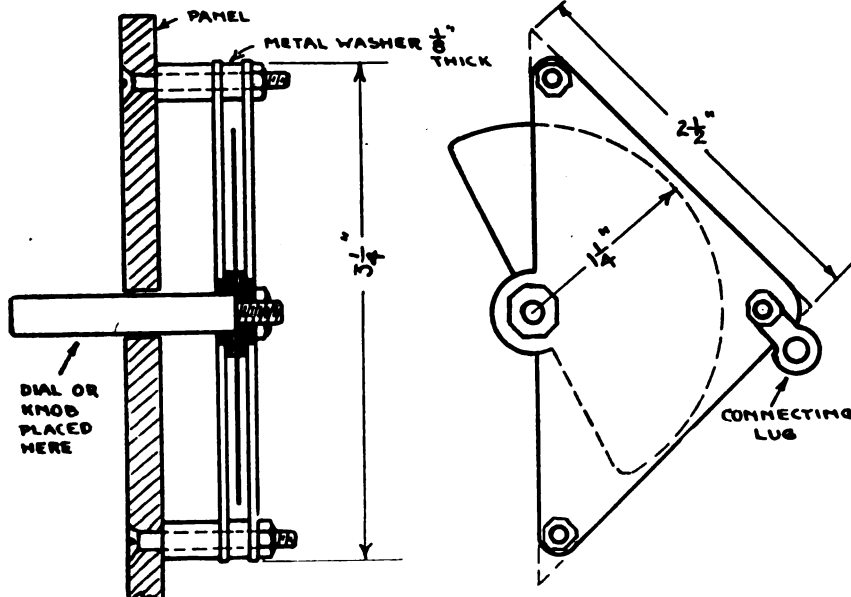
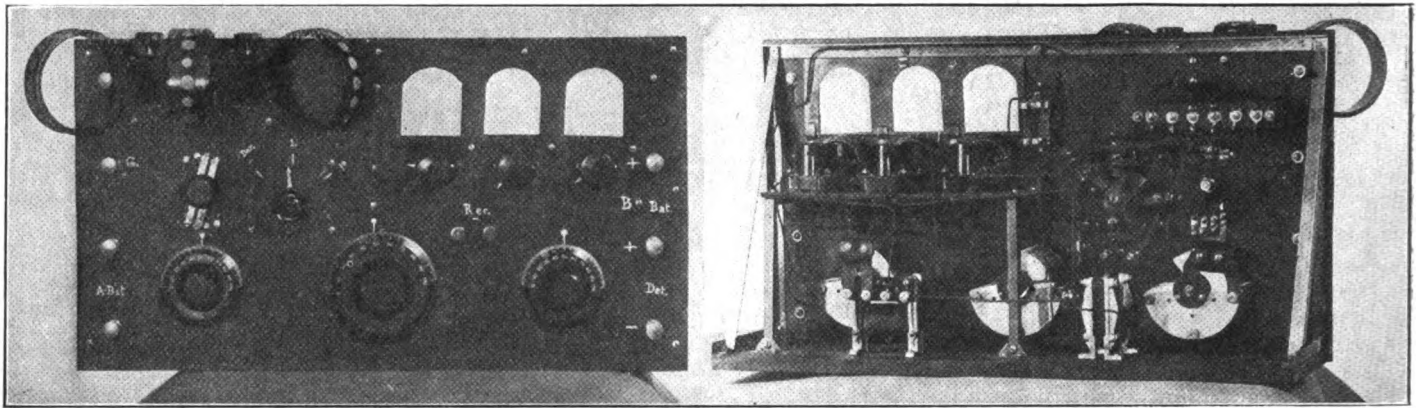


Figure 4—Assembly of the single-blade vernier condenser, as described by Ortherus Gordon, showing also the manner of mounting on the panel.



Front and rear views of the set designed and constructed by Edward Pina. The utmost care was taken in its construction. All the work was done under conditions which might impel the average amateur to doubt. It is worthy of note that, in point of construction, there are few sets that can surpass it. Note the specially designed anticapacity directly above the amplifying transformer and between the two condensers. The honeycomb coils were designed and hand wound by the builder especially for short-wave work.

Prize Set Built on Kitchen Table

By John Kent

FOR originality and clever wiring there is much to admire in the set, described in this article, the work of Mr. Edward Pina, an amateur, residing at 326 West 20th street, New York City. All the work on this set was done on the kitchen table of his home, without the use of any tools except those generally found in an amateur's shop. It serves to illustrate how an amateur, if he is a careful worker and takes his time, can construct apparatus that is comparable to many of the manufactured sets in point of construction. The features of this set are:

Panel made of special hard fibre. Original anticapacity switch controlling, independently, the detector and each amplifier without the use of jacks and plugs.

Specially wound honeycomb coils for reception on 360 to 400 meters, 600 to 800 meters, and so on.

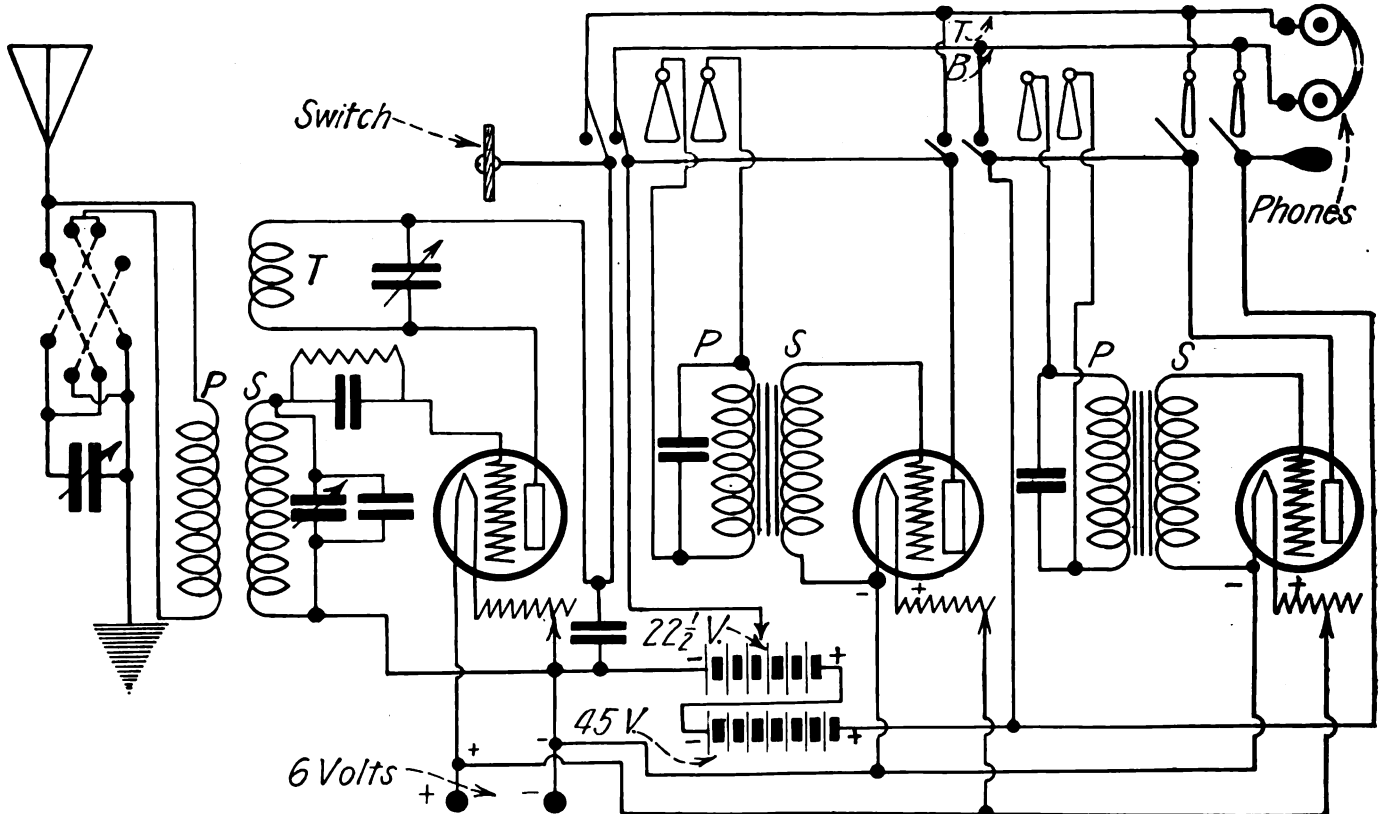
Flexibility by the use of series parallel switches.

In the rear view of the set may be seen the special anticapacity switch, located right over the transformer. It is constructed in such a manner

that the detector is connected at all times while the amplifiers are thrown in or out as desired. All leads are materially shortened by use of this switch. It is an enormous help in short-wave work.

All the variable condensers are equipped with clips which allow small fixed-condensers to be placed in parallel with them. This allows a fixed increase in capacity which, the builder has found, helps considerably in short-wave work.

This set won a prize at the Evening Telegram Radio Show, held in the 71st Regiment Armory, New York City, last May, before it was



Schematic diagram of the connections of Edward Pina's set. The anticapacity switch is shown on the upper portion. It is so arranged that the switch arms of the detector are connected either to the phones or the first stage of amplifier. By reason of the fact that the arms of the amplifier side are wider, they permit the second step to be connected in by just a slight turn of the handle. A fixed condenser is shunted across the regulation secondary-condenser and, also, across the primaries of both amplifying transformers.

Construction of a 1½-volt Wet Cell

By Robert L. Dougherty

IN the past few months, the 1½-volt tube has come into general use. One of the great drawbacks in using a dry cell in connection with this tube is its short and uncertain life. You may operate your set, to-night, on the dry cell and suddenly find that your battery is going "dead," and you will miss a fine concert just because you have no other battery on hand—and all the stores are closed.

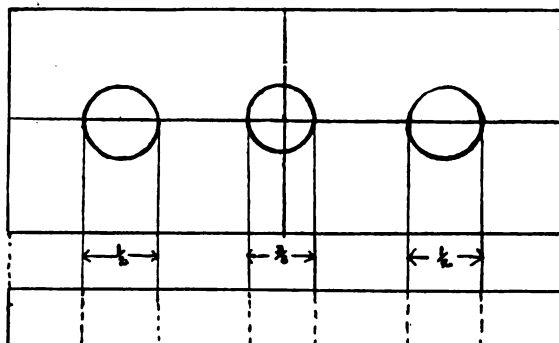
While the wet cell has its drawbacks, if it is placed in a conspicuous place it is not as attractive as a manufactured dry-cell with its nicely printed outside cover, but it has the advantage of being fairly constant. If care is taken to remove the elements after using the cell, and washing them in water—which is an easy matter—it will last many hours longer than any other dry cell. Its elements can be easily and cheaply replaced.

There are two kinds of batteries that will lend more readily to home construction than some of the others—salamoniac and sulphuric-acid cells.

In the salamoniac cell there is not the danger generally attributed to the sulphuric-acid cell, although the elements used in the construction of both cells are identical.

The necessary materials are 2 carbon rods, about 5 inches long and ½ inch in diameter; 1 standard wet-battery zinc; a small fruit jar, or

Figure 1. Diagram showing how the three holes should be bored in the block of wood in the construction of a 1½-volt wet cell. The correct measurements and guide lines are also given. The wood may be cut in circular shape, the exact fit of the jar, if a neater-appearing finished article is desired.



large tumbler; a few ounces of salamoniac, and a piece of wood.

Drill the wood in the same manner as shown in Figure 1, and put the three elements in the two carbon rods on the outside and the zinc in the center. It is best that the carbon rods be held in place by a couple of wood screws, as this will make it easier to connect them. The carbons may be connected by a narrow metal-strip. Fill the jar about three-quarters full with water and add the salamoniac until no more will dissolve. The completed element is then immersed in the solution and the battery is ready to connect up. Such a cell will furnish 1½ volts. Where it is advisable to make a neater-looking job, the wood may be cut in circular shape, the exact fit of the jar.

The second battery uses a sulphuric-acid solution, in connection with an element made identical to the one above. Sulphuric acid is a

dangerous material if not handled carefully. If spilled on anything, it will eat in quickly. In case of such an accident, wash immediately with ammonia. Be sure that you don't mix any of the ammonia with the solution in the battery.

The solution should be made up as follows:

One part bichromate of potash, 1 part sulphuric acid (10 per cent solution) to four parts of water.

Fill the jar about ¾ full with this solution. Put in the elements and the cell is ready for use.

Always be certain to pour the acid into the water, otherwise the acid will spatter due to the heat generated in the chemical action.

The only replacements are occasionally a zinc and a carbon element, and a few drops of water as the solution evaporates.

Any number of these cells may be hooked up in series for any voltage wanted.

(Continued from preceding page)

completed. It won on points of construction alone, as it was not completely wired when exhibited and could not be operated.

The panel is supported by upright brass standards fastened to the baseboard and running completely around the outside of the panel.

It took over three months to construct this set, Mr. Pina working from 7 until 10:30 every evening. This will give the reader some idea regarding the pains taken in order to perfect it. Every article used is of the finest make.

"Any amateur," said Mr. Pina to the writer, "with a little time and trouble, can construct apparatus. The only thing necessary is ability to handle tools and patience to do a good job thoroughly."

Subscribe for RADIO WORLD. \$6.00 a year, \$3.00 six months, \$1.50 three months.

B. of S. New Radio Work Directive Radio-Transmission Tried on a Wave Length of Ten Meters

THE enormous increase in the use of radiotelegraphy and telephony during the past two years has created a demand for apparatus capable of being operated with a minimum of interference. Wherever the need is not for broadcasting but for point-to-point communication the case seems hopeless, unless directive transmission can make it possible. Directional transmission on very short wave lengths (below 20 meters) may offer a solution to this problem.

Recent reports by Marconi, Franklin, and others show that interesting and valuable data have been obtained on directive radio transmission using wave lengths below 20 meters. The Bureau of Standards has just completed a series of similar experiments, the preliminary results of which confirm the work of these investigators. The experiments conducted at the Bureau of Standards were made with a parabolic reflector (cylindrical type), which was designed for a 10-meter wave length. It was made by constructing a parabolic wooden frame with an aperture of one wave length. This frame

was suspended in the air and 40 wires spaced 1 foot apart were suspended from it. The source, located at the focus, consisted of a 50-watt electron tube. The output from this tube was coupled to an antenna, which was a linear oscillator of the Hertzian type, which was tuned to a wave length of 10 meters. The complete reflector system was arranged so that it could be rotated.

Numerous polar curves were obtained by rotating the reflector and taking readings of the received current at every 10° position of the reflector. The receiving apparatus was located 170 feet from the reflector in most of the work and consisted of a loop antenna (single turn) with a thermoelement in the loop circuit. A portable galvanometer was connected to the thermoelement.

With all adjustments correctly made at the reflector, good directional transmission was obtained. With the reflector turned 20 degrees from the direct line to the receiver, the received current dropped off to one-half of what it was with the reflector directed to the receiver. There was practically no radiation over an angle of 270 degrees, while the majority of the radiated power was confined to an angle of 30 degrees.

98 Stations Now Send Weather News

United States Government Radios 8,000 Words Daily of this Important Information. One Great Lakes Station Handled 150,000 Words from June to December

IN order to get an idea of the immensity of the weather broadcasting carried on daily, an estimate of the number of words transmitted daily by the Governmental stations is fixed at 8,000. A reduction is made on Sundays, when approximately 6,000 words are handled. At the Naval station at Alton, Illinois, approximately 150,000 words are handled during the Lake shipping season between April 15 and December 15. This is one of the largest traffic schedules of the whole system of 98 stations.

Radiotelegraphy, although an invaluable factor for several years in receiving and sending data on weather to and from ships, was not recognized until recently as a medium for the general dissemination of forecasts, according to Professor C. F. Marvin, chief of the United States Weather Bureau, in his report to Secretary of Agriculture Wallace.

The use of radio by the bureau, throughout the country, was limited because of the necessity of using code, he explains. "With the intro-

By W. R. Service

duction of radiotelephony, which makes it possible for anyone to receive the messages in spoken words, the broadcasting of information over the interior has increased enormously," he declares. A year ago, the daily forecasts of the Weather Bureau were broadcasted from twelve stations in seven States, principally by radiotelegraphy; whereas, on July 1, 1922, ninety-eight stations in thirty-five States were carrying daily weather forecasts and warnings chiefly by radiotelephony.

Government and Private Stations Used

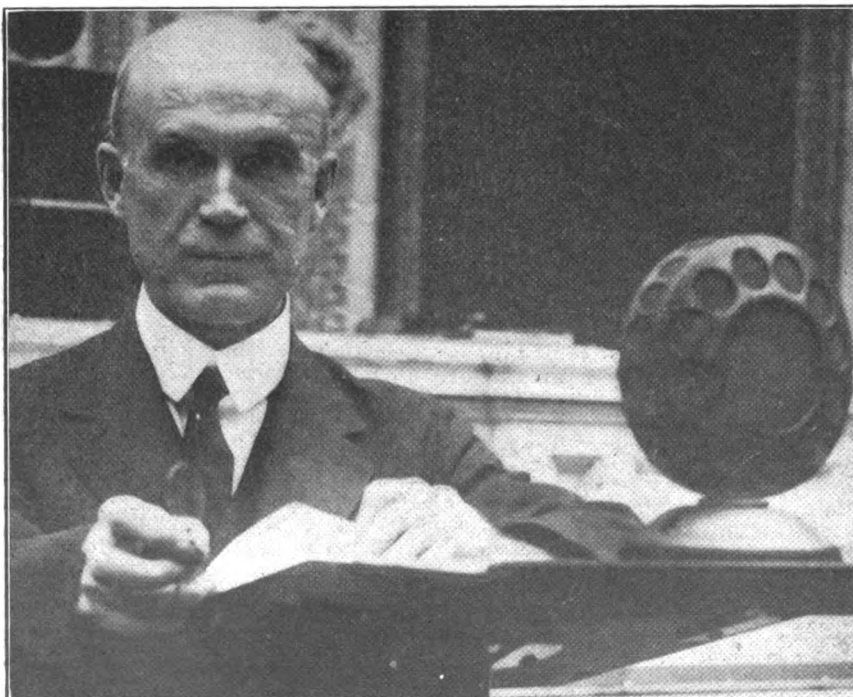
All broadcasts are sent out from governmental, commercial, and private stations, without expense to the Bureau. A special wave of 485 meters has been assigned by the Department of Commerce, and to avoid interference and duplication, only two stations in a city are licensed to transmit weather information, although many others

would gladly cooperate. It is estimated that, at the end of the year, 25 per cent. of the licensed broadcasting stations were engaged in distributing this valuable meteorological information. The broadcasts are supplied to the radio stations from neighboring meteorological stations by telephone. Undoubtedly the service could be placed on more efficient basis and materially extended, the Chief of the Bureau states, if funds were available for telegraphing information to radio stations not now included in the system, and engaging more employees.

The value of radiotelegraphy in this special service has been demonstrated, Professor Marvin declares, pointing out that its future usefulness "cannot be estimated." Hundreds of farmers who do not get a forecast service by the telegraph, or through the daily press, and for whom code broadcasting was of little use have installed receiving sets during the year. They now obtain the weather forecasts and warnings, so important in their occupations, as promptly as do business interests in urban communities. A great future increase in rural receiving stations is inevitable, the weather officials believe.

Another important accomplishment in radio work during the past year, was the inauguration of a program of broadcasting the twice-daily forecasts, cold wave, frost, and other warnings and information issued for the States lying in the Chicago and Washington forecasts districts. From April to November, a summary of weather conditions as they affect the crops during the week preceeding is also included. This service began in June, 1922. Radiotelegraphy and high wavelengths are utilized, as telegraphy is more reliable for long-range transmission. The radio-receiving stations, equipped for high-wave reception, receive a direct service thereby, and local radiophone stations are enabled to broadcast for their districts. Material extensions were also made during the year in the radio-bulletin service for the benefit of marine and aviation interests. The chief of the Weather Bureau is gracious in his thanks to the officials of the Naval Communications Service

Congressman Fess Makes Radio Speech



(C. National Photo and Wide World Photos)
Congressman Simeon D. Fess, of Ohio, about to make a speech by radio, in the House of Representatives. At the right is the microphone to catch his remarks. This is not to be a regular Congressional "stunt." It was simply a "try-out." And it worked.

Peanut-Tube Hook-Ups I Have Used Successfully

By P. F. Metzler

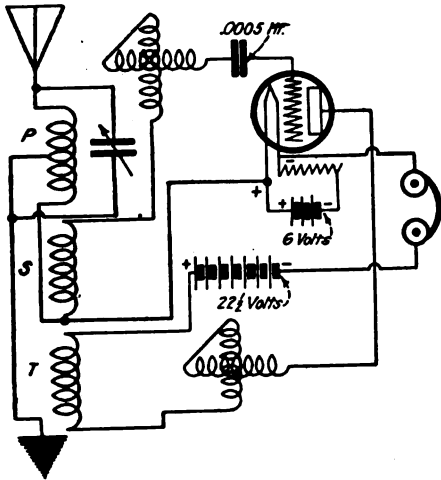


Figure 1—Schematic diagram suggested by Mr. Metzler. Note that the ends of the primary and secondary are connected for fine tuning. The use of the tickler coil, in conjunction with the variometers, gives a very selective circuit, and one that oscillates freely. Drawn by S. Newman.

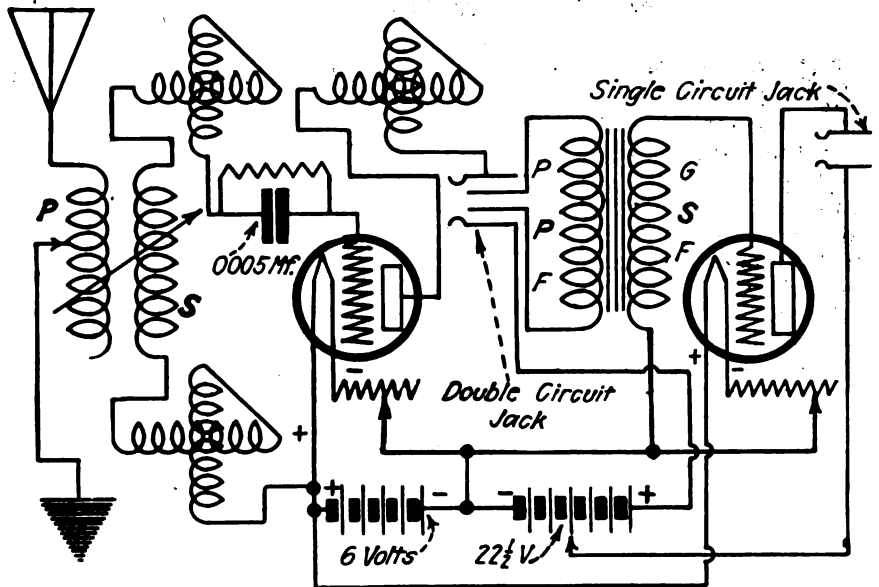


Figure 2—In the above circuit the third variometer in the filament gives stability of oscillation, making the circuit oscillate over the entire range of the coupler. Drawn by S. Newman.

MANY diagrams have been published of hook-ups employing standard makes of vacuum tubes—both detector and amplifying tubes. I will describe a few hook-ups employing the Welsh relay radion or “peanut” tube. The more I experiment with this little tube, the better results I have secured, especially using it as a detector tube.

The construction and arrangement of the coils used in these hook-ups were fully described in my article in RADIO WORLD, No. 26, dated September 23.

In Figure 1 accompanying this article, you will note that the end of the primary and the end of the secondary connect to the filament. I might suggest that a switch be placed here so as to disconnect the primary and the secondary at will, as with the connections shown it is more difficult to tune as it is much sharper. While the spark stations are not operative let this connection remain loose; but when one starts up, make this connection which practically cuts them out. Note that no grid leak is used with this hook-up.

In Figure 2 either a vario-coupler or a loose coupler, may be used. A variable condenser also may be used in the primary circuit to great advantage. You will note that this is a little different from the other hook-ups using two variometers. The one in the filament end of the secondary makes it much more selec-

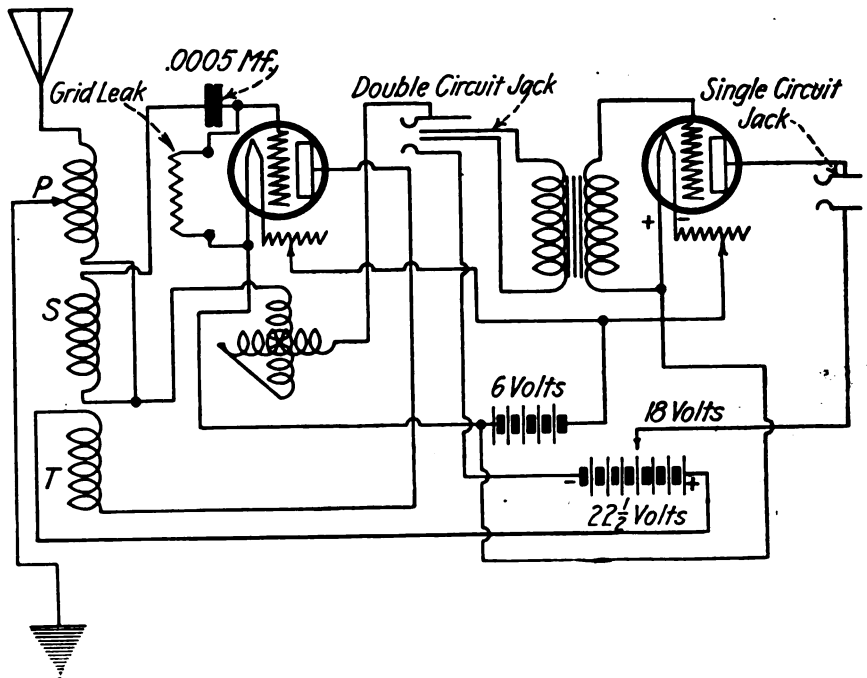


Figure 3—As in Figure 1, the end of the primary is connected to the end of the secondary. Note also that the grid leak does not shunt the condenser but, instead, connects from the grid side of the condenser to the side of the filament.

tive and also helps to make the circuit oscillate more powerfully.

In Figure 3 the grid leak leads to the filament and does not shunt the condenser. This arrangement was found most satisfactory. In both Figures 2 and 3, there are but 18 volts used on the amplifying tube for the plate voltage. This is, of

course, operated with Welsh radion relay.

I have been successful with all of these hook-ups. For instance, on the night of November 29, I heard WZY, KDKA, WJZ, WBAP, WHK, WHAS, WMH, WGM, 2XC, WOC, 2XY, WSB, WFAT, WIGR, WJAH, and WMAB.

Broadcasting Most Important Factor in Nation's Existence

"We Are on the Threshold of a New Era Which Will Probably Affect Our Modes of Life"—Maj.-Gen. Squier, U.S.A.

WASHINGTON, D. C.—Radio development advanced several lengthy strides during the past year through broadcasting, technical research, and the application of advanced design to military communications, according to the annual report of Major-General George O. Squier, Chief Signal Officer of the United States Army.

Through the operation of the Army radio net, established in May, and numbering 60 stations on November 30, the Signal Corps saved the Government \$14,357 in the transmission of official communications, over what they would have cost at commercial rates. These radio stations established in Corps Areas in Continental United States and in their subdivisions handled a total of 40,494 messages in the seven months of operation, cooperating with Naval coastal radio-stations in some instances.

Broadcasting Outstanding Feature of Past Year

The Army radio stations at Nome, St. Michaels, Holy Cross, and Iditarod, Alaska, have been rehabilitated. New and powerful sets with a range of about 150 miles have been installed at Nulato and Wrangell. Signal Corps installers were working at the Noorvik, McGrath and Bethel stations, and equipment was en route to Fort Egbert and Ruby, at the end of the fiscal year. Equipment for the Craig station was also available, leaving only three stations in the territory awaiting new apparatus.

"The outstanding feature of the year in signal communication undoubtedly has been the phenomenal development known as 'broadcasting'," says General Squier. The suddenness of this development, he believes, has no parallel in the application of science to everyday life. "In the educational field alone," he states, "we are on the threshold of a new era which will probably affect our modes of life." Pointing out the importance of radio communication in both peace and war, the chief signal officer explains that the Signal Corps is endeavoring to keep abreast of all developments with a view of utilizing and assimilating them for Army purposes. The experiments, conducted in his office, in broad-

By Carl H. Butman

casting over electric-light lines in an effort to reduce the interference in the ether, and with the "superphone," a method of secret line-radio communication, are cited as examples of practical experiments undertaken recently.

Radio Research and Development

Although handicapped by both a reduction of funds and personnel, the division of the Signal Corps entrusted with communication, research and development, completed 78 new specifications of radio sets and apparatus, together with 300 drawings during the year. Among the accomplishments in radio engineering was the perfection of a new radiotelegraph set for infantry battalions for communicating with regimental and corps headquarters. This set has a five-mile radius and employs waves between 75 and 77 meters, but is capable of ten settings, or different notes, between its extreme waves. One of its advantages is a portable square loop, about 9 feet, which may be folded. It also has directional features. These sets are now in production for the United States Infantry Corps. Another set, designed especially for division or corps headquarters, employs six 250-watt tubes in transmitting. This gives a telephone range of about 100 miles and

a telegraph range of practically 600 miles. The set is portable in that it may be mounted in tractors for field transportation. A tube set was developed for use in permanent stations with two 50-watt tubes operated from storage batteries for both telegraph and telephone transmission. The sending and receiving units are separate and the range is about 150 miles.

Progress of Aircraft Radio Work

For the Air Service, two 100-mile range telephone and telegraph sets were especially developed, one for large airplanes like the Martin bombers and the other for use at ground, or base, stations. The ground-station apparatus uses two 250-watt tubes in place of ten 50-watt tubes. Since June 30, contracts for the development of both these designs have been let to commercial electrical companies for completion. The perfection of a 5-mile range set for interplane communication employing the Armstrong receiving system and intended to be used on pursuit planes in formation flying, has also been placed in the hands of manufacturers, due to lack of Signal Corps personnel.

Contracts have been awarded for the production of a number of new airplane radio sets with a 30-mile range, using two 50-watt tubes. The apparatus is split up into several units which are distributed in the plane and controlled from the dashboard by the pilot. Work on a radiotelephone mule pack for use in mountain artillery was also underway, but uncompleted at the close of the fiscal year. Considerable progress in the design and testing of a radiotelephone set for use in Army tanks was accomplished. The development and test of a 5-station interphone set for use in the Martin bombers is also progressing.

Other developments included work on a field-telephone repeater for use in coupling line and radio communication, especially in balloon communication; the perfection of a direction finder for the Coast Artillery Corps, and tests with the resonance wave-coil antenna for the elimination of static, revealed that where large antenna cannot be erected, on portable sets, this apparatus may be of great advantage.

Don't It Get Your Goat

WHEN you have decided that it is a fine night to listen for DX and then find that your storage battery is discharged?

When you go all the way downtown to get some specific piece of apparatus, to find that all the stores are "sold out"?

When you are telling someone that you got Davenport, Iowa, so nice and clear, to have a fellow come along and say: "Oh, that's nuthin'! I get him so regular that I don't listen for him no more. I only listen for DX fellows now."

When you think that you are using an entirely original hook-up to find that it was discovered so long ago that it has whiskers?

When your girl gets peeved and says: "You're always broke, buying thingamagumies for that radio. I like to go out once in a while?"

You're as blue as can be. The first thing you tune in is XYZ playing "Good-by, Summer?"

When the new set you built doesn't give you as good results as your old "piece of junk"?

When nobody appreciates the fact that you like to read code once in a while, and kick when you don't let 'em hear the local broadcasting?

The Radio Primer

For Thousands of Beginners Who Are Coming into Radio Circles

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

NAME the four common methods of producing electromotive force.—(E. M. F.)

Electromotive force is most commonly produced by the following means: friction (static electricity); chemical action (ordinary battery); motion (dynamo and alternator); thermal action (thermo junction. Two dissimilar metals and application of heat.)

* * *

What is an ohm?

An ohm is the unit of resistance. The international ohm is measured by the resistance offered to the flow of an unvarying electric current through a column of mercury 106.3 centimeters long, weighing 14.452 grams, at a temperature of 32 degrees (F.).

* * *

What is Ohm's law?

The strength of the current in amperes in any given circuit is directly proportional to the E. M. F. and inversely proportional to the resistance, as in the equation

$$\text{Amperes (I) equals } \frac{\text{volts (E)}}{\text{resistance (R)}}$$

is generally written as follows:

$$I = \frac{E}{R}$$

Illustrated by problem:

Voltage in circuit 12 } = amperage 6
Resistance—2 ohms }

Apply the same principle where the resistance and amperage is known. Thus, where $E = I \times R$.

Problem: Amperage is 4; resistance is 3 ohms. Find voltage.

Amperes	4	
Resistance	× 3	
Voltage		12

* * *

Apply same when voltage and amperage are known, to find resistance.

$$\text{Where } R = \frac{E}{I}$$

Problem: Voltage is 110, amperage is 5. Find resistance in line.

Voltage is $110 \div 5$ amperes = 22 ohms

* * *

Explain three ways in which batteries may be connected and show a diagram?

In series; in parallel; in series parallel.

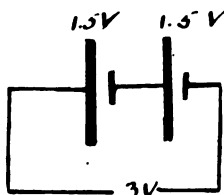


Figure 1

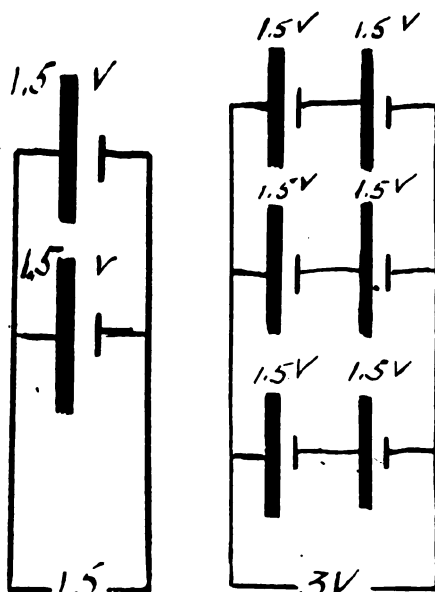


Figure 2

Figure 3

The three diagrams showing how batteries may be connected. Fully explained in accompanying article.

Figure 1 shows the cells connected in *series*. When the cells are connected the total E. M. F. (voltage) is the sum total of one cell multiplied by the number of cells in the circuit. But the strength of the current (amperage) will not exceed that of one cell and will probably be less because of the internal resistance of the cells themselves. Therefore: with two cells in series, the voltage of each cell is 1.5, and the voltage is 3. Assuming that the circuit is capable of delivering 20 amperage, the sum total amperage of the cells in the circuit is only 20. By connecting cells in series, therefore, we increase the voltage, but not the amperage.

Figure 2 shows cells connected in *parallel*. When the cells are connected in parallel, the total E. M. F. (voltage) is no more than that of a single cell itself; but the current

Worth Knowing

WHEN an amateur is constructing a set, he frequently runs into difficulties when he is mounting his condensers. If he doesn't remove one of the end plates to get the holes straight, he is apt to get his holes drilled out of alignment. The result is that the condenser is generally held to the panel by one screw instead of three. A little trick that will remove the objection when the end plate is removed—which generally means over an hour's work when the plates get out of alignment—is to get a fairly stiff piece of cardboard and make a hole for the shaft. Then with the drill find the holes that the screws fit into and puncture the cardboard in the direct center of each hole. You will then have a temporary template that, while not as exact as one made of metal, will be, if carefully done, sufficient for all needs.

* * *

Use Double Pulleys

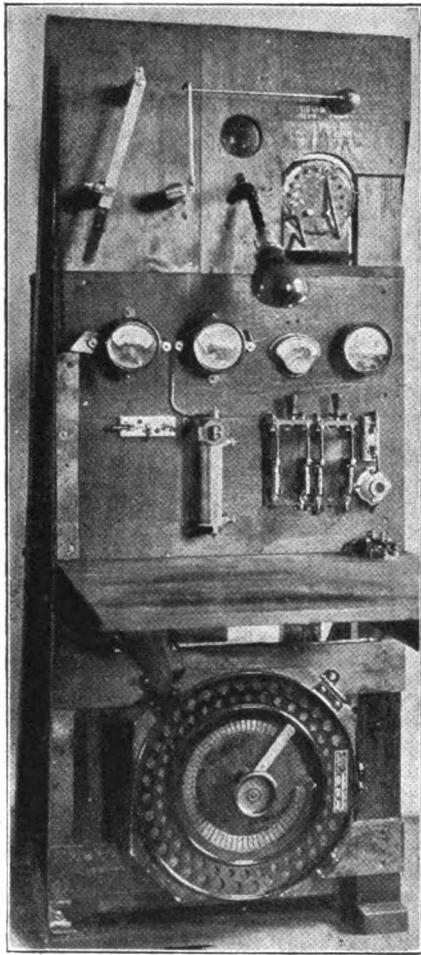
WHEN the average amateur is putting up an aerial from 100 to 150 feet, he generally is unable to pull it in tight enough to get it absolutely level. The result is that it is generally slack, due to the weight of the wire. A good plan is to use two double-pulleys. When these are used, it will enable anyone to exert an enormous pull on the wire. Approximately four times the pull may be exerted on the wire than if a single pulley is used. One pulley should be attached to the pole and the other to the insulator.

(amperage) is that of one cell multiplied by the number of cells in the circuit. Therefore: with two cells in parallel, the voltage of each cell 1.5, and the total voltage is 1.5. Assuming that the circuit is capable of delivering 20 amperes, the total amperage is 40. By connecting cells in parallel, we increase the amperage, but not the voltage.

In figure 3 the cells are connected in *series-parallel*. When the cells are thus connected, the total E. M. F. is that of the cells connected in series, and the amperage is that of the number of cells connected in parallel. Therefore: with six cells connected in three groups of two each in series, with three groups in parallel, the total voltage is that of the cells connected in series and the current is that of the groups connected in parallel. Voltage of each cell, 1.5; voltage in circuit, 3. Assuming that the cells are capable of delivering 20 amperes, the amperage is the total of the three groups of cells, 60.

Latest Device to Send Speech by Radio

By *S. R. Winters*



Front view of electron-tube transmitter of completely modulated waves, described in the accompanying article.

SPEECH modulation of radio-frequency currents is responsible for radiotelephony and its fascinating applications. The vibrations of speech are complex and the task of any form of telephony is to faithfully copy, or reproduce, electrically, at the receiving point the sound wave voiced at the transmitting station. The telegraph key, used in the transmission of dots and dashes, is the visible difference between radiotelegraphy and radiotelephony. In the latter mode of communication, the telegraph key is displaced by means capable of varying the antenna current employed in transmission to harmonize with the sound waves of the voice. A carbon microphone is the device commonly employed for this purpose.

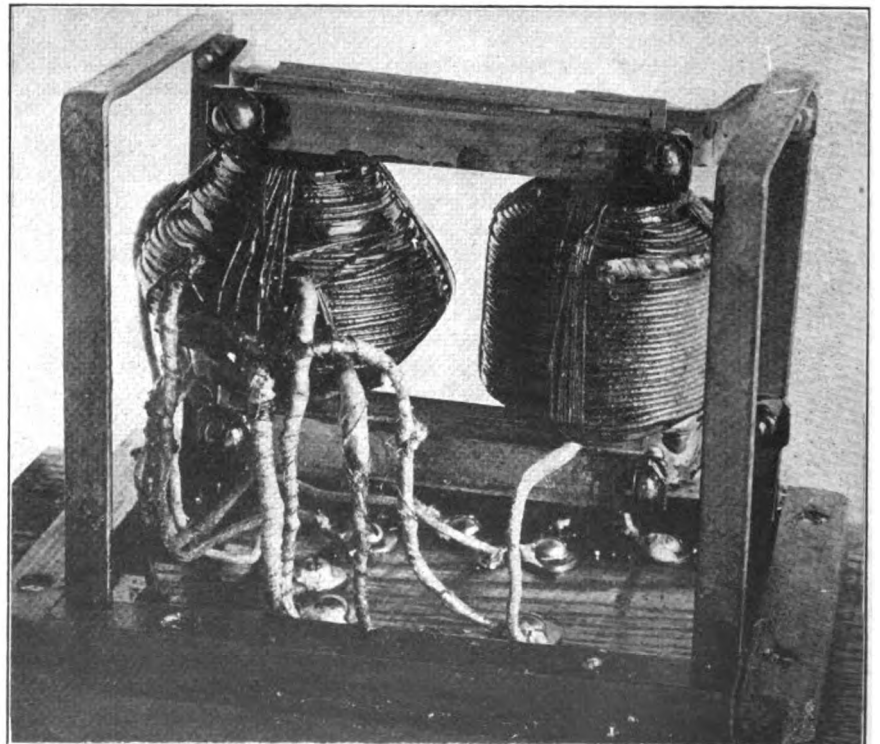
Credit for a new invention belongs to Lewis M. Hull of the Radio-Communication Section of the Bureau of Standards, United States Department of Commerce. The apparatus has been vested with such

structural features as to command attention in three particulars: The possibility of operating an electron-tube transmitter from the exclusive sustaining strength of an alternating electric-current source which compares favorably in efficiency with similar sending apparatus utilizing direct current; the requirement of a high-voltage generator or battery is obviated; and, finally, it has the additional virtue over a continuous-wave transmitter in that the communications transmitted thereby may be received over a limited distance by use of a non-oscillating detector. The application of this apparatus in fog signalling and direction finding experiments held at the Bureau of Standards have proved the above claims.

This transmitter employs a type-P pliotron tube. The plates, as well as the filament, are fashioned of tungsten and the former are stamped with rings having a common center, to avoid twisting or bending when subjected to excessive heat. A companion unit of the type-P pliotron tube, in the operation of this transmitter, is a 500-cycle, 150-volt alternator. The power output of this storage-house of electric energy exceeds 200 watts in an antenna having from 8 to 15 ohms resistance and

a natural wave-length below 200 meters. The adjustable wave-length range extends from 500 to 1,000 meters. The result is the ability to radiate completely modulated electromagnetic waves, rendering feasible their reception by means of crystal detectors. The original experimental unit was designed to operate at short wave-lengths.

The compensating winding of the filament-circuit transformer, illustrated in one of the photographs, consists of 100 turns of No. 16 wire, with a tap every dozen turns from 30 to 100. The filament rheostat lends itself to service in adjusting the filament electrical-impulses for any steady value of primary voltage on the transformer. The series compensating winding also makes it practical to adjust the transformer to the source of electric supply in the circuit so that the filament strength may attain a safe maximum when the load is thrown on. The inventor of this transmitter suggests that if ample power is available from the generator it is advisable to overcompensate the transformer, thereby rendering it possible to heat the filament at curtailed electric consumption except when the key is pressed. The incorporation of the series compensating winding in the filament transformer was considered



Filament transformer showing compensated winding used in connection with the electron tube transmitter of completely modulated waves.

Radio's Benefits for All Classes of Humanity

By J. Andrew White

Chairman of National Radio Week Executive Committee

SINCE broadcasting started, I have received thousands of letters from radio fans and, quite naturally, I am in position to know what radio means to the average person.

Take the blind, for instance, it has injected new hope into their lives; it has become a bright spot in the darkness that is their lot; it brings to the sightless the newspaper, the

book, the theater, opera, concert, and lecture platform, which, in the ordinary routine of their lives, is denied them. True they may be led through the streets, but how much better it is to bring to them the things denied by others. A blind person must be unusually gifted, insensitive to public pity or annoyance and amply financed if he or she is to take advantage of the re-

(Continued from preceding page)

essential by reason of the fact that the 500-cycle voltage, when employing a 2-kilowatt alternator, dropped enough to lessen the filament current to the extent of 15 per cent. when the electric burden was thrown on in the plate circuit.

An examination of the performance records of this transmitter reveals that communications transmitted through it were received through distracting interference at

a distance of 225 miles, when a 6-foot coil antenna, detector and amplifier were in service. Signals from this transmitter, which supplied 5 amperes antenna current to an antenna approximately 50 feet high, in Washington, D. C., were copied at a range of 100 miles by employing an antenna 60 feet high, with an audibility of 10,000, using an autodyne receiving-circuit with two stages of audio-frequency amplification.

sources of modern society. Only the newest of these resources, radio, brings easily within the ken of the blind all that may be represented by the spoken word or musical sound.

When we realize that there are nearly 53,000 blind persons in the United States, we can understand that radio means a great deal to them.

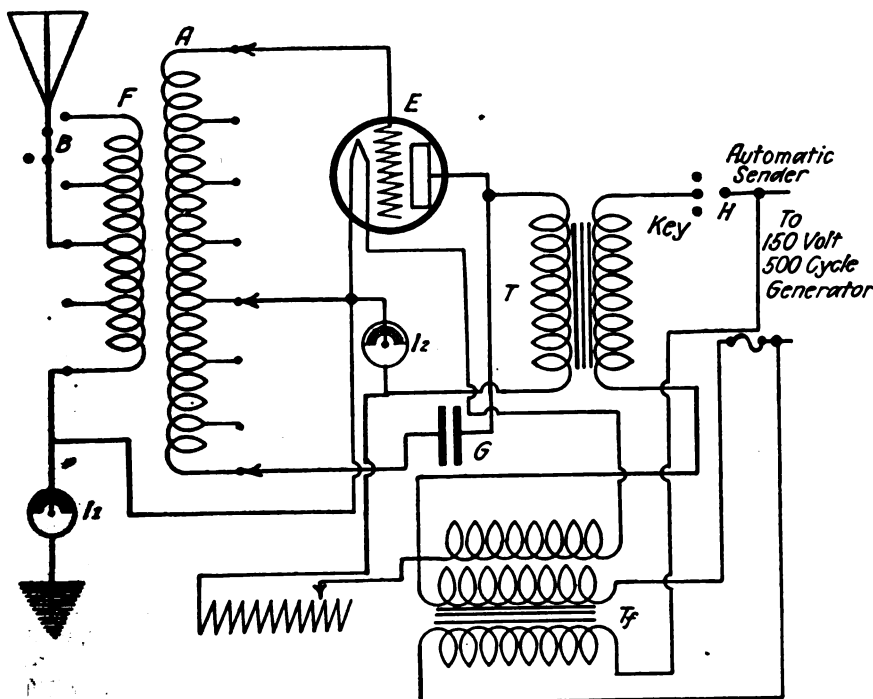
Take the case of Carlos Escalante, which came to my attention some time ago. He had been an active business man and had traveled widely. In 1920, he was attacked by a sudden illness and his eyes failed. For a year and a half, he sat in darkness with memory as his only muse. In the home where he once strode confidently, he could but stumble uncertainly with outstretched arms. Last Christmas, one of his old friends gave him a radio set. It was a godsend to the man. Those of us who rush about daily can only dimly appreciate the joy that radio brought to him.

Take the shut-ins. Only those of us who have gone through a long seige of sickness can understand what the radiophone means to those confined to their beds day after day. It actually hastens recovery, since it tends to relieve the mind of worry. The mind has a powerful influence on the body, and often the patient's own mental condition is the chief obstacle in the way of an early recovery.

Dr. W. E. Jacobs, medical superintendent of the Cumberland Hospital, Brooklyn, New York, recently commented on this subject: "Radio," he said, "deserves to be ranked with the best mental therapeutic agencies. In fact, for hundreds of cases the radio telephone can be prescribed as one of the best treatments."

Broadcasting has brought the mountain to Mohammed; the bed-ridden may now enjoy the opera, the drama, and the lecture. Little sufferers may now be lulled to dreamland and relief from pain by the calming influence of lullabies and bed-time stories.

In considering radio we must not forget its place in prison reform. Only recently was radio placed in Sing Sing. Warden Lawes made the following statement: "What the future will hold is difficult to predict. The radiotelephone cannot be an instrument for anything but good; for that reason, if no other, every effort will be made to find a permanent place for it in prison life. I believe its greatest value will lie along mass educational lines. The men hearing addresses made by prominent persons in many parts of the country will gain invaluable instruction."



Schematic design of the circuit described by Mr. S. R. Winters: (A) Plate and grid coupling coils; continuous coil wound on fiber tube 5½ inches in diameter; 80 turns No. 18 solid wire spaced one-eighth inch apart; end taps brought out every 5 turns on grid side and every 10 turns on plate side of coil. (B) Antenna switch. (D) Generator field rheostat. (E) Electron tube, type P pilotron. (F) Antenna coil; 30 turns, Itzendraht, wound on fiber tube 6¾ inches in diameter; taps brought out every 2 turns; mounted so as to slide over coupling coil in order to vary mutual inductance. (G) stopping condenser; mica; C=0.004 uf. (H) Automatic sender, driven by direct-current motor, which is supplied from the field circuit alternator. (I) Antenna ammeter. (I) Filament ammeter. (R) Filament rheostat. (T) Supply transformer, 2 kva.; ratio of turns 40/1; full-load voltages 100/6500. (Tr) Filament transformer, special construction, shown in detail in Fig. 5. The main windings consist of 200 turns No. 16 d. c. c. wire on the primary side, connected across the 150-volt supply, and 120 turns No. 16 d. c. c. wire on secondary side, connected to filament circuit. Drawn by S. Newman.

Radiograms

The Latest Important Radio News Briefly Told for the Growing Army of Radio Fans

THE "Missouri Broadcasters' Association" has been organized, seeking to eliminate radio interference in the interest of transmitting stations and owners of receiving sets. Their rearrangement of broadcast schedules eliminates practically all of the troublesome interferences which have been increasing for the past three months among Missouri broadcasting stations. This reorganization of radio programs doubles the value and service of the average receiving set, and marks a new boost resulting in increased demand for complete sets as well as for the assembling of home built receivers. The officers of the Missouri Broadcasters' Association are Jedell Mayes, president; Leo Fitzpatrick of Kansas City, secretary.

Radio will carry the inaugural address of Governor-elect Alfred E. Smith throughout New York State on January 1. Transmitting apparatus will be placed in the Assembly Chamber, where the ceremonies will be held, amplifiers in the Senate Chamber and on the Capitol steps will transmit the address to the assembled crowds, while thousands of private radio stations will receive the message broadcast.

A cable was sent recently to the amateurs in England to tune in their radio instruments on the 360 meter wave length to listen to H. Gordon Selfridge, jr., who broadcast from the Radio Corporation—Westinghouse Station WJZ at Newark, New Jersey. Mr. Selfridge, jr., assistant manager of the Merchandising Division of the Great London Store, is on a three months' tour in the United States investigating the methods of the American department stores. His father, Harry Gordon Selfridge, is a post-graduate of Marshall Field & Company, Chicago. Mr. Selfridge, jr., on his return trip from the Pacific Coast heard a concert from WJZ while he was in Kansas City. He hopes that this experiment will result in establishing really satisfactory reception of an American station in the British Isles.

Slackers in church contributions are not going to be able to hide behind the radio set. According to the size of a check received by a New York church after the broadcasting of one of its services the radio audience is more deeply touched than the church audience. From one little family which listened in

on the church service came a check for \$11.35. Multiplying this amount by the number of families to whom the radio church service has become an establishment it is seen that the total represents more money than is taken in by all the churches combined in a year's time.

President Scripps, of the United Press, has started out on a two years' cruise of the world, accompanied by radio. He will make the voyage on his 152-foot yacht, "Ohio," which has a cruising radius of some 9,000 miles. The first stop will be Jacksonville, Florida. A 2-kilowatt spark transmitter and a complete receiving equipment have been installed on board and are in charge of J. L. O'Connell, operator. Mr. Scripps wants to keep in touch with the world.

A young-lady singer participating in a broadcast concert at Anaconda, Montana, was heard by relatives at Alert Bay, 2,000 miles away. They were greatly surprised when, listening in, they heard her voice for the first time in five years.

Radio operators on ships in the Pacific tune in on Honolulu station for the midnight time-signals, and then by a quick adjustment catch the noon time-signals from Nauen, Germany.

The Public Health Service wishes to learn the extent of its radio audience through an appeal to all who "listen in" on its broadcasting programs to communicate by post card to the Surgeon General, Public Health Service, Washington, D. C. Officials of the service declare that they believe theirs is the greatest radio audience in the world, as health programs are regularly broadcast from ten different stations scattered from coast to coast, but they desire to back up their belief with facts.

A musical program, broadcast from WGY, Schenectady, New York, was plainly heard at Cherbourg, France, by the chief radio-operator and others on the steamer "America" while the ship was at dock in that port. Dr. W. R. Whitney, director of the General Electric Company's research laboratory, who is traveling abroad, talked with Chief Operator Black of the "America" and learned for the first time that WGY had successfully bridged the Atlantic. According to Dr. Whitney, Operator Black stated that a concert from the Schenectady station had come in so well that when he removed the telephones from his ears and laid them on the table in his room the music was plainly audible to those nearby. Cherbourg is 3,100 miles from Schenectady. This feat establishes a WGY record for transmission to the East only. This station has been heard in Hilo, Territory of Hawaii, which is 5,200 miles from Schenectady by direct air-line.

KGB, the Tacoma, Washington "Ledger"-William A. Mullins Electric Company radio broadcasting station, is inaugurating a novel feature. It is planned to broadcast weekly reviews of the current leading radio periodicals and books, published in the interim, reading these reviews over the radiophone on a regularly assigned day each week. The reviews will be prepared with care by a staff of three—two radio experts to digest the material and a newspaperman to write the reviews.

Radio added luster to the "Tree of Light," the huge Christmas tree annually given a place in Madison Square, New York City. The Radio Corporation of America installed a set in the branches, with several powerful voice projectors. The special program from WJZ was given, and thousands heard radio for the first time.

The present laws governing radio transmission in England and France prohibit their amateurs from using more than ten watts, which limits their range, but on December 21, when they began transmitting their signals to American amateurs, they were permitted by their governments to use 1,000 watts, which will enable them to participate in the tests involving two continents. The French amateurs transmitted on wave lengths between 180 and 300 meters.

As Coué Might Say:—

"Week by week, in every way, RADIO WORLD is getting better and better."

The Beginning of a "Bug"

By R. L. D.

(With Apologies to K. C. B.)

JUST THE OTHER night,
I MET a friend of mine
I HAVEN'T seen in years;
AND, OF COURSE, we told each
other . . .
JUST how much . . .
WE THOUGHT each had changed.
AND HE invited me
UP TO his house . . .
AND I ACCEPTED the invitation.
I WAS introduced
TO HIS wife . . .
AND his son . . .
AND LITTLE daughter.
AND HIS RADIO SET—
HE TRIED to get me
INTERESTED in . . .
IT but I couldn't . . .
SEE HOW any grown man
COULD SIT at a table
LIKE HE did . . .

AND FOOL with a lot of knobs
AND FIDDLE WITH levers
UNTIL I heard a man
TALKING, AND he said:
"THE NEXT selection played
BY MISS SMITH will
BE 'MEDITATION' from 'Thais.'"
AND THAT IS my favorite
PIECE OF music . . .
AND IT WAS SO
WONDERFULLY clear and
NICE that when . . .
MISS SMITH finished
I APPLAUDED loudly,
AND THEY laughed at
ME! . . .
AND, anyway, next
WEEK I'm going . . .
TO BUY A BIG one
FOR MYSELF alone.

Radio and the Woman *By Crystal D. Tector*

A FRIEND dropped in the other day. Spying my radio set, she made a wry face and said: "Oh, mercy! Has your husband one of those things, too? My Joe bought one about two months ago, and since it is working, he comes home, rushes through his supper and then goes and puts those phones on—and he doesn't budge until about twelve o'clock. He is as talkative as a stone; and every time I start to say something, he either shushes me or else looks with that far-away look. It's simply terrible! It's worse than living with a mummy." I wonder what she would say if he didn't have the radio "bug" and went out every night. She should be glad that she has something to keep him home.

WELL, who would have thought of it but a woman? I went visiting the other afternoon. It was raining and my hostess had a sore foot. No one had thought to bring knitting. Do you know what we did? We got out her son's buzzer-practice set and sat there all afternoon and learnt the code. And we formed a little club and intend to practice every Tuesday afternoon until we are all able to copy twenty words a minute. Then we are going down and get first-class licenses.

I THINK it is just terrible! I refer to the way the average radio salesman imposes on the average customer. I was listening to a young man who thought he knew more than is good for him, talking to a poor little confused woman who had the perfectly good intention of buying her cousin a set for his Christmas. Something like this took place:

"Well, madam, you see if your antenna hasn't sufficient length, you will have to add inductance into the primary circuit. Then again if—" and so on for about fifteen minutes until the poor thing was so confused that I interrupted and said:

"Listen here, young man! You aren't talking to Professor Steinmetz. Tell this young woman just what she'll need in order to set up a simple set."

He looked at me and blushed. Later, when in the subway to make a dinner engagement, I saw the same young man closely studying a book. It was a well-known volume on making radio simpler for the layman.

I RECENTLY bought a fairly large map of the United States, in order to keep a record of broadcasting stations, but found that putting ink and pencil marks on it didn't improve its appearance any. So I went out and bought a number of large colored thumb-tacks and printed the call letters of the stations on them. Then I took a piece of string and pasted small pieces of paper on it to represent distance. When I hear a new station, I apply another thumb-tack. I have a ready reference both as to stations received and the actual distance they are located from my town.

FRIEND HUSBAND and myself went visiting last week—and we didn't enjoy ourselves one bit. Sonny had a nice radio set and there was a good program on; but he kept switching around all the time to see if he "couldn't get it in louder." The result was that it sounded like a Chinese cabaret.

VISITED the editor of RADIO WORLD last week to wish him Merry Christmas. I never knew that one man could keep so busy. I remained in his sanctum about ten minutes and then just had to get out. He made me ashamed of myself for loafing. He blamed it all on National Radio Week. I believe him. I think that National Radio Week has done more to stimulate radio than any one thing that has happened since Marconi became a "bug."

EVER since amateur radio communication has been established between France and the United States, Friend Husband has seriously considered "scrapping" the set. He is worried over the fact that the French stations might start broadcasting the latest fashions, and, he says, when they start doing so the American husband owning a radio set will be kept broke buying new clothes. How good of him to think of others!

HE was a neighbor of ours for about a week. Friend Husband met him on the train, and invited him to drop in and listen to a radio concert. During the intermission, like a lot of other "hams," I began to cut loose in all the latest radioese. I kept it up for about fifteen minutes—and all the time he was smiling sort of funny. Finally he and Friend Husband got to talking about business. F. H. confessed to being a lawyer, and then our guest sprung the surprise of my young life.

"I'm consulting engineer for one of the largest radio companies in the country," he glibly uttered.

Friend Husband is still alive. But he'll laugh himself sick if he isn't careful.

Radio Adds Joy to Her Home



(C. Kadel & Herbert)

That radio is filling an important and necessary place in the American home is indelibly proved by the photographs Miss Detector has selected to illustrate her page this week. The young lady who posed for the photograph is Miss Dorothy Knapp, who recently won first prize for physical-culture development. The upper photograph shows her radio set in her kitchen—she is an experienced housekeeper.

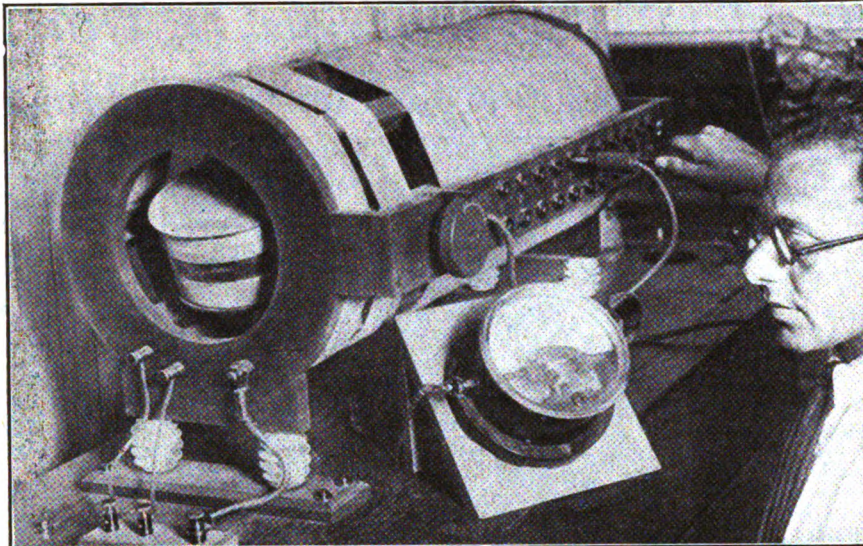


(C. Kadel & Herbert)

The lower photograph is a cozy corner of her living room. Miss Knapp also uses radio to furnish music by which she takes her physical-culture exercises.

News-Photos 1923 with

Captions
By
Patrick
Nichols



(C. Kadel & Herbert)
(Above) Huge inductance used at the College of the City of New York Radio Laboratories on the powerful transoceanic transmitter. This instrument was specially built by the students of City College for the circuits used. The tickler may be seen just inside the small coil.

(Right) If you want to make your loud-speaker more powerful, try the stunt shown here. It is a well-known fact in scientific circles that parabolic-shaped objects will throw sound waves, or heat- or light-waves better than conical-shaped objects. For that reason, all powerful search-lights have parabolic reflectors. This is just what an object like the heater in the illustration will do if you place a loud-speaking horn before it. You will have to experiment as to the proper distance that the horn must be placed from the center, as the acoustic properties of the objects surrounding it have a great effect on it. This experiment has the same effect as if you lengthened the horn of the loud-speaker. If you don't happen to have a heater handy use a tin dishpan or a large bowl, which is even better than the pan.



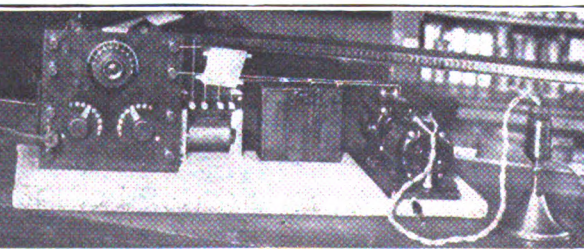
(C. Kadel & Herbert)



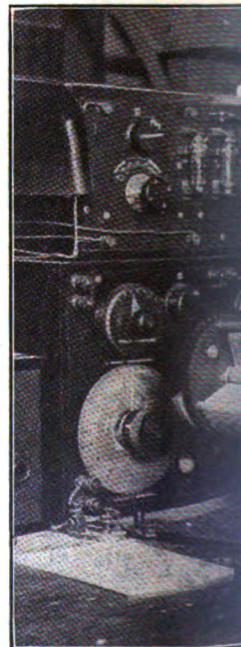
(C. World Wide Photos)
(Above) Step right up, ladies men! Absolutely the only one No, we are not referring to the radio receiving set he is wearing. C. Saunders, Beecher claims to have invented the scarf pin. Here he is shown wearing it. This is the result of year-long experimentation.



(C. Underwood & Underwood)



(Left) The world's smallest radiophone transmitting set—the smallest radiophone set in use. Despite its small size, it is said to be very efficient and is in use at station 9 CEX. It has a range of 75 miles. Note the small generator-set which is used to supply the necessary high voltage for the plate circuit. Two tubes are used—one oscillator and one modulator.



(C. Kadel & Herbert)
(Above) Where research work Ringle is testing out a new circuit which allows the operator to control the volume of the sound in laboratories such as the one at the City College of New York.

How Radio Starting Plenty of Pep



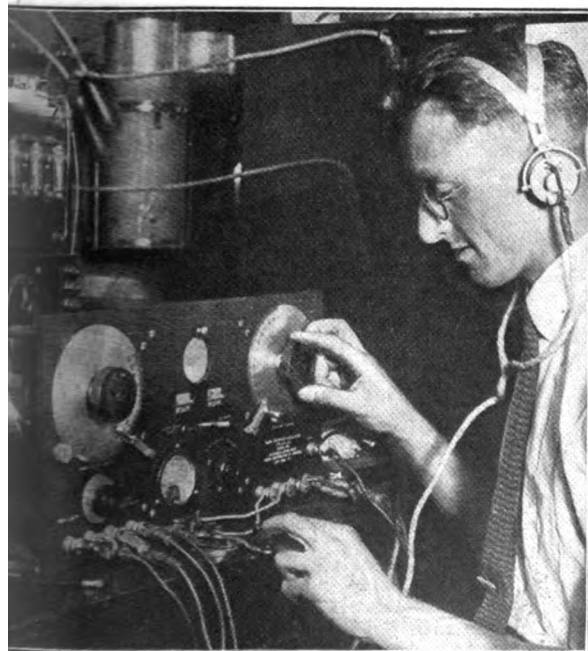
(C. Kadel & Herbert)
 (Above) Not every dog in the world is privileged to have his own Rolls-Royce and listen to radiophone music. But "Duke," prize Boston bull, being of the canine aristocracy, is not to be confounded with other dogs. In a special interview granted the photographer, this peer of dogdom remarked that he would rather listen to KDKA than gnaw a nice juicy steak-bone. But, of course, all dogs are not so well educated as "Duke," and their thoughts run to more mundane matters.



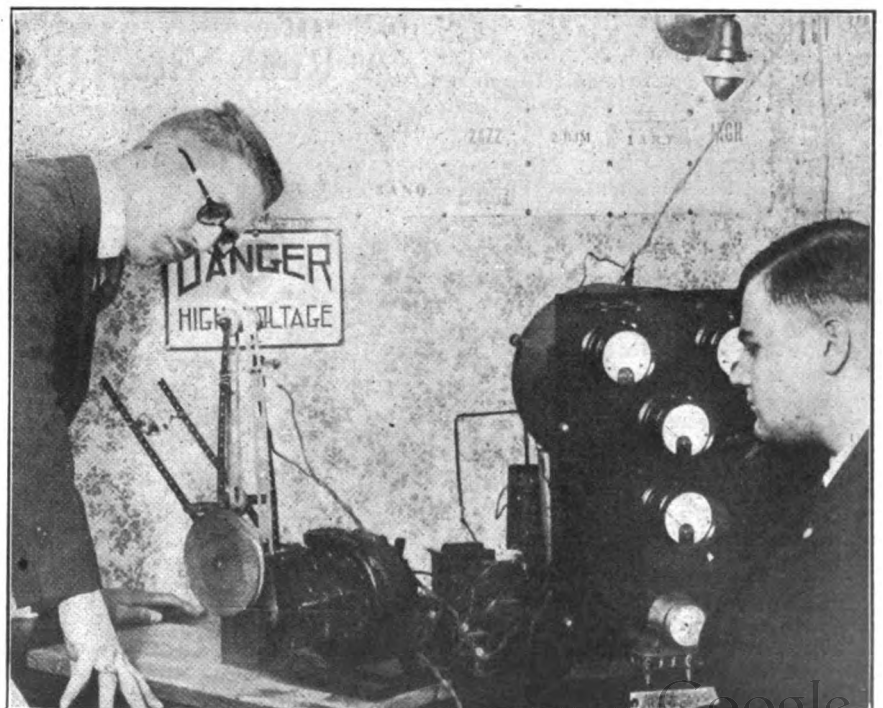
(C. Kadel & Herbert)
 (Above) The ideal set for the outdoor man. The set is absolutely water and weather proof. It was constructed by Wendell Kilmer to withstand any kind of weather. The set proper is regenerative, employing both radio- and audio-frequency. Excellent results have been accomplished using a barbed-wire fence as an aerial—and that in a pouring rain! As the photograph shows, the entire cabinet is shielded so that no capacity effect will be felt.

(Below) The first American amateur station to be heard in France during the official American Radio Relay League tests. Fred H. Schnell, at left, is the traffic manager of the league; at the right, is Perry Briggs, owner of the station. The photograph shows them testing out the automatic sender with which they called France. This was used so as to enable the operator to keep a constant watch on the apparatus. These radioists are to be heartily congratulated for being the first to actually get into communication with Great Britain and France.

I gentle-
 activity!
 ma—it is
 tag as a
 England,
 set radio
 it in his
 I experi-



is conducted in the College of the City of New York. Abraham
 e of transatlantic receiver. Notice the milliammeter on the panel
 me how much current is passing through the plate circuit. It
 that most of the leading engineers are constantly conducting
 experiments to improve radio.



(C. International News Reel)

With the DX Nite Owls

A Canadian's Fine Work

From Clifford Dafos, 152 Patterson Avenue, Chatham, Ontario, Canada

I HAVE read in RADIO WORLD a number of letters from different owners of receiving sets who claim to have "busted" a few records in receiving. If Mr. Weis is proud of his home-made set, I should be tickled pink with mine. I have a single-circuit regenerative set with one step of audio-amplification. Vario-coupler, 11-plate variable condenser, grid leak, and condenser, phone condenser, point switch, dials, and panel are all home-made. It isn't very elaborate or imposing in appearance, but it sure works! I am inclosing a list of long-range stations I made last night, just as I heard them. I had a friend with me, with another set of phones, so the list may be proved.

I have a letter of verification from KHJ, Los Angeles, as I heard him first on November 13: KHJ, KGN, CJCG, CFCN, CKAC, CFCF, WNAC, WAAC, DN4, WHB, WDAF, WBT, PWX, WBAP, WFAA, WSB, also 6XB, and 6BT in San Francisco. These last two carry off the long-range championship for this locality. I have to share the honors with Mr. Collins, owner of the radio shop here, who, as well as myself, has heard all the above stations, using a Grebe CR 9.

You United States boys have it all over us in Canada on the transmitting end, but we'll make you step to keep up with us on the receiving end. I never log a new station simply by the call letters, but wait until the name of the company or the town and State is given. I find this the only accurate way.

The equipment of my set is as follows: English (Mullard) tube used as a detector, and Meyers R. A. C., No. 3, with Chelsea transformer as amplifier. I find either Brandes 2000-ohm or Sterling (English) 8000-ohm phones give almost equal results, though my favorite is the Sterling set.

My aerial is a single wire, 80 feet long, 13 feet high at one end and 16 feet high at the other end, where a 4-foot lead-in is connected which runs through a window to my set. My ground lead is about 12 feet long and is attached to the water pipes.

My set isn't a freak in any way. I use a standard hook-up and have built one for my sister and one for a friend. The three sets work just about the same. The secret is in the value of the grid leak and grid condenser, also the phone condenser. I don't know what value they are as I just experimented till they worked right. I wish to thank W. W. J. for the help he unknowingly gave me in adjusting my set.

Hoping this may find space in our paper.

Aerial 200 Feet Long

From M. P. Bailey, Moscow, Idaho

I NOTICE a letter in RADIO WORLD No. 35, dated November 25, from Kenneth F. Smith, Birmingham, Alabama, regarding the number of stations he has been able to hear and which he claims is a record. I believe that I have him beaten, but do not consider that I have made a record as yet.

Not counting our local broadcasting station, the nearest station that I have picked up is at Portland, Oregon, about 400 miles away, while the farthest station

The Editors of RADIO WORLD will be pleased to receive sketches of hook-ups of the various "DX Nite Owls" sending in records, with a view of publishing them.

Other letters from the DX "bugs" will be published from week to week.—The Editor.

heard is Atlanta, Georgia, about 2,000 miles. However, I counted the stations on my log about two weeks ago, and had 59. Since that time, I have picked up several more. My long-distance ones include WOC, Davenport, Iowa; WHB, Kansas City, Missouri; KSD, St. Louis; Dallas, Texas; Fort Worth, Texas; Winnepeg, Manitoba; Minneapolis; Louisville, Kentucky.

My set is a home-made single circuit with two stages of audio and no radio amplification. I have a single-wire aerial about 200 feet long and use a water pipe as a ground. The aerial is about 20 feet high. I do not count any station that I cannot understand through the Magnavox.

I have on file replies from most of the stations heard, as I usually write them of the reception. I was able to pick up St. Louis several nights ago broadcasting a dance program from the Hotel Statler. They were so loud that we could have danced by it. This is about 1,500 miles.

Responds to the Hooting

From Norman Peterson, Concord, Contra Costa County, California

HEARING the Hoot! Hoot! of the night owls, I respectfully submit what I think is a record. "Maybe they are and maybe they ain't!" Here we go: WHB, Kansas City, Missouri, 1,300 miles; WBAP, Fort Worth, Texas, 1,400 miles; CFCN, Calgary, Canada, 1,400 miles. Detector tube, vario-coupler, variable condenser—that's all!

With Detector Tube Only

From Perkins Bennegan, 637 Poplar Avenue, Fresno, California

SINCE everybody else seems to be doing it, I have decided to tell my receiving record. I have heard about 70 different stations, and usually get about

A Real Nite Howl!



Ripley in "The Globe," New York

20 each night. My best record for 4 hours is 21 stations; 5 hours, 23; 6 hours, 26. The stations I get clearly and loud each evening range from KHJ, KFI and KWH, Los Angeles; KDPT, San Diego; KFAF, KLZ, DD5, DN4, Denver; KZH, KDYL, Solt Lake; KFC, Seattle; KGG, KGW, KYG, Portland, to KUO, KFDB, KDN, San Francisco.

For my DX work: WOC, Davenport, Iowa, 1,600 miles; PWX, Havana, 2,500 miles; KSD, St. Louis, 1,600 miles; WDAP and KYW, Chicago, 1,800 miles; WSB, Atlanta, Georgia, 2,000 miles. That's a pretty good record for one night's work!

On December 2, I heard all the above stations. I don't have such luck every evening, but nights similar to that are not so rare. I won't say that these stations came in loud enough to be heard all over the house; but they do come in fairly loud. PWX came in very QSA.

My set consists of a detector tube only. I use a vario-coupler and variable condenser for tuning. My aerial is about 40 feet high.

* * *

Accepts Mr. Smith's Challenge

From Jack Cowan, 512 Cotton Avenue, West End, Birmingham, Alabama

IN RADIO WORLD, No. 35, dated November 25 is a letter from Kenneth T. Smith. It so happens that we are located in the same city but so far have not had the pleasure of meeting. However, I accept his challenge, so here goes to "get my feet wet."

I have a home-made set, also, with two stages of audio-frequency, aerial 125 feet long, 35 feet high. On Saturday night, November 25, the following stations were brought in clearly over my loud-speaker, which, by the way, is only a 6000-ohm phone and an ordinary Grafonola horn:

WCR, Buffalo; WBAD, Minneapolis; WDAP, Chicago; WNAD, Norman, Oklahoma; WEAF, Fort Dodge, Iowa; KHJ, Los Angeles; 8XAK, Springfield, Ohio; WSB, Atlanta; WOM, Atlanta; WOC, Davenport, Iowa; WBAP, Fort Worth; WKM, Memphis; KSB, St. Louis; WDAF, Kansas City, Missouri; WHAS, Louisville; WFAA, Dallas.

On other nights, I have heard up to eighteen stations. I make no record of stations received in my log unless they are audible enough to be heard over my loud-speaker. Within the last sixty days, I have heard sixty different stations, all of which are located over 250 miles from Birmingham, Los Angeles being the greatest distance.

* * *

In One Year!

From Joseph Muntyan, 246 East 90th Street, New York City, N. Y.

I NOTICED an article in one of the papers the other day entitled, "Does It Pay to Assemble Your Own Set?"

My answer is, "Yes!" I knew nothing about radio until about a year ago. I bought parts of a crystal set and assembled it myself, getting as good results as may be expected from a crystal. But the results did not satisfy my wishes. Later I bought a blue print of a "long and short-wave honeycomb coil set with 2-step amplifier." I completed the set about three months ago. It took me two weeks to assemble the set as I took my time with it, making sure that all connections were made right and properly soldered. I have two cabinets, one for the receiver and the other for the 2-step amplifier. For

With the DX Nite Owls

(Continued from preceding page)

loud-speaker, I am using a single Baldwin phone, type C, which brings in the music of the nearby stations clear and loud enough to dance by. Furthermore, it is a pleasure to tune in and out the different stations on this set, as I do not experience the hissing and buzzing sounds that so many complain of when they put their hands close to the set. In appearance and operation this set is as good if not better than some of the higher-priced sets on the market to-day. Following is a list of radiophone stations I have received to date with a wire connected to the fire escape as aerial. The landlord would not permit me to put an aerial on the roof:

WJZ, WHN, WWZ, WOR, WAAM, WEA, WOO, WBS, WGY, WHAS, WOZ, WRW, WOE, WHAZ, WWJ, WOC, KDKA, WIP, WFI, WBZ, WVP, WBAN, WNAC, WGI, KYW, WDAP, WHB, WJAX, WAAC, WMAK, WGR, WSB, WDAF, WBAP, KSD, WMAS, WOAA and IXD.

I have letters and post cards from most of the stations confirming my statements; and, furthermore, I keep a record of the time and date that I receive the stations. All the above-named stations were received by using 2 D-L 50 and 1 D-L 75 coils, including station WVP. I would like to know what results I would get by using an aerial 150 to 200 feet long.

This is another instance where it is not necessary to have an aerial in order to do good work. It is quite possible that if the writer were to put up an aerial such as he suggests in his letter, his results would be improved. Landlords must be landlords, and, evidently, the poor radio amateur is never appreciated until it is too late.—The Editors.

Heard in New Brunswick

From Hollis Baird, River de Chute, Carleton County, New Brunswick

I HAVE noticed letters in RADIO WORLD regarding receiving records. With Giblin-Remler coils in a standard tickler-circuit using radiotron tubes, mica variable condensers and only one step of audio with 22½ volts plate-voltage I get the following stations: WJZ, WGY, WWJ, KDKA, WBZ, WEA, WBAY, WNAC, NOF, WHAZ, WOR, WIP, WGL, WLW, WAAN, Columbia, Mississippi;

Transatlantic Tests Successful

France Copies Signals of American Amateurs for First Time, December 13

FIRST reports on the transatlantic tests of the American Radio Relay League, received at the league headquarters, Hartford, Connecticut, on Wednesday, December 13, show that twenty-five American amateurs were heard in England and thirteen in France. For the first time in the history of amateur radio the French were successful in copying the signals from American amateurs. December 12 marked the start of the tests, and they will continue until December 31.

The following were heard in England: 1-BGF, Perry O. Briggs, 52 Girard avenue, Hartford; 1-YK, Polytechnic Institute, Worcester, Mass.; 2-K, A. G. Kastemayer, Schenectady, N. Y.; 2-NZ, E. R. Raguse, Tottenville, N. Y.; 2-XAP, Rensselaer Polytechnic Institute, Troy, N. Y.; 2-ZK, George C. Cannon, New

WOO, KCAC, Montreal; WFI, WGI, WHK, KSD, WDAP, CFCA, Toronto.

These stations are from 475 to 1,400 miles from here, with the exception of KCAC, which is only 275. The majority of them are heard regularly.

Of course there are better records than mine; but I think it is better than Mr. Merklein's.

* * *

Mr. Miller Adds to His Set

From W. Miller, Box 222, Southern Methodist University, Dallas, Texas

LAST night (December 13) being a quiet night for Dallas, I was afforded the opportunity to do a little stepping with my one-tube contraption. At various intervals between the hours of 6 o'clock and 11 o'clock I received stations WPA, WWJ, WOAI, WDAF, WGM, WOC, WBAP, WHB, WOS, KSD, WNAV, KFAF, PWX, KDKA, WGY, KLZ, WCX, KLN, WSB, KZN, KHJ, WDAJ, WLAC, KDPT and enjoyed opera from KYW.

I submit this information as one night's results—not claiming a record. This performance should prove satisfactory to any "night owl."

My circuit is as set forth in RADIO WORLD, No. 30, dated October 21, with several improvements.

Since adding these improvements, I have added six more States to my log, which now totals 33, besides Havana, Cuba; Tampico, Mexico; and several Canadian stations. Not so bad for a novice!

* * *

Without Any Grid Leak

A Suggestion to Increase the Range of Mr. W. Miller's Circuit

REGARDING the hook-up of Mr. W. Miller, published in RADIO WORLD, No. 30, dated October 21, which has attracted unusual attention among amateurs throughout the United States and Canada, RADIO WORLD has received the following interesting suggestion from Dr. Willis L. Hale, 47 North Washington Street, North Attleboro Massachusetts. Dr. Hale writes:

"Increase value of Miller circuit 100 per cent by leaving out all grid leak and use a vernier rheostat. It's a dandy! Good for 1,000 miles any night."

Rochelle, N. Y.; 2-ZL, J. O. Smith, Valley Stream, L. I.; 3-ZW, Walter A. Parks, Washington, D. C.; 8-AQO, C. P. Meredith, Cazenovia, N. Y.; 8-AWP, S. Woolworth, Syracuse, N. Y.; 2-EL, H. H. Carman, Freeport, N. Y.; 2-BML, H. H. Beverage, Riverhead, L. I.; 2-LY, C. A. Wood, Port Richmond, N. Y.; 3-BGT, C. S. Risley, Atlantic City, N. J.; 3-IIC, G. L. Diechman, Baltimore, Md.; 3-ZY, L. A. Dunham, Washington, D. C.; 4-FB, A. Bush, St. Athens, Ga.; 4-PI, L. Rexach, San Juan, Porto Rico; 7-PO, G. E. Kensey, Seattle, Wash.; 8-GQ, R. Moore, Columbus, Ohio; 2-ZS, C. R. Runyon, Jr., Yonkers, N. Y.; 3-XD, University of Princeton, Princeton, N. J.; 4-BX, G. S. Smith, Wilmington, Del.

The following stations were heard in France: 8-AQO, C. B. Meredith, Cazenovia, N. Y.; 1-YK, Worcester Polytechnic Institute, Worcester, Mass.; 1-BGF, P. O. Briggs, Hartford; 1-BCG, Minton Cronkhite, Greenwich; 2-XAP, Rensselaer Polytechnic Institute, Troy, N. Y.; 2-ZK, George C. Cannon, New Rochelle, N. Y.; 3-HG, G. K. Diechman, Baltimore, and others.



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With either size Magnavox Radio the hook-up is as simple as connecting the ordinary head receivers.



R-2 Magnavox Radio with 18-inch horn: this instrument is intended for those who wish the utmost in amplifying power; for large audiences, dance halls, etc. . . . \$85.00

R-3 Magnavox Radio with 14-inch horn: the ideal instrument for use in homes, offices, amateur stations, etc. . . . \$45.00

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Radio.

2 Stage AC-2-C . . . \$80.00
3 Stage AC-3-C . . . 110.00

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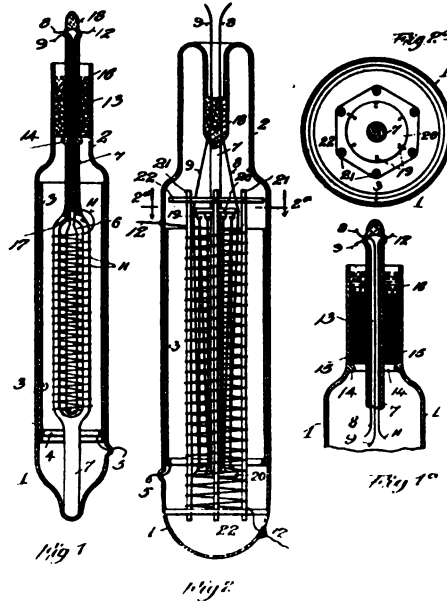
Latest Radio Patents

Lee de Forest Discovers New Oscillation

No. 1,437,486. Patented: Lee de Forest, New York City, N. Y.

THE latest radio invention of Dr. Lee de Forest appears to have a number of advantages over the present types of oscillations. Told in his own words, Dr. de Forest says:

"I provide a glass vessel containing the usual three electrodes, the filament, or glower; the grid; and the plate, or wing—the vessel being designated generally by reference numeral 1. The vessel 1 is preferably tubular in form and constricted at one end to form a neck 2. In Figure 1 the neck 2 is open, as indicated. The plate or wing element 3 is preferably in the form of a cylinder, and is positioned close to the wall of the vessel, or, preferably, plated directly on the wall of the vessel, and may be of any desired suitable material such as silver, platinum, tungsten or the like. Fitting in close contact with the plate is a band of tungsten, or nickel, or the like, indicated at 4, to which is connected a lead wire 5, sealed through the wall of the vessel as shown. The filament or glower electrode 6, which is preferably carbon, tungsten, or oxide-coated platinum, is as shown, in the form of a loop or "hair-pin," anchored at its lower end in a glass frame 7. The glass frame 7 is in the form of a glass rod which rests at its lower end against the bottom of the vessel. Intermediate its ends, the frame is formed with yoke arms which form a space between them, in which space the



Four figures, showing diagrammatically the most important parts of Dr. deForest's invention.

filament 6 extends. Above the yoke portion of the glass frame or rod the rod is hollow, and the respective leads 8, 9, of the filament extend upwardly in the hollow rod and are sealed through the wall."

ectors of radio-frequent oscillations, and, also, as amplifiers of feeble currents.

These electron tubes comprise an evacuated bulb containing a source of electrons, a metal "plate" member and a "grid" member consisting of fine wire or a perforated metal sheet interposed between the source of electrons and the "plate" member.

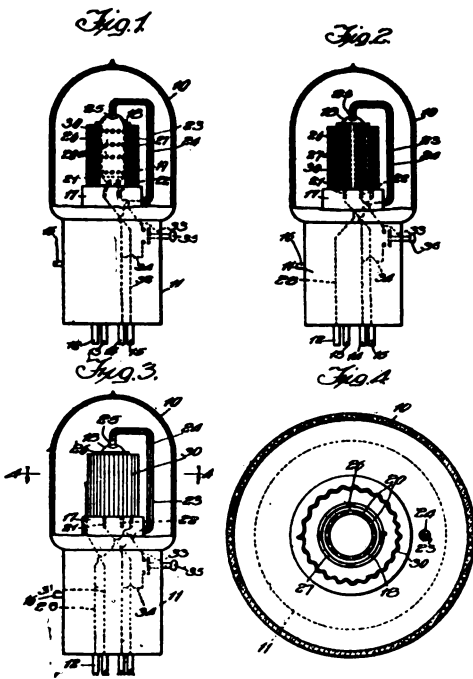
In the arts of space telegraphy, telephony and the like, the electron tube finds great application; but the particular method employed to enable the tube to function properly on one of its several uses is not a part of this invention. The specific requirements of the use to which the tube is put will necessitate adaption of the tube to meet these requirements. However, such adaption is only for the purpose of obtaining a certain capacity or obtaining some result which does not alter the fundamental characteristics of the tube. To cause the tube to function in any of its capacities as a detector, high-frequency current generator, or as an amplifier, it is only necessary to properly place it in the circuit of which it is to be a part. The tube must have suitable coating elements in the circuit. This fact is well known to experts.

The objects of this invention are as follows: To provide an electron tube having an arc for a source of electrons, this arc being confined in a tube containing a vaporizable material; to provide an electron tube capable of sustained and prolonged usage. In continuous-wave telephone work, the filament of the oscillator and modulator is subject to a great strain from the high voltage and amperage of the grid and plate circuits so that the life of the tube is very short. In Mr. Mueller's device, the filament is done away with, thus increasing the life of the tube.

New Electron Tube

No. 1,437,667. Patented December 5, 1922. Patented: Eugene L. Mueller, Chicago

MR. MUELLER'S invention relates to electron tubes and, more especially, to electron tubes where in the source of electrons comprises an arc. Electron tubes are of general use as sources of high-frequency current, de-

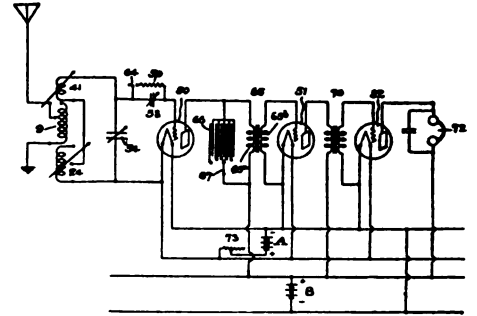


Four figures, showing diagrammatically the elements of construction in Mr. Mueller's new electron tube.

New System Applied to Coupling Apparatus

No. 1,437,772. Patented December 5, 1922. Patented: John B. Nowlan, Denver, Colorado

THE object of my invention," says Mr. Nowlan, in his transcript, "is to provide a radio-receiving apparatus of high selectivity whereby signals transmitted on adjacent wave lengths may be received and isolated for reproduction without undue interference. Another object is to provide a circuit arrangement in a radio-receiving apparatus for securing extreme accuracy in the coupling of the tuned circuits of the receiving apparatus; also to provide a construction of coupler for securing accurate adjustment of coupling of the tuned circuits of the receiving apparatus; and to provide circuit connections and an arrangement of parts where-



Combination of a primary circuit including a primary winding, and a secondary circuit comprising a pair of windings, each directly connected in series and each cumulatively coupled to the primary winding, the secondary circuit beginning at one end of the windings and continuing in a single direction through other secondary winding to the end. These ends form the sole terminals of the secondary circuit for connection with the radio receiving apparatus.

by simplicity in adjustment, compactness and selectivity in the different parts of the receiver circuits is secured, with means on a receiver panel whereby the apparatus may be protected against heavy surges and electrostatic charges, and may also be protected when not in use by direct connection of the antenna with ground."

The radio-receiving apparatus of this invention comprises an insulated panel carrying the radio equipment supported on the rear thereof and housed within a cabinet. The apparatus includes a radio-frequency oscillating circuit which may be an antenna ground-circuit, a coil-collector circuit, or a ground system balanced against a free ended extended conductor. The oscillation circuit includes a primary inductance tapped at selected points to switch contacts whereby the desired amount of inductance may be included in the oscillating circuit.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and exhibitions. Keep us posted by mailing full information.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31, Colwell & Korbell, Fisk Building, New York City, directors of publicity.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

FIRST UNIVERSAL EXPOSITION OF INVENTIONS AND PATENTS, Grand Central Palace, New York City, February 17 to 22, inclusive, 1923.

NAA to Be Chief Government Broadcaster

Takes Place of NOF, Which Will Resume Its Experimental Work

NAA, the great Naval Radio Station at Radio, Virginia, near Arlington, D. C., becomes the United States Government's chief broadcasting station for official information on January 3, 1923. On that date, all regular broadcasting previously handled by NOF, the radio experimental station of the Navy at Anacostia, will be transferred. Thereafter, NOF will resume its experimental and research work, which may include the broadcasting of the Navy and Marine Band music in the interest of modulation tests.

A special wave length of 710 meters from the Government and public broadcasting band was assigned to NAA by Herbert Hoover, Secretary of Commerce, on December 15, at the request of the Interdepartmental Radio Committee. This was done in order that the several regular circuits of the Army and Navy located there may be operated simultaneously without interference which occurred when phone broadcasting was undertaken on the lower governmental wave lengths from the main antenna.

The new radiophone transmitting set was especially made for NAA at the Naval Radio Laboratory at Anacostia. It is based on the master-oscillator, power-amplifier system, and employs six 250-watt tubes, giving an output of 1½ kilowatts. The apparatus is arranged so that the waves from 400 to 2,200 meters may be used in transmitting, and the power is derived from a 2-kilowatt generator. When transmitting on 710 meters, a special single-wire antenna, stretched from the top of one of the 400-foot towers, is used. This new circuit does not interfere with any of the other circuits, although used simultaneously. The height of the antenna gives practically the same efficiency as the multiple-tuned antenna used at Anacostia. When transmitting on the high-wave length, 2500

meters, the large antenna will be used and other circuits will be interrupted temporarily. The design of this special set will permit of excellent modulation for the sending of speech and even music, Naval radio engineers say.

Transmitting ranges will vary with the season and with the day and night; but it is expected that a range of several thousand miles may be attained in nighttime transmission during the winter months, although this may fall off in daytime sending during the summer months to a 250-mile radius.

Recent broadcasts of the President's congressional address are reported to have been heard as far west as Chicago and Detroit, which speaks well for the work of NOF on 427 meters. Basically, the new set for Arlington is built on the results of radiotelephone broadcasting experiments conducted from Anacostia and a knowledge gained from the operation of the well-known set at NOF.

The Latest and Most Essential Part of an Efficient Tube Set



Variable Grid Leak and Micon Condenser Combined

Clarifies Signals; Lowers Filament Current; Increases Battery Life; Eliminates Hissling.

Price only **\$1.00**

Road what one user has to say:

Mt. Vernon, N. Y., Dec. 5, 1922.

Chas. Freshman Co., Inc., New York City.

Dear Sirs: My Variable Grid and Condenser received O. K., for which I wish to thank you, for it surely does all you claim for it. Would not sell this Variable for \$10 if I could not get another. Yours truly,

(Signed) **C. H. TAYLOR**,
Freight Agent,
N. Y., N. H. & H. R. R., Mt. Vernon, N. Y.

At your dealers—otherwise send purchase price and you will be supplied without further charge.
Manufactured by
Chas. Freshman Co., Inc.
87 Beekman St., New York City
Home of Micon and Antenna

Six New Broadcasters

LICENSES issued to broadcasting stations on 360 meters during the week ending December 16 include the following:

- WQAL—Cole County Tel. and Tel. Co., Mattoon, Ill.
- WPAK—North Dakota Agricultural College, Fargo, N. D.
- WPAT—St. Patrick's Cathedral, El Paso, Tex.
- WPAH—Wisconsin Department of Markets, Waupaca, Wis.
- WOAY—John W. Wilder, Birmingham, Ala.
- KFDH—University of Arizona, Tucson, Ariz.

Radio Entertainment for Hire

A NEW phase of the radio game is that of entertainment service furnished on call, just like an orchestra service. If you wish radio entertainment, a Washington radio concern announces that it will bring a set, install it and guarantee entertainment from the ether suitable for a social evening, "or no charge."

Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

THE RADIO DESK



A NEAT AND CONVENIENT DESK FOR YOUR RECEIVING SET

It has a closed lower compartment with removable panel for batteries, rectifier, etc.

A mounting board for switches and wiring.

The front half of top is hinged and has a large compartment underneath for head phones, tester, programmes, etc.

It is all closed, yet easily accessible. No doors or drawers in the way and enough room to sit up comfortably and operate.

Size of top 22x36 in. Height 31 in.

Made of Birch in Walnut or Mahogany rubbed finish at \$18.00. Or of solid Oak in Golden or Silver Gray finish at \$19.00 each.

Shipped direct from the factory upon receipt of price.

Specify freight or express. Proposition to dealers.

MADE BY

WM. THIES & SON, Huntingburg, Ind.

Manufacturers of Telephone Cabinets since 1902.

What Shall I Give HER For a Present?

The biggest treat any woman of refinement, who is most particular about her appearance, can have is

Les Beails Skin Food.....	\$1.25
L. Arc - Ma - Clé ideal cleanser	\$1.25
Kanti Face Powder (four shades)	\$1.50
Rouge Supersative	\$1.00
Jessene astringent	\$1.50
Marvelous wrinkle remover and cleanser	
Amber Royal Perfume.....	\$4.00
Eye Lash Grower.....	\$1.00
	\$11.50

Mme. Anita Kanti's Christmas Beauty Box

Mme. Kanti's wonderful preparations have been the favorite for years and used by the famous beauties of both Paris and New York.

Among Mme. Kanti's personal clients can be named the reigning stage and screen stars.

ABSOLUTE SATISFACTION GUARANTEED

Address

This entire assortment in beautiful Christmas Box will be delivered prepaid upon receipt of

\$10

MME. ANITA KANTI

47 West 2nd Street, New York City

Any individual article in this assortment mailed on receipt of price in plain wrapper

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

New Wonders of Radio Seen at Big New York Exposition

THE American Radio Exposition, at the Grand Central Palace, New York City, opened at 2.15 p. m., on Thursday, December 21, and closed at midnight, December 30, 1922. It was, undoubtedly, the most successful radio exhibition to date, and will become an annual event.

United States Senator-elect Royal S. Copeland made the opening address. His subject was, "Radio as It Concerns Everyday Folk."

He was followed by Colonel A. H. Griswold of the American Tel. and Tel. Company, who spoke on "Radio Broadcasting."

The famous screen actor, Rudolph Valentino, gave a snappy talk on "The Truth About Myself."

All of these and other speeches were successfully broadcast.

All addresses and songs were broadcast from WEAF through speech amplifiers which were located on a truck in the middle of the exposition floor.

Through the agency of these amplifiers, it was possible to hear all speakers clearly. The loud-speakers made it possible to hear everywhere in the large exposition grounds.

Some striking features of the exposition were:

A regenerative set so large that an ordinary-sized man must stand on a step-ladder to work it. The controls had to be grasped with both hands.

A set made of imitation ivory (ivory pyralin) with solid gold controls. This set was designed for use in a Fifth Avenue boudoir.

Major Edwin H. Armstrong working his famous superheterodyne circuit. In order to do this he worked in a large glass-cage to cut capacity effects.

Following is a complete list of the exhibitors:

Eiseman Magneto Company.
Western Electric Co.
Associated Manufacturers of Electrical Supplies.
Coto Coil Company.
National Airphone Corporation.
The Bristol Company.
C. Brandes, Incorporated.
Dubilier Condenser Radio Company.
Signal Electric Manufacturing Company.
"The Evening Mail," New York.
Jewett Manufacturing Company.
Pathe Phonograph & Radio Company.
Radio Detector Company.
Electric Storage Battery Company.
Experimenter Publishing Company.
Radio Directory & Publishing Company.
Gould Storage Battery Company.
Milliken Brothers.
Allen D. Cardwell Mfg. Corporation.
DeForrest Radio Tel. & Tel. Company.
Radio Corporation of America.
National Carbon Company.
Marko Storage Battery Company.
Weston Electrical Instrument Company.
Pacent Electric Company.
A. H. Grebe & Company.
American Radio & Research Corporation.
National Radio Products Company.

H. Hyman Company.
Radio Call Book.
Formica Insulate Co.
Hutchinson Radio Co.
Executive Radio Council (2nd District).
American Radio Relay League.
Norman W. Henley Publishing Company.
S. Newman & Company.
Crockier-Wheeler Company.
Alden-Napier Company.
Experimenters Information Service.
Electric Specialty Company.
Stanley & Patterson.
Williard Storage Battery.
Inter-Ocean Radio Corporation.
Fiber Products Company.
The Radio Guild
Office of American Radio Exposition Company.
General Insulate Company.
Davis Manufacturing Company.
Amateur Home Made Set Contest.
Triangle Phone Parts.
Sleeper Radio Corporation.
C. D. Tuska Company.
Copper Clad Steel Company.
Stromberg-Carlson Telephone Mfg. Company.
American Bell Radio Company.
Engravers & Printers Machinery Company.
Rasla Sales Corporation.
Malone-Lemmon Laboratories.
National Radio Chamber of Commerce.
Moon Radio Corporation.
Manufacturers Patent Company.
Novo Manufacturing Company.
Feri Radio Company.
Tait Knob & Dial Company.
Bel-Canto Corporation.
"Radio Digest."
Clapp-Eastham Company.
Crosley Mfg. Company.
Radio Mica Products Company.
"Popular Radio."
Holtz Cabot Company.
Betts & Betts Corporation.
Scholes Radio & Mfg. Corporation.
Le Fax Corporation, Incorporated.
Radio Detector Company.
States Radio & Engineering Company.
Brilliantone Radio Company.
The Radiall Company.
Ackerman Bros. Company, Incorporated.
Electrical Record.
Post Electric Company.
Boissonault Company.
Radio Industries Company.
Burgess Battery Company.

Next week's issue of Radio World (published January 3, 1923, dated January 6, 1923) will contain a special article, fully illustrated, describing the American Radio Exposition now at the Grand Central Palace, New York City.

A New Adapter

Manufactured by Industrial Sales & Engineering Co., Newark, N. J.



THE Radiphono Adapter manufactured by Industrial Sales Engineering Co., Newark, N. J., is a device that may be applied to phonographs in reproducing radiotelephony clearly. It is of nonresonant material, and when used with a fairly sensitive phone and at least one stage of amplification produces results. It fits on the tone arm of an ordinary phonograph. Due to the fact that it is made of heavy insulating compound instead of metal, there is an absence of vibration. In view of the fact that it sells for a reasonable price, it should prove attractive to all amateurs who seek clear reception.

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Kendall Electric Co., 511 West 7th St., Des Moines, Iowa.
Wayne Radio Co., 1204 Calhoun St., Fort Wayne, Ind.

Altex Electrical Supply Co., Brooklyn, \$10,000; B. Levy, F. Alexander, H. J. Sanders. (Attorney, N. B. Finkelstein, 51 Chambers St., New York.)

Lake Crystal Electric Co., Lake Crystal, Minnesota.

The Electric Shop, North Kansas Ave., Marcelina, Mo.

S. O. S. Radio Corporation, Rochester, N. Y.
Globe Electric Co., 226 East Long St., Columbus, O.

Sterling Electric Service & Supply Co., Albany, contractors, builders, \$20,000; A. I. M. and A. Weintraub, F. Berner. (Attorney, N. M. Medwin, Albany, N. Y.)

Jack Sign Co., Wilmington, Del., electrical signs, \$20,000. (Corporation Service Co.)

Mogul Electric Co., Manhattan, radio instruments, etc., \$5,000; J. P. Mirandy, S. M. Knapp, Z. Wilder. (Attorneys, Reit & Kaminsky, 305 Broadway, New York.)

Keystone Electric Co., 24 Public Square, Wilkes-Barre, Pa.

CAPITAL INCREASE

Moloney Electric Co., Manhattan, \$700,000 to \$1,500,000.

Heard at Radio Counter

A Conversation Between Customer and Radio Clerk

(Part VIII)

"I RECENTLY heard it said that if I connect a variometer in my plate circuit, I would convert my loose-coupler set into a regenerative set, or that I could get my circuit to oscillate."

"That is absolutely right. By doing so, you will also increase the loudness of your signals."

"Does it matter just what kind of a variometer I use?"

"No; any variometer will function. But, of course, as with anything else, it always pays to get the best."

"Well, that may be true; but I wasn't going to spend any more money in an initial investment, than necessary. This is merely an experiment on my part. If it works satisfactorily, I intend to purchase the best set on the market."

"That is sensible; but, then, I am under the impression that a cheap one might not function as well in the beginning as a good one. You would then lay the blame on the circuit, forgetting that probably the instrument was the cause of the trouble."

"That is very true. What do you consider the best?"

"Well, I think that this one, right here, is the best on the market. Of course, it is slightly more expensive than the one next to it; but it is well constructed and will stand up better."

"All right, I shall purchase that one on your recommendation. Please have it wrapped up."

"Correct, sir. Just one moment—and I will have your change."

(To be continued)

Mas'er Baldwin Phones Reduced!

Singles \$6.00 Headset \$12.00
Clarophone \$20.00

Dealers write. We carry also Eisemann Magneto Corp. products.

CLARK & TILSON

1 EAST 42nd STREET NEW YORK

Radio Books Reviewed

"Radio for All." By H. Gernsback, editor, "Radio News." Published by J. B. Lippincott Co., Philadelphia. \$2.

WHAT the novice in radio needs is a book in which he can get all the information necessary to understand radiotelephony and radiotelegraphy, to make or buy a receiving set suitable to his means, to know how to operate his set, and, after he has an understanding of the radio art, information that will enable him to advance and get the most out of his outfit. All this must ordinarily be dug out of text-books, pamphlets and government publications, but the aim of "Radio for All," by H. Gernsback, is to have all the data and information that the beginner will need from the time that he takes up radio. It is a permanent, comprehensive reference book for the dyed-in-the-wool amateur.

The chief features of the book are: What radio is. What instruments to use and how to operate them, shown by drawing diagrams. How to read diagrams. How to make receiving instruments. Miscellaneous radio information, with lists of all broadcasting stations in the United States and Canada, and the Radio Act of 1912. Map of the United States Radiophone Broadcasting stations suitable for hanging in radio room.

Other features are: The theory of radio carefully explained with drawings. Description of and instruction for operating instruments of receiving and sending sets, with all picture diagrams of the wiring of the apparatus. How to make your own receiving sets costing from \$3 to \$50. How to read diagrams. For every diagram there is a corresponding technical diagram using symbols instead of drawings. How to tune sharply and eliminate interference from other stations. How to protect your set from lightning. Explanation of time and weather signals. How to make a practical vacuum-tube detector, two-stage amplifier set costing less than \$50. How the radio compass works. Underground aerials, loop aerials, and directional aerials. Formulae for finding wave length; miscellaneous formulae for finding capacity of condenser and other instruments. Tables of wire resistances, wave lengths and their corresponding frequencies and approximate wave lengths for different aerials.

"The Radio Constructor." By S. Newman.

IT is a fact that a great deal of money may be saved by making one's own set. Also, the fun to be had in building radio apparatus is not to be overlooked, as it is with pride that one looks at the thing he has produced himself. Unfortunately, a great number of fans have not as yet learned to read with ease diagrams in which symbols are used to represent each piece of apparatus. So far, we have seen only a few really practical plans for building apparatus with standard parts, but we have noticed recently the tendency toward simplifying the diagrams in order to bring them, so to speak, within reach of the layman.

Among the practical plans which we have seen lately may be mentioned those published by S. Newman & Co., 74 Dey Street, New York. This firm also publishes a small booklet containing data for the construction of receivers and amplifiers of various types, presented so as to appear as if seen from above. All con-

nections are shown as clearly as possible, and enable even an inexperienced person to attach the wires between the proper binding posts on each apparatus constituting the set. In the plans, which are of large size, a perspective view of the completed outfit is given, showing how the unit looks when completed. Among these plans are some giving directions for the construction of regenerative receiver, radio-frequency, amplifiers and other apparatus.

"The Radio Constructor" is published in a compact size and is profusely illustrated with hook-ups.

"Ideas for Radio Experimenter's Library." By M. B. Sleeper. Published by Norman W. Henley Publishing Co., New York.

M. R. SLEEPER'S new volume contains valuable information for the advanced radioist who wishes a wealth of data and information that will help him build better and more efficient radio receivers. This is a "how-to-do-it and a how-to-make-it" book from cover to cover. A great deal of information and facts are given on the construction of inductance coils for various wave lengths. Tables are included which make the winding of coils for any particular purpose easy for the novice. The construction of various testing and laboratory instruments is also included. A chapter is devoted to the various methods of hooking up tickler coils. This will be of value to the radio workers who anticipate the best results with their home-made regenerative outfits.

Overheard in the Subway

FIRST FLAPPER—"Oh, yes; I find that by shunting a double-o-five condenser across the primary of my first amplifying transformer I don't get that howl. Why don't you try it?"

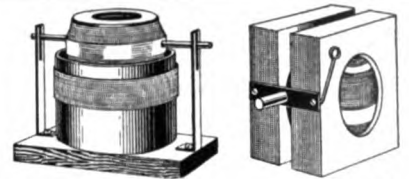
FLAP No. 2—"I will, later. I am experimenting with resistance coupling just now, and I am getting some good results out of it."

FIRST FLAP—"Well, good luck O. W. Seventy-three, C. U. L., this is my station."

Old Lady to Radio Operator—"And where is that station STATIC that I hear my grandson talking about?"

Man listening in for the first time—"I didn't know that the zoo had a station." Operator—"ZOO—how come?"

M. I. I. F. T.—"Sure—don't you hear the birds singing!" Operator—"Ooooooooooooooooooh!!"



VARIOMETERS VARIO-COUPERS \$2.95 EACH
These instruments, completely assembled and guaranteed, are perfect in construction and design. All parts are accurate. Easily mounted on panel. Coupler primary has seven taps, 3/16" or 3/8" shaft. Effective tuning range 180 to 600 meters.
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2323 So. Central Pk. Av. CHICAGO, ILL.



VARIABLE CONDENSER

23 plate Variable Condensers. Genuine brown Bakelite ends. Heavy Aluminum Plates. All brass parts nickel plated. Complete with Knob Dial and Pointer, \$1.75 Cash with order.

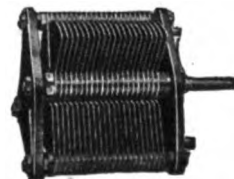
E. J. ROBE
620 W. Monroe St. CHICAGO, ILL.

SAVE MONEY

ON HIGH GRADE Variable Condensers

Direct from Manufacturers

Take the middleman's profit and selling costs for yourself. We sell you direct. These extremely accurate instruments made by experienced condenser people are minus the decorative frills that add to cost. Price reduced to rock bottom without sacrificing quality in the least. Satisfaction or your money back. Write today for very interesting circular.



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43 Plate \$2.95
Complete with Mounting Screws

Your Order Filled by Return Mail

No checks or money orders needed. Pay postman. Send the order TODAY, enclosing 3 two-cent stamps to cover mailing cost and receive your condenser in a day or two.

MANUFACTURERS' RADIO ASSOCIATION

90 East Kinney St. Newark, N. J.

Spirola REAL CABINET LOUD SPEAKER

NOT JUST THE USUAL HORN ENCLOSED IN A CABINET
Beautiful-Compact-TONE COMPARABLE ONLY TO THE
FINEST CABINET PHONOGRAPHS

Nothing adds so much to everybody's enjoyment of a two-stage set as a high-grade loud speaker. We make a complete line—of the highest class construction throughout, with fine hand rubbed finishes. SPIROLAS are always sold under money back guarantee to equal in volume and far surpass in beauty and tone any up to date their price.

SPIROLA DUPLEX—for use with any headset. SEPARATE TONE CHAMBER FOR EACH PHONE, eliminating interferences between phones. Satin black finish, nickel plated fittings. (Model DB) \$3.85
Oak (DO) or mahogany (DM) finish, bronzed throat and fittings. \$4.85
SPIROLA SIMPLEX—for use with Baldwin or other unit. Black (SB), oak (SO) and mahogany (SM) finish, same prices as DUPLEX.
SPIROLA CONCERT—complete with built-in unit and cord. Oak (CO) and mahogany (CM) finish, bronzed throat. \$12.50

At dealers or postpaid (C. O. D., if preferred)
L. H. DONNELL MFG. CO., DEPT B, BOX 70, ANN ARBOR, MICH.

RADIO PANELS
High dielectric resistance.

6"x24"	\$1.00
8"x24"	1.25
12"x24"	1.75

Manufacturers' special sizes solicited.
Agents wanted.
PAGESON COMPANY
Box 68, Merchants Station, St. Louis, Mo.

SPECIAL OFFER
For a limited time only.

Paragon RA-10...\$65	Grobe CR-5.....\$70
Paragon DA-2... 55	Grobe RORC.... 65

Prices F.O.B. Red Bank, N. J.
A. V. GREGORY
42 Broad Street Red Bank, N. J.

Do You Like Clear Tone—Sharp and Distinct? If so try
MARSH'S
Vernier Variable Condenser
AT LAST

Made in Three Styles. Dial Knob and Screws Complete. Fully Guaranteed.

27-Plate	\$3.50
23-Plate	\$4.75
11-Plate	\$4.25

Mail orders promptly filled.
F. P. Marsh, 145 Nicoll St.
NEW HAVEN, CONN.

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The Niftiest Short Wave Tuner on the Market
Only \$6.00 & PP on 1 lb. Send for pamphlet.
L. W. GOODMAN
DREXEL HILL, PA.

Doctor _____, Norristown, Pa., writes: Listening in recently with my GOODMAN, heard a voice, "We are now 90 miles out from San Francisco." Then DENVER came in and sunk the ship.

PATENTS

To the Man with an Idea

I offer a comprehensive, experienced, efficient service for his prompt, legal protection, and the development of his proposition.

Send sketch or model and description, for advice as to cost, search through prior United States patents, etc. Preliminary advice gladly furnished without charge.

My experience and familiarity with various arts frequently enable me to accurately advise clients as to probable patentability before they go to any expense.

Booklet of valuable information, and form for properly disclosing your idea, free on request. Write today.

RICHARD B. OWEN, Patent Lawyer
32 Owen Building, Washington, D. C.
2276-P Woolworth Bldg., New York City

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

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FRED S. CLARK, Secretary and Manager
1493 BROADWAY, NEW YORK, N. Y.

ASSOCIATE EDITORS
Robert Mackay Robert L. Dougherty

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Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their proportional rates.

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One page: One time—\$150.00.
Half, Quarter, Third and Two-thirds pages at proportionate rates.
One inch, one time—\$5.00. Per agate line, \$0.40.
On four consecutive issues, 10% discount.
On thirteen consecutive issues, 15% discount.
Cover and preferred-position rates made known on application.
Terms: 30 days Net. 2% 10 days.

CLASSIFIED ADVERTISEMENTS:
Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 28, 1932, at the Post Office at New York, New York, under the act of March 3, 1879.

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While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

Organ Recital by Radio
WJAX, Cleveland, Sends Out a Fine Program from World's Largest Instrument

AN unusual feature recently broadcast by WJAX, radio station of The Union Trust Company, Cleveland, was the organ recital by Edwin Arthur Kraft, a well-known Cleveland organist, at the new Cleveland Public Auditorium, Tuesday evening, November 28.

This program was of especial interest to radio fans because of the unusual character of the organ on which the recital was played. The Cleveland Public Auditorium organ is the largest in volume of any organ in the world and has been the cause of much interest on the part of musicians as well as much curiosity on the part of the public. It occupies a space 30 by 30 by 20 feet, and requires a force of 70 horse-power to blow it. Three hundred miles of wire were used in its construction. It has 5 manuals, 125 black keys, 180 white ones, 32 pedal keys, and 160 different stops. Each stop gives the effect of a different instrument, any one of which may be played alone or together with any or all of the others, with the result that almost any desired orchestral effect may be obtained. The largest pipe is 25 inches by 30 inches by 33 feet long and the smallest pipe 1/4 of an inch in diameter and only 3/4 of an inch long. There is, also, an echo organ placed 325 feet away from the main organ which makes it possible for the organist to obtain particularly unique effects.

The tonal quality of the organ brings out the broadcasting loud and clear.

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At Your Service!

There appeared in RADIO WORLD, dated April 1, 15, and 30, the following articles:
April 1—A 500-Mile Radiophone Employing a 5-Watt Tube, by Frank A. Hahnel. "Tell Me, Please, How Will This Set Receive?" by E. L. Bragdon. Short Cuts in Receiver-Circuit Design, by O. C. Roos. Making a Short-Wave Regenerator, by Fred. Chas. Ehlert.
April 15—First Principles of Electricity as Applied to Radio, by John P. Miles. Your Storage Battery, by E. L. Bragdon. What Makes Radio Possible, by Edward Linwood. Ground Connection as Vital as Antenna, by Fred. Chas. Ehlert.
April 30—Valuable Pointers on Aerial Construction, by Edward Linwood. What is Meant by Tuning, by E. L. Bragdon. Radio-Frequency Amplification and Regeneration, by Frank Armstrong. Honey-Comb Coils and Condensers, by Edward Linwood. Charging the Storage Battery, by E. L. Bragdon. How to Construct the Variocoupler, by Frederick L. Rumford.

Each copy sent on receipt of 15c. per copy, or the three copies for 45c.; or better still, send your subscription beginning with any one of these numbers, and we will send this paper for 52 issues, and you will then have a complete file for ready and constant reference. RADIO WORLD, 1493 Broadway, New York.

KDKA Breaks Its Record

Its Music Picked Up by Steamer in South Pacific Ocean, 5,000 Miles Away

BROADCASTING a concert 5,000 miles is the proud record of KDKA, the radiophone broadcasting station of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pennsylvania.

This latest achievement of KDKA, which first started operating November 2, 1920, was brought to the attention of the Westinghouse broadcasting officials on the receipt of a postal card from E.

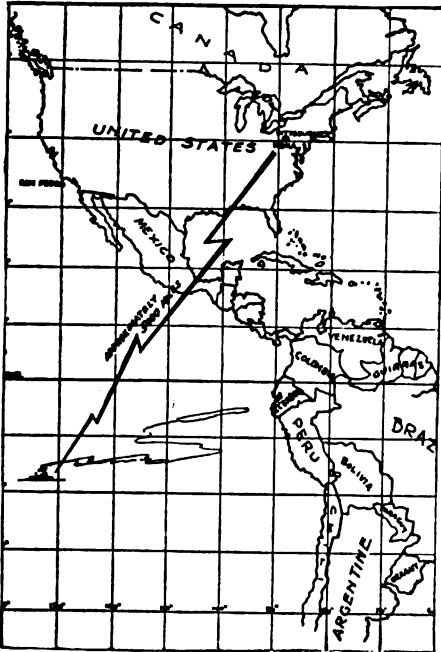


Chart illustrating the distance—5,000 miles—covered by music broadcast from KDKA.

G. Osterhoudt, radio operator of the steamer "J. A. Moffett," in which he tells of hearing KDKA while off the coast of Peru, a distance of, approximately, 5,000 miles.

The card, which was mailed in San Pedro, California, contained the following:

"Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa. \ KDKA

Gentlemen:

At 9:30 p. m. (local time), on October 5, while off the Peruvian coast, 3,453 south of San Pedro, California, I heard your phone on 360 meters, playing "Stumbling." The QRN was quite heavy but I am positive that it was your phone. I am using a honeycomb set with an audion detector (Audiotron). Please verify this, if possible, and oblige,

Very truly yours,

E. G. Osterhoudt, Opr.

S.S. 'J. A. Moffett,' care Radio Corporation of America, 109 Steuart Street, San Francisco, California."

This request has been verified by a glimpse into the back programs of KDKA with the result that this station has broken its own broadcasting record which was set last spring when a ship in the port of Iquique, Chile, heard an entire concert. The distance of the ship from the broadcasting was approximately 4,200 miles, so that the new record beats the old by 800 miles.

To many anxious inquirers RADIO WORLD has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

DELICATE SOLDERING

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Platinum Heating Unit—Interchangeable Tip—Universal Current



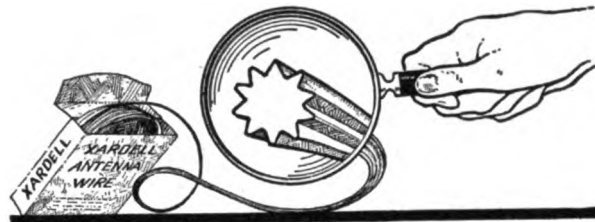
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PER HUNDRED FEET

That will at once appeal to you. It is different and better than any makeshifts to date, being hard drawn from the finest copper having a corrugated surface with 10 collecting points on its cir-

cumference. This gives a greater collective and gathering surface. The result is extreme sensitiveness, and an increase in the range and clearness of any set from the simplest crystal type to the finest V. T. Receiver.

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SUBSCRIPTIONS

RADIO WORLD now has 70,000 readers. We are making a drive for a hundred thousand before the end of the year. Ninety per cent of our readers renew their subscriptions. A marvelously high average.

ADVERTISING

RADIO WORLD, the national radio illustrated weekly, is the oldest radio weekly, having the largest circulation. Radio manufacturers and distributors appreciate that RADIO WORLD is a most profitable medium to carry their trade notices.

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The work is entirely in your spare time. We pay a liberal commission. Previous experience not needed, as we give our representatives full detail instructions and every possible assistance and help. Write telling us all about yourself—age, education, business experience—and we will immediately give you full details. Telling you just how you can materially increase your income. DO IT NOW.

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1493 BROADWAY

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Short Cuts in Receiver-Circuit Design, by O. C. Roos.
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Mounting Crystals in Your Detector, by E. L. Bragdon.
Storage Batteries for Radio, by Fred. Chas. Ehlert.
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How to Construct One- and Two-Slide Tuning Coils, by George W. May.
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The Beginner's Catechism, by Edward Linwood.
- Test of Inductance Coils, by Fred. Chas. Ehlert.
Short Waves from a Simple Receiver, by Stanley Bryant.
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How to Make Your Radio Cabinets, by W. S. Standford.
How the Crystal Detector is Used to the Best Advantage, by C. J. Williams.
How to Construct a Long-Wave Regenerative Receiver, by George W. May.
Tested Invention of Major Armstrong Amplifies Set 100,000 Times, by John Kent.
Repairing Cracks in Hard-Rubber Storage Battery Jars, by W. S. Standford.
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- JULY 1.**
Novel Unit-Detector and Amplifier, by Frederick J. Rumford.
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Facts for Beginners, by Fred. Chas. Ehlert.
- JULY 22.**
When Your "Movies" Come by Radio, by Stanley Bryant.
Underlying Principles of the Vacuum Tube, by George W. May.
Practical V-T Detector Panel, by Frederick J. Rumford.
Revised Radio Dictionary, by Fred. Chas. Ehlert.
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The Vacuum Tube as a Transmitter, by Charles H. Plath.
My 20-Kilowatt Tube and its Uses, by Irving Langmuir.
Importance of the Capacity Switch, by E. L. Bragdon.
The Truth about Lamp-Socket Aerials, by Harold R. Hart.
- AUGUST 5.**
How to Construct and Operate the Armstrong Superregenerative Circuit, by John Kent.
Using Radio Frequency to Extend Range, by George W. May.
Things Every Radio Fan Must Know, by E. E. Hawley.
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Practical Measurements of Capacity and Inductance, by W. A. Dickson.
Experimenting with Armstrong Circuit Produces Unusual Hook-up, by Dr. O. S. Kelly.
How to Secure Perfect Regeneration, by Fred. Chas. Ehlert.
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The Storage Battery as an Important Factor in Radio Reception, by Donald Van Wyck.
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New Bureau of Standards Radio Literature

TO meet the increasing interest in the use of radio-receiving apparatus, the Bureau of Standards of the Department of Commerce is publishing a series of circulars descriptive of simple receiving sets. The first two of this series are Bureau of Standards Circulars No. 120 and 121. These two circulars describe the receiving sets which use crystal detectors. The third paper of this series is Bureau of Standards Circular No. 133 and may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents a copy.

This circular is a description of an electron-tube detector and gives instructions for its operation. A receiving set employing an electron-tube detector is more sensitive than a set employing a crystal detector, and may be expected to give more satisfactory results. The tuning devices, antenna, lighting switch, ground connection, and telephone receivers with which this electron-tube detector is used may be those previously described in Circulars 120 and 121.

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Broadcast Bill's Radiolays

By William E. Douglas

HAD some snow out here last week, first we've had this year, reckon that's to let us know winter's gettin' near. 'Course winter has advantages, there's nothin' much to do, no corn to plow, er cultivate, but there's a cow er two that every mornin', hot er cold, to milk out in the shed, while all you city fellers are tucked in yer comfy bed. With winter there comes Christmas time with all its joy an' cheer, which after all, I reckon, is the best time of the year. With snow an' sleet comes coastin' an' a lot of bob sled rides an' when the creek is frozen we kin skate a bit besides. I've noticed, too, in winter, radio "comes in" the best, which bein' true I s'pose I should ferget about the rest of winter's inconveniences like thawin' out the pump, with weather down to zero, when yer swing yer arms



an' jump to keep up circulation. Gosh! I hate to do the chores when its as cold inside the barn as it is out of doors. When I get up these mornin's it's as dark as pitch outside an' 'fore I get the chores done I am almost froze beside. Last week I caught an awful cold, worst one I've had fer years. My nose wuz like an eight-day clock, an' eyes chuck full of tears; my back ached an' my head ached. I felt ninety-four years old. I wish some doc could find out how such things could be controlled. I soaked my dainty feet in mustard baths till they were pink—I'd hate to tell you how much lemonade Min made me drink. All wrapped up in a comforter there's nothin' I could do but listen to my Radio an' I wuz feelin' blue because on every Tuesday night they broadcast singin' lessons which helps me find an outlet fer my musical expressions. While I don't need no lessons still it keeps me up to date on how to tell the other boys who ain't so fortunate. But Tuesday I wuz feelin' bad, it kinda got my goat—all stuffed up with that cold of mine I couldn't sing a note.

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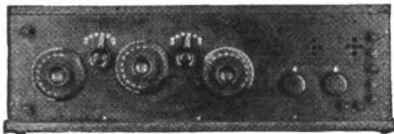
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Universal—Accurate—Interchangeable
A Complete Two-Stage Long Range Receiver



Set includes two Federal Transformers, Condenser, two-molded variometers, molded variocoupler, three V. T. sockets, slant rheostat, dial, Read 'Em binding posts, switch points; in attractive cabinet and drilled panel; complete, ready to hook up. **\$40**
A \$125 Radio, for.....

F. R. S. Radio Corporation

409-D East Fort St. Detroit, Mich.

Radio Romance

By Dr. Frank Crane

FEW of us realize the romance of radio. To very many it seems to be merely another form of amusement, another mechanical device in addition to talking machines and pianolas.

There is a very large number of people, however, to whom radio opens up a new world.

If you will take into our imagination the picture of the many who are shut in and have little communication with the outside world we begin to see in radio wider possibilities for enriching life.

Hospital patients can redeem their hours of loneliness by listening in. The concerts and lectures and stories broadcast from central stations, affairs which may not be alluring to those of us who are vigorous and well, are to these people a godsend.

Henry Smith Williams calls our attention to the remote workers on the frontiers of civilization. "Imagine yourself," he says, "a lumberjack working month in and month out in a northern logging camp, which you leave at most twice in the year, on Christmas and on the Fourth of July. For months together you are shut out from all physical contact with what we ordinarily speak of as the world. No newspapers, no letters, no rumors even of what is going on a hundred miles away."

Then, with a simple radio outfit the lonely man may take his place at the world's table and resume his touch with humanity.

Then let your imagination call up these things:

The lonely lighthouse or lightship, where men live for months in solitude.

The explorer, far from civilization in the forests of Canada or the jungles of Africa, being able to keep constantly in touch with those at home.

The Desert of Sahara, which is already dotted with radio stations from which French garrisons receive instructions.

Alaska. Recently the first station was established at Fairbanks.

The Boy Scouts. Especially in England, the boys are using radio. With a radio outfit there is no excuse for getting lost.

The detection of crime. William J. Flynn, former Secret Service chief, says that radio is especially valuable in broadcasting description of criminals.

The use of radio on ships in remote parts of the sea and on air vessels.

The influence of radio in unifying humanity. Dean Schneider of the University of Cincinnati, says: "What perhaps appealed to me more than any other phase of the possibilities of the radio telephone is its potent influence in bringing together all peoples of the world, in cementing human relationships, in doing away with discord and promoting international understanding and sympathy."

Finally, think of how radio could be used by Arctic explorers.

Every one of these items is intriguing to the imagination.—From "The Globe," N. Y. (Copyright, 1922, by Frank Crane and "The Globe," N. Y.)

Hears Her Own Play by Radio

AS Miss Zona Gale, famous author, listened in at her home in Portage, Wisconsin, one evening, recently, she heard the voice of WGY, broadcasting station of the General Electric Company, speak her name and convey the greetings of the studio players who were about to present, as the evening's program, the play made from her book, "Miss Lulu Bett." The following day, her acknowledgment came in a telegram to WGY in which her manager, F. L. Van Epps, said:

"Miss Gale acknowledges your greetings. Lulu Bett coming through fine."

The play was given by the studio actors of WGY, headed by Edward H. Smith.

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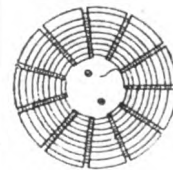
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Look Spider Web Inductance and Discs

that give the wonderful results as described in Radio Age.

Inductance wound complete..\$2.00
Disc Only \$0
Diagram for connections free with order.

We are manufacturers of Storage Batteries for Radio A and B circuit.



WRITE FOR PRICES
International Battery Co.
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Grand Rapids, Mich.

That Armstrong Circuit

So much interest has been displayed in the special article, "TESTED INVENTION OF MAJOR ARMSTRONG AMPLIFIES SET 100,000 TIMES," by John Kent, that appeared in RADIO WORLD No. 13, dated June 24, 1922, the publisher decided to put aside a number of copies for those who were not able to get this issue when published. Copies will be sent, postpaid, on receipt of 15c., or send in your subscription, \$6.00 for one year (52 issues), \$3.00 six months, or \$1.50 three months, and subscription will be started with the issue containing the article about Major Armstrong's Amplifier.—RADIO WORLD, 1493 Broadway.

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NEW YEAR'S PRESENT!
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 12,400 Radio Dealers, covering U. S. by States..... per list, **\$7.50**
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 268 Radio Stations..... per list, **4.00**
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 Ask for price lists for Canada, England, other lists.
TRADE COUNCIL ADDRESSING CO.
 100 W. ADAMS STREET CHICAGO, ILL.

Quality, Design + Workmanship + Material = **RELIABILITY**

RADIO-A RE-CHARGER

Simple to Use
 Just plug in at any 110 v. A. C. lamp socket—attach clips to battery—turn on current and you have your own charging plant.

A compact portable Recharging unit that will fully charge a 100 AH battery overnight for 5c. to 10c.
 At your dealers or write
King Electric Mfg. Co., Inc.
 1651 Fillmore Avenue Buffalo, N. Y.

Garden Hose Saves Day
Radio Manufacturer Does Quick Thinking When Returns Fail Doctor
Listening in to World Series

WHEN the radio returns of the World Series baseball games were being broadcast at least one unique turn was given this event. As is generally known, the voice of the broadcaster was transmitted from the Polo Grounds, New York City, to Newark, New Jersey, where the broadcasting was done.

One of the directors of the Freed-Eismann Radio Corporation of New York was giving a "radio baseball party" at his home in Far Rockaway, Long Island, when the telephone-bell rang. It appears that Dr. Richard H. Hoffman, a New York physician and one of the director's friends, had also been "listening in" to the radio returns at his own home. But in the middle of a very exciting play his storage battery ran down.

In haste he hurried to phone his friend to inquire what to do. The radio corporation director offered to assist him, and this is how it was done:

Instead of continuing to "listen in" on one loud-speaker horn a second was connected in series. Then the gardener brought in the lawn hose, which saved the day. One end of the hose was stuffed down the throat of the loud-speaker and the other fastened to the mouth-piece of the land-telephone. "Central" set the connection to the doctor's home telephone, and Dr. Hoffman, listening to the receiver of his land-telephone, was able to hear every play. Thus the plays were transmitted from the Polo Grounds by land-phone to Newark, by radio to Far Rockaway, by garden hose to a land-phone again, and by land-phone to the elated doctor, whose own set had broken down at an inopportune moment!

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

Jump your common detector spring or catwhisker and
INCREASE YOUR CRYSTAL RANGE
 BY USING A "PT" ULTRA-SENSITIVE CONTACT IN YOUR CRYSTAL DETECTOR
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 Price, with instructions, twenty-five cents.
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RADIPHONO ADAPTER
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Here is an efficient economical way to use your Vetroia, Edison, Brunswick, etc., as a wonderful loud speaker.
 This adapter is constructed of molded composition. It eliminates metallic and distorted sounds. Guaranteed to be satisfactory or money refunded.
 If your dealer cannot supply you send us \$2.00 and we will mail one by parcel post prepaid.
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 Phone, Market 9023

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 Everyone Is Becoming
WE REPAIR
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VACUUM TUBES
 and Guarantee Them!



Your dealer should know, but if he does not, send direct to
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 Tubes returned Parcel Post C.O.D.

Attention! Fans and Amateurs!

Have you built your own receiver?
 Are you experimenting with any particular hook-up?
 Are you improving your set?
 Are you doing any interesting constructive work in radio?
 Why not share this knowledge with your thousands of brother fans who read **RADIO WORLD** every week?
 We want pictures of receiving sets with descriptions of how you overcame some difficulty, or of any additional part or unit that you have added to obtain better results. These are the things that, probably, the other fellow is looking for. Send in your information; pictures or whatever you have done to improve the art.

Remember the beginner is looking for them.
 We intend to print in this paper, each week, pictured information and description of value to radio amateurs. If you have found a newer or better way of doing anything, don't keep the secret but tell it to your thousands of brother fans.
 Send in a photograph of your set with or without accompanying diagrams and measurement. State whether you figure in the picture yourself, or not, and without any expense whatsoever to you we will make an engraving and publish it. Be sure to write your name and address plainly on photograph.
 Send in your picture at once, or if you have not made a set or done anything else in making radio material, tell the boy next door all about this offer.

Address Technical Editor
RADIO WORLD, 1493 Broadway, New York City, N. Y.

"Button, Button, Who's Got the Button?"

THE old game, "Button, Button, Who's Got the Button" has just been applied to radio broadcasting. When the younger radioists meet, they ask one another how many radio buttons they have—the one with the greater number being the winner. Several stations now have individual buttons and many others have orders on file. W. Dandridge Terrell, jr., fourteen-year-old son of the chief radio inspector, of the Department of Commerce, is the "inventor" and owner of the new radio-button scheme. He is supplying broadcasting stations with identifying buttons of different colors bearing their name, call, and frequently their slogan. Distribution of the buttons is made by the stations to listeners-in who report having received their broadcasts.

Many fans are already proudly displaying the buttons of their favorite stations on their coat lapels or on banners hung on the wall over their receiving sets. Those possessing the most buttons are local champions. As new broadcasters adopt buttons, the scope of the game increases and there are more buttons added to the pennants of the receiving stations. A prize pennant is planned for the receiver securing the most buttons in a given time.

The young inventor, who is a pupil in the Force School in Washington, is believed to have started something new in the way of advertising and both broadcasting stations and fans are enthusiastic over the plan. Among the first stations to adopt buttons were WSB, the Atlanta "Journal," DandzeWFAA, "The News," Dallas, Texas.

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This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

VACUUM TUBES repaired reasonably. Satisfaction guaranteed or cost nothing. Vacuum Elect., 163, 1621 Derr, Toledo, O.

SILVER MIRRORS—PLATING OUTFITS FURNISHED—Stop daily grind. Plans free. Established 1886. CLARENCE SPRINKLE, Dept. 9, Marion, Indiana.

EXCHANGE JOLLY, INTERESTING LETTERS through our club. Stamp appreciated. Betty Lee, Inc., 4254 Broadway, New York City.

PATENTS—Electrical cases a specialty. Pre-war charges. B. P. Fishburne, Registered Patent Lawyer, 386 McGill Bldg., Washington, D. C.

FOR SALE—No. A-1 Gorton Engraving Machine and set of Radio letters, in good condition. Will sell cheap or trade for radio supplies. L. S. Ritter, 414 Deaderick St., Nashville, Tenn.

RADIO FANS: Have you read of the wonderful new all-wave Radio Frequency Amplifier invented by Doctor Miller of the Naval Radio Research Laboratory, Bureau of Standards, Washington, D. C.? We manufacture this device under license. May be added to your present set, giving wonderful results on distant stations, or may be made up into loop receiver sets with extreme range and beautifully clear reception, for home or automobile use. Besides being the best amplifier on the market, the Miller covers all waves at equal efficiency. Price, \$6.50 per unit. Details free. Coast Radio, Inc., El Monte, Los Angeles, Calif.

FREE APPARATUS FOR SECURING SUBSCRIPTIONS FOR "RADIO." Write today for complete list of premiums and our special subscription offer. "RADIO," Pacific Bldg., San Francisco, Cal.

WE WANT YOUR NAME—On a postal card. We would like to get the name of every RADIO WORLD reader, as we expect to send out a special message that will interest you. Be sure to send us your name on a postal card and address it, GIFT DEPT., RADIO WORLD, 1493 Broadway, New York.

NEWS AND GOSSIP OF THE STAGE—Send 10c. for specimen copy of NEW YORK STAR, the great illustrated theatrical weekly. \$4.00 year, \$2.00 six months, \$1.00 three months. New York Star Co., 1493 Broadway, N. Y.

DID YOU GET THE XMAS RADIO WORLD? This was our attractive issue of December 9. Mailed on receipt of 15c., stamps or coin—or subscribe and have your subscription begin with XMAS number. RADIO WORLD, 1493 Broadway, New York.

WE NEED RADIO WORLD, dated April 22 and August 5. If you have copies you don't require, mail to this office and current issues will be sent you for them. RADIO WORLD, 1493 Broadway, New York.

To your personal address: Radio World, 1 year (52 numbers), \$6.

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USED RADIO APPARATUS bought, sold and exchanged. Write, if interested. Roy McConnell, Ravenna, Nebr.

BROADCASTING MAP of the United States appeared in RADIO WORLD No. 8. Sent on receipt of 15c. coin or stamps; or start your subscription from that number (\$6.00 for 52 issues).

RADIO WORLD, 1493 Broadway, New York

BUY "BILTRITE" PRODUCTS DIRECT FROM MANUFACTURER. Save 35%. Variometers, mahogany, green silk wire, special machined hardware, \$3.50; Variocouplers to match, \$2.85; Condensers, 23 aluminum plate, \$1.65; 43, \$2.15; Double Circuit Jacks. 45c; \$1.25 Plugs, 65c; etc. Literature. WAGNER NOVELTY CO., DELPHOS, OHIO.

LIGHT—Make a flash-light without the use of batteries or bulbs. Instructions for making, 25c. H & M Specialty Co., Box 66, Brighton, Mass.

LATEST—BUILD a curiosity clock for the home. Instructions, 25c. H & M Specialty Co., Box 66, Brighton, Mass.

RADIO WORLD as a Holiday Gift

Have You a Friend Who Is Interested in Radio as an Amateur or a Fan?

If so, you must know that such a friend would welcome a yearly subscription for RADIO WORLD from you. Send us \$6.00 and we will place the name of your friend on our mailing list for the coming year, and also we will send a special notification to your friend to the effect that RADIO WORLD will be sent for 52 weeks to his address with your compliments. Send in a yearly order, so that the first copy and our acknowledgment of your courtesy to your friend will be received before Christmas.

Address: Subscription Department, RADIO WORLD, 1493 Broadway, New York, N. Y.

Holiday Gift Subscription Blank

RADIO WORLD,
1493 Broadway, New York, N. Y.

Enclosed find \$6.00 for which send Radio World (52 numbers) for the coming year, 1923, to the following address:

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City and State.....

My Name.....

Address

City and State.....

Send notification to the name given that RADIO WORLD will be sent with my compliments for the coming year.

If you wish to send more than one subscription, write additional names and addresses on a separate paper and add \$6.00 for each additional subscription.

Radio Club News

THE Radio Experimenters League announces on its letter heads that it is "Run for amateurs by amateurs." If interested write William Guild, Secretary, 68 Glen Ridge Avenue, Glen Ridge, New Jersey.

The Princeton Radio Club announces that messages will be transmitted free for undergraduates to any part of the United States or Canada. Its members have agreements with other amateur radio outfits for the relaying of messages for points beyond the range of its 50-watt set. With this set, however, the Princeton operators managed to get in touch with amateurs in England three weeks ago, establishing a record for sets of that power, it is believed. The club has twenty-five members.

The Eighth Ward Radio Club, which meets every Tuesday at the Christodora House, 147 Avenue B, New York City, at 7:45 p. m. sharp, has room for new members, with a little knowledge of radio. The club members have donated two buzzer-sets for code practice. The members are making progress under the leadership of Manuel Smith, of Plainfield, New Jersey. It is desired to have only boys who reside in the neighborhood of Tompkins Square, between Fifth and Fourteenth streets. Applications for membership may be filed with Martin Remnek, secretary, Eighth Ward Radio Club, 250 Avenue B, New York.

The Young Men's Hebrew Association, 92nd Street and Lexington Avenue, New York City, has installed a large radio receiving-set which will be used for a number of purposes. The educational department will give a course in radiophone operation and construction which will be open to members of the association. The entertainments which are held from time to time will get the benefit of the concerts and other numbers which are broadcast.

Answers to Readers

1—Is it possible to use 110-V A C with a step-down transformer and potentiometer to light filaments?

2—Where may they be purchased?

3—Can W D 11 tubes be used for amplifying as well as for detection?

4—Would several turns of insulated wire strung around the room be of any use as an aerial for a powerful regenerative set?

5—Are the W D 11 tubes as good as the regular tubes using 6 volts—L. L. Hamilton, Topsham, Maine.

1—While this can be done, you will be troubled with a constant 60-cycle hum in your set. This is especially noticeable with the regenerative circuit. A filter circuit may be built for this use, but it is less trouble to use the regular A battery, and better results will be obtained.

2—Potentiometers may be purchased in any stores handling radio goods.

3—These tubes have been used successfully both as detector and amplifier.

4—You would probably be successful in doing this if you used about 150 feet of wire, but an outside aerial is advisable wherever possible.

5—It is impossible to discuss the merits of various competitive radio tubes in these columns.

* * *

I am constructing a 2-slide tuner according to enclosed sketch. Give me a hook-up for this.—George Cole, Sandusky, O.

If you will look in RADIO WORLD, No. 11, dated June 10, you will find an article and several hook-ups, "How to Construct One and Two-slide Tuners," by George W. May. You mention using a flat board for your winding core. This is all right, but why not stick to the standard way and wind it on a round tube or core?

* * *

What size windings should be used in the regenerative set described by Harold Day in RADIO WORLD, No. 30, dated October 21.—Scott Weakby, Kansas City, Kansas.

You should use No. 20 wire wound in the following manner: eight turns with taps taken off every turn, then seven groups of eight turns apiece. This will permit you to get what is known as single-turn tuning. The rotor should be wound full with the same size wire.

* * *

Can a step-down transformer be used to light bulbs? We have D-C current.—John Spigler, New York City.

A step-down transformer cannot be used on D C. It will only work on A C.

* * *

Enclosed find diagram of superheterodyne with 5 tubes. When hooked up, as shown in diagram, I get nothing but howls. What is the matter?—William Charلمان, Pottsville, Pa.

Your diagram is correct. A superheterodyne is a very hard circuit to manipulate. We suggest that you consult anyone of the following back numbers of RADIO WORLD in order to learn the correct manipulation of this circuit: June 24, July 8, July 15, August 5, September 16. If you are not familiar with working sets of this type, it is better to construct a simpler set as this is an extremely hard set to work unless you understand it thoroughly, which very few people do.

* * *

I recently purchased a Paragon regenerative set and have had wonderful results. Kindly explain why stations at a distance, like Atlanta and Chicago, seem to go in and out. I sometimes lose them entirely.—Robert Steinger, Rockaway Park, N. Y.

The trouble you are experiencing is com-

mon and is known as "fading." This cannot be helped. It is not the fault of your set.

* * *

1—Can I use a radiator pipe for a ground?

2—Is an outside aerial necessary?

3—Can I use more than one set of phones with a crystal set?

4—If so, will I have to use two condensers across them.—Inquirer, Youngstown, Pa.

1—Yes. A radiator pipe is all right for a ground. A cold-water pipe is better.

2—No. Reception can be accomplished with wire strung around the room, but it will not function as well as an outside aerial.

3—Yes. It will cut down the strength of the signals, but not enough to trouble you.

4—No. One condenser across the phones is all that is necessary.

B C M BROADCAST RADIO RECEIVER

Many people live in locations where an aerial is impossible. Others object to their premises being disfigured by poles and wires, and many doubt their ability to operate sets with such complications. Eliminate these features by using B C M Radio Frequency Broadcast receivers and inside aerial.

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VARIABLE CONDENSERS—
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If your dealer doesn't carry, address Dept. D,
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TRADE
"VAC-SHIELD"
MARK



"VAC-SHIELDS" bring in DX.

This new invention enables you to eliminate any possibility of linking up the magnetic field between tubes and does away with inter-stage coupling and unnecessary noises, thus overcoming stray capacity effects that are always so troublesome and make it so difficult to tune in distant stations.

Make reception worth while. Your set should have them.

Order today. By mail, postpaid, \$1.00.

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THE ONLY GENUINE AND GUARANTEED

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Wave Length, 150 to 3,000 Meters

Eliminates the use of all Variometers, Variocouplers and Loading Coils, inasmuch as it performs in one compact unit the functions of all of these devices combined.

For the Novice—The six efficient hook-ups given free with each "All Wave" Coupler enables the greenest novice to attain the same results attained by the expert in building the simplest, most compact and most efficient radio receiving set possible.

Be Prepared—For the higher wave lengths that have been and will be allotted to broadcasting stations because of their ever-increasing number. BUILD a set that cannot become obsolete.

Unusual Results Attained—Individual users of the "All Wave" Coupler have written us that in Rhode Island it is nothing unusual to bring in stations as far south as Havana, Cuba; while in Mobile, Alabama, Newark, N. J., is brought in daily.

Beware of Imitations—of the "All Wave" Coupler, which is guaranteed with a money back to operate as advertised. Look for the trademark, "All Wave," on the rotor, also the six efficient hook-ups in the box.

\$9.00 Six efficient Hook-ups sent upon receipt of 10c. stamps or Free with each "All Wave" Coupler

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THOUSANDS OF SATISFIED USERS



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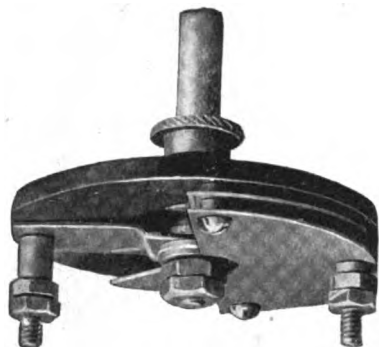
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will deliver RADIO WORLD to your home. In order to be sure of getting RADIO WORLD regularly, and of not missing a single issue, we suggest that you either subscribe direct or through your newsdealer at \$8.00 a year (52 issues), \$3.00 six months, and \$1.50 three months. Or instruct your newsdealer to deliver RADIO WORLD regularly to your home each week. Dealers will take standing orders and make deliveries of paper whenever requested. Radio World, 1493 Broadway, New York.

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RADIO WORLD wants young hustling subscription representatives in every college, school, factory and big business concern throughout the country. Send us your name and address for full particulars. RADIO WORLD, 1493 Broadway, New York City.

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"Best" Variable Condensers require one hole only in panel. This feature is absolutely unique with "Best"; all other makes requiring three or more holes.

The plates are made of pure aluminum specially prepared to insure straightness, and soldered in slotted tubing, assuring uniform spacing and eliminating use of washers.

- "Best" VernierList \$1.50
- 5 Plate .000125 MFD..List 3.00
- 11 Plate .00025 MFD..List 3.00
- 23 Plate .0005 MFD..List 3.50
- 45 Plate .001 MFD..List 4.50

THE name "Pruden" back of standard Radio Equipment is a guarantee of mechanical excellence, perfection of workmanship and scientific correctness of design.

Now, more than ever, when the market is flooded with inferior goods, it pays to buy standard trade marked products.

You can pin your faith to "Pruden." Money-back unconditionally if you do not get complete satisfaction.

Just a few leaders of Pruden Reliable Products shown here that will give you better radio results at no greater cost.

Dealers write today for our interesting proposition.

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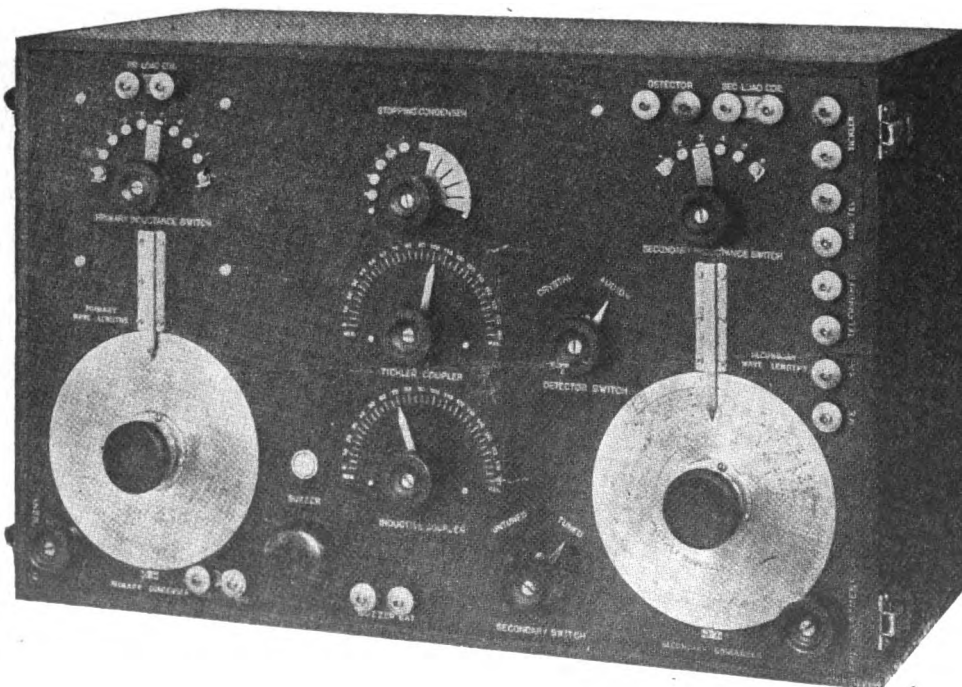
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Radio Detector

The only fixed radio detector requiring no adjustment. Used in place of crystal or vacuum tube detector. Gives excellent quality of sound without distortion, battery or tube noises. Detects telegraph signals at several thousand miles. Detects broadcasted music more clearly than vacuum tube detector, and requires no amplification where the incoming signal has sufficient strength to actuate the sensitive phones. Ideal for use in regenerative circuits. Handsome, substantial, suitable for assembly in the finest radio equipment. Guaranteed against imperfection or faulty operation. List each \$3.50

The De Luxe U. S. Navy Type Radio Receiver

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Best of its type—must not be confused with instruments selling for from \$200 to \$300. Highly selective. Will pick up messages, music, lectures, etc., that lower priced instruments will not hear. This receiver is equipped with binding posts which are normally short circuited for 300 to 6,800 meters by which wave lengths up to 23,000 meters may be received by the attachment of loading coils. Capacities of proper loading coils for above are: Primary 50; Secondary 50; Tickler 80 millihenries. While the receiver is provided with a "standby" or untuned circuit, it also has an unusual degree of selectivity. Although primarily designed for the more advanced fields of Radio work, or the laboratory, the simplicity of arrangement and beauty of finish make it unusually desirable for the radio club or for the individual who desires the finest equipment obtainable for his home or office. In the receiver, Bakelite tubes, threaded, provide the forms on which inductance coils of high frequency cable are bank-wound. After assembling, the coils are impregnated with an insulating compound, in vacuum, and thoroughly baked. The inductance switch controls a mechanism whereby the different sections may be connected, completely disconnected and opened, or completely disconnected and individually short circuited. This arrangement is important for, by it, each coil has a natural period when connected which is less than the shortest wave length in the receiver's range. The reception of parasitic signals is overcome, the absorption of desired signals by the coils is minimized, more energy is forced to the detector and on all wave lengths the interference is reduced.

CHARLES R. ABLETT CO.
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VOLUME TWO OF
RADIO WORLD

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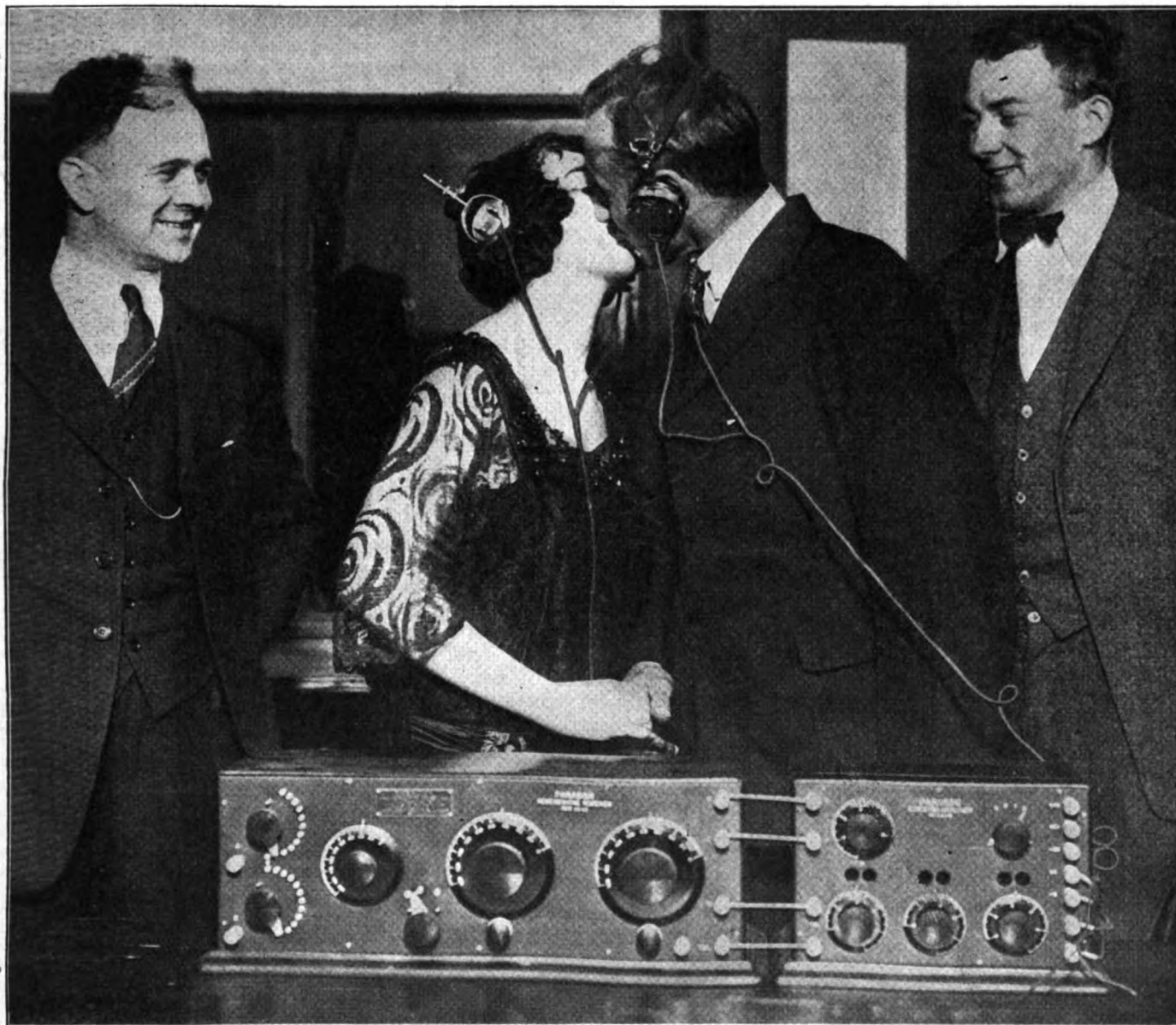
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But You Can't Throw Rice at the Set!



(C. Underwood & Underwood, N. Y.)

Yes, millions heard this wedding kiss! The ceremony was performed at the American Radio Exposition. Dr. Saxon, the officiating minister, at the extreme left. Next Miss Girstner, the bride; Mr. Woorm, the happy groom, and his best man.

THE marriage by radio of Miss Margaret Girstner and Joseph Woorm, of New York City, at the American Radio Exposition, held at the Grand Central Palace, was an event that will make radio history. The ceremony, at which Rev. B. F. Saxon officiated, was heard by many thousands of "listeners-in." One of the large exhibitors of the exposition

presented the happy couple with a complete receiving set. The management gave them a wedding breakfast and a gift of money. It is estimated that over half the population of the radio world was "present" at this novel wedding through the courtesy of station WEAF. The happy couple stood on the balcony facing the crowds below, and every word uttered

was amplified through the special power speech-amplifier so that every person in the exposition could hear. From the exposition these words were transmitted over land wires to WEAF and broadcast over the world. The bride's family, who live out of town, were listening in when the ceremony was performed, which is just as good as being present.

How to Make a Variable Grid-Leak

By Ortherus Gordon

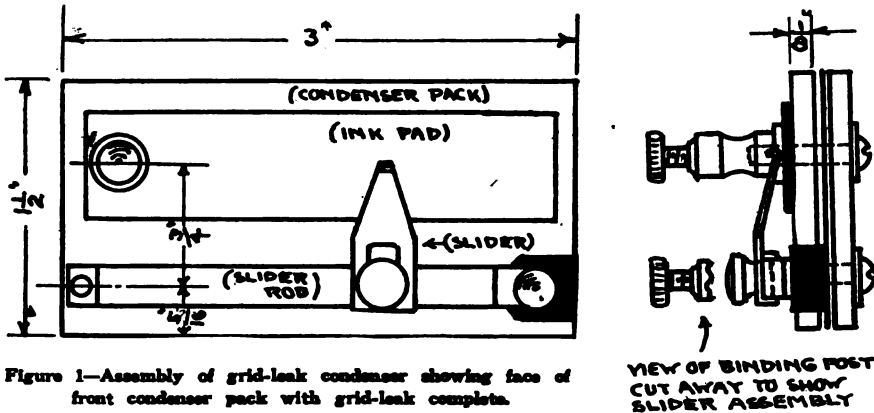


Figure 1—Assembly of grid-leak condenser showing face of front condenser pack with grid-leak complete.

UNLESS an article on construction really helps an amateur by showing him, in at least one way, how to improve his apparatus, it fails in its purpose. Scientists and experimenters are finding new faults with present-day radio apparatus and are constructing more efficient instruments to replace those found wanting. The craze seems to be in getting all the elements of radio reception under variable control. But such a craze is madness in the right direction. Radio sets are like children: no two are alike and no two respond to the same treatment. Each requires individual attention and instruments are being manufactured with this idea of "personal service" in view.

The latest improvement along this line is a variable grid leak, plans for which accompany this article. Grid leaks were formerly considered an unimportant part of the vacuum-tube receiving set; but not now. Considering the duty of grid leaks and the confusion that results when they fail in their duty, it is a wonder that more attention has not been paid to ways and means of improving them.

What is a grid leak, anyway? What is it for?

When a vacuum tube is operating at top-notch speed, there piles up on its grid an unwilling swarm of negative electrons. If given the chance, every single electron in this swarm would beat a hasty retreat, leaving the grid empty and the vacuum tube "dead." On the other hand, if no avenue of escape is opened to those electrons which exceed the number properly needed by the grid, the "extras" would "choke" the set and play havoc with decent reception of signals. If a door is opened, everybody goes home; if the door remains closed, there's a riot.

There is, however, a way of maintaining the golden average, which, as you already know, is by connecting a grid leak to the grid of the vacuum tube. A grid leak is nothing more than a barrier of very high resistance, only broken down when the negative electrons amount to such numbers as to successfully charge and cross it.

In other words, the resistance of the grid leak should be high enough to keep back just the amount of electrons needed by the grid. Every grid has different requirements—and a resistance that is "jake"—for one will be too high for another and

too low for still a third. Moreover, it has been found that the same grid has various demands when working under a variety of conditions. For this reason, a variable grid leak is an essential to maximum efficiency.

The workshop plans for such an instrument, illustrating this article, have been proved by actual construction. If followed, the result will be as good a grid leak as can be bought anywhere. The instrument is good-looking, may be mounted on a panel in an upright position, or laid down flat on the base-board; and, what is more to the point, it may be built by any amateur for a few cents.

Because a condenser invariably goes with the grid leak, and the combination termed a "grid-leak condenser," the plans are extended to include a condenser as well. The capacity of such will be about .00025 mfd., while the resistance of the grid leak will range from practically zero to about four megohms.

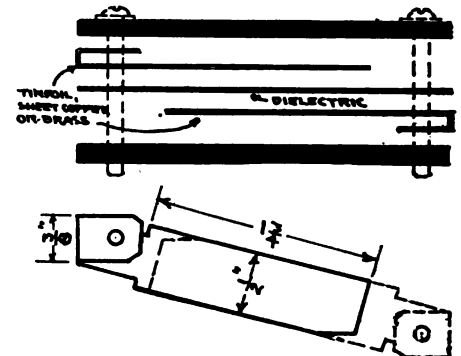


Figure 3—Diagrammatic details of the condenser.

"Condenser packs" is the name I have given the two bakelite, or hard-rubber rectangles, used as blocks about which to construct the grid leak. They are 3 inches long by 1 1/2 inches wide and of any thickness over 1/8 of an inch. Wood is hardly recommended unless it is a very hard wood such as ash, oak, or maple soaked in melted wax or some other insulating composition. Even then, it will not be as satisfactory as hard rubber, bakelite, or any other composition panel material.

The condenser is a departure, in shape at least, from the ordinary strips of metal or metal foil. The detailed drawing (Figure 3) calls for tin foil, sheet brass, or copper, cut in the shape and dimensions shown. The plates are on an angle so they will go from one binding post to the other in a diagonal line. The extensions are brought out and

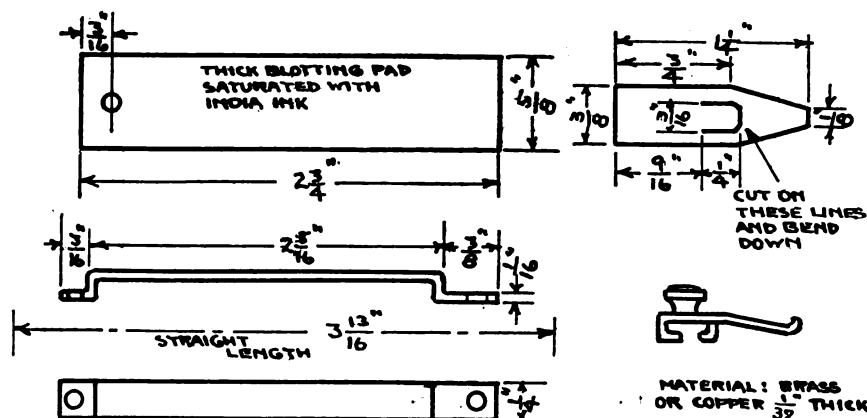


Figure 2—Diagrammatic details of the grid-leak.

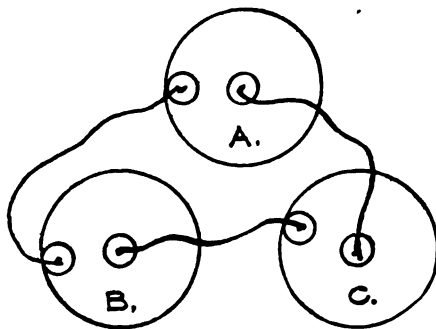
To Reclaim Dry Cells

By C. C. Huntington, Mauch Chunk, Pa.

NOW that the $1\frac{1}{2}$ -volt tube is so popular conservation of dry cells is worth considering. Old cells which have outlived their usefulness for ignition purposes, may be reclaimed without trouble or expense and without the use of sloppy mixtures. The reclamation is genuine, not makeshift.

Connect three old cells: A, B, and C, as shown in the accompanying drawing, and let stand over night. In the morning, cell A will show approximately the combined amperage of the three before connecting.

It would be well to select for reclamation the cell showing highest amperage. The beauty of this is that it works. Try it.



Schematic diagram of the three cells as described by Mr. Huntington.

(Continued from preceding page)
bent around the condenser packs; one in front to the lower binding-post and the other behind to the upper binding-post.

The dielectric, or the insulation intervening between the two condenser plates, is a rectangular piece of mica or heavily waxed paper cut to the same dimensions as the condenser packs. When the dielectric is made, the condenser unit is assembled as shown in Figure 3; and, when ready, the two holes are drilled through everything at the same time. Then the bolts from the binding posts are inserted and the condenser packs temporarily tightened to await completion of the variable grid leak.

As shown in Figure 1, the grid leak is mounted on the face of the front condenser pack. The details are given in Figure 2. They comprise a piece of thick blotting paper soaked with India ink, a slider-rod, and a thin brass slider. The blotting paper is, of course, the grid leak itself, while the slider-rod and slider only serve to vary its resistance. The India ink mentioned is known as drawing ink. It may be obtained from an amateur friend who has a drawing-outfit, or at any stationery store. In soaking the blotter, it is better to use a large piece and then cut it to size. Tack or pin the paper down to a thin piece of metal so that all the ink poured on it will be absorbed by the blotter. Then let it dry and cut out a rectangle $2\frac{3}{4}$ inches long by $\frac{5}{8}$ of an inch wide. Punch a hole in it to correspond with the upper binding post and then stick it, with glue, in the position shown.

For this operation, paste will not do. Use glue or household cement.

The slider-rod is a piece of brass or copper rod $3\frac{13}{16}$ inches long by $\frac{1}{4}$ of an inch wide. Have it thick enough so that the rod will not bend. About $\frac{1}{16}$ of an inch should be about right. Bend the rod and drill it as shown; but before putting it in final position on the condenser pack, make the slider.

Take a thin piece of spring brass and cut it according to the detail in Figure 2. A sharp chisel will cut out the lug to perfection, so that it can be bent down to clip on the rod. Then bend the whole slider in the shape indicated, put on a knob of some kind, and fasten it to the rod. Then put the rod in place, tighten up the bolts, and the job is done.

The result is a neat and efficient grid leak condenser, which should drag in those weak signals which are now on the outer edge of your receiving range. When the slider is well to the left, the resistance is very low, but it increases as the

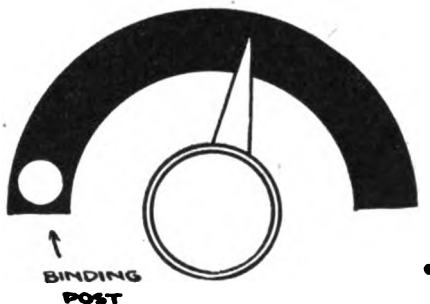


Figure 4—Alternate suggestion which may appeal to some amateurs who want to make a grid-leak without a condenser.

slider is moved slowly to the right.

One side of the grid leak is connected to the grid, while the other side is connected to the secondary of the tuning device. The positive pole of the A battery is also connected to the other end of the secondary, so that the positive side of the battery attracts the negative charge of the grid, drawing it in some degree through the grid leak. Some hook-ups cut out the secondary from this circuit and show the grid leak connected directly between the positive pole of the A battery and the grid of the tube.

Figure 4 suggests an alternate shape of variable grid leak. The blotter is cut into a semicircular form, and a knob and pointer used instead of a slider. Some amateurs may prefer this plan over the other, but it does not lend itself very readily to a combination of both grid leak and condenser.

Worth Knowing

You Can't—

RECEIVE signals if you forget to throw the lightning switch.

Expect a tube to work right after letting it fall on a concrete or hardwood floor.

Get the filament of your tube to last if you connect your B battery to it. It will light up brightly for a short space of time, but it doesn't last long enough to produce satisfaction. Besides, you wouldn't be able to get the B-battery connections right.

Expect to get Cuba regularly on a crystal set.

Hear church services over the radio and get satisfaction. You are generally too comfortable when sitting at your set.

* * *

Let us look at radio in connection with the question of isolation. Think of the condition of most country roads at this time of the year; snow-covered and practically impassable. Think of what radio means to the folks imprisoned in the midst of snow-covered fields. Think of what a force this will be in keeping the young folks on the farm, a problem now causing the government much worry. Radio will not only entertain the farm folks, but it will help to overcome the fundamental cause of the desertion of rural communities. In connection with isolation, let us not forget the men in the lumber and mining camps and in the lighthouse service. Take the latter, whose lives are dedicated to the safety of travelers. In many cases, radio has relieved the tedium of life on the "lights." For the first time in history, these men can keep in touch with the world that used to pass them by.

* * *

It sometimes happens that you won't get any results when you hook up a tickler-circuit regenerative set. If this happens, try switching your tickler leads, changing the connections, thereby changing the direction of the current through the circuit. The easiest way to tell whether your tickler is connected is by the rushing sound heard in the phones when the circuit is brought into resonance. If you don't hear this sound, switch your leads.

* * *

Crystal detectors, no matter how sensitive, cannot be depended on for broadcast reception over a distance of more than 25 miles, although greater distances may be covered under favorable conditions. Code messages may be received over long distances.

New Game for Radio Amateurs

By A. G. Shirt

FORECASTING the weather by means of a radio receiver is a new game for radio amateurs. It is fully as fascinating, and almost as scientific, as chess. It has an element of chance, of course; but long practice will give to radio amateurs that weather "instinct" formerly enjoyed only by old salts or people with rheumatics. It does not consist in merely copying government forecasts sent out by Arlington, after the time signals, at 10 p. m. It is much more interesting.

There is not a haggard member of the great radio fraternity who has not had the weather clamp down on his radio activities at one time or another. In fact, the weather occasionally stirs up a rumpus, not for the sake of healthful argument, but because it is its prerogative.

So many "big fellows" have been double-crossed by the tyrant weather that an amateur stops to think after telling the story of his own modest DX work and adds, reflectively and significantly: "Under, of course, favorable weather conditions." When

he writes about ranges he adds: "U, of course, F W C." Then he jumps all the distances mentioned in his letter by one hundred miles to take care of the DX he would hear on that wonderfully clear night he has been waiting for. The boys understand all this and immediately evolve a problem in mental deduction.

Weather is a tribulation; but it's an ill wind that blows no good, and what gives us a pain in one respect is as good as a tonic in another. If our radio-receiver acts queer when it is cloudy, queerer when it rains, and queerest in a thunder-shower, why not catalogue these symptoms and then turn into the truest little weather prognosticator that ever happened? Why not consult the radio receiver on the eve of some important event, and then place a few odds on the appearance or non-appearance of Old Sol?

However, enough is already known about how approaching weather affects radio receivers to make fairly decent prophets of us all. Several Westinghouse engineers have been studying the matter. While their data is not

yet complete, they have demonstrated that radio waves are boosted along by high barometric pressures and set down by low barometric pressures.

High pressure, as a general rule, indicates clear weather; while low pressure means bad weather. The graphic illustration of a storm as used by the Weather Bureau is a cluster of concentric circles, with the lowest barometric reading enclosed by the inner circle. This is the heart of the disturbance, or the storm center. Disturbances move in two directions at the same time. They twirl about their center in an enlarged cyclonic movement, like a top, and also sweep forward over the surface of the earth. They are like a fellow who gets delirium-tremens and then goes visiting his wife's relations.

In the United States weather matters are quite simplified. Storms take one of two possible directions. They either sweep across country from west to east or they brush up the Atlantic Coast line from south to north. Therefore, a radio receiver situated in the eastern states, or on the Atlantic seaboard, is vulnerable from two points of the compass. If stations to the west are heard faintly, or not at all, it means that, other things being equal, there is a low barometric disturbance intervening. The disturbance is moving east. By tuning in on stations nearer the observer's receiver, and determining just where the signals begin to weaken, you can tell the approximate location of the storm. A little practice will enable you to compute the hour at which it is due to break in your own locality.

The same interesting procedure may be carried out when signals from the south are lacking in their usual intensity. If the "Voice of the South" sounds as if it were as far away as Buenos Aires then you may expect something else besides a concert.

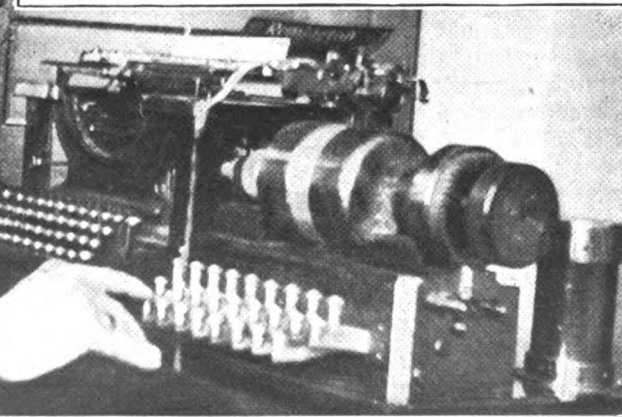
It does happen, however, that all low-pressure areas are not raging storms, but merely uncomfortable weather. A low barometer coming from the west, for example, means warm, cloudy weather with wind from the east. A high barometer from the west means clear, cold weather with westerly winds. A low barometric pressure sneaking up from the south (and consequently putting a damper on signals from that direction) means wet weather with southerly winds. When the amateur has had a little practice he can tell by the speed with which the low area approaches just how intense a disturbance to expect.

New Code-Translating Typewriter for Radiotelegraphy or Regular Wire Work



The latest contribution to science is this new code-sending and code-receiving typewriter, which is equipped to operate either by wire or radiotelegraphy. The inventor, Edward Hebern, a mechanic of Oakland, California, is shown using the machine, which has awakened interest of government officials. The machine, with the proper code wheel inserted, translates the coded message from any similar machine immediately upon receipt. An electric current is applied in certain combinations, which causes the machine at the receiving end to reproduce in understandable words an apparently meaningless but systematic jumble of syllables sent out by the operator of the sending machine. The secret of the invention is in its master wheel, a small spool not unlike that on which typewriter ribbons are wound, containing twenty-six apertures on either side and a similar number in the rim, the whole being three inches in diameter. Each letter is wired in combination with other letters.

(C. Underwood & Underwood, N. Y.)



How 45 Men Were Saved from Death at Sea by Radio

Radio Log of Rescue of 45 Men from the S. S. "Monte Grappa" by the White Star Liner "Pittsburgh," on the High Seas. The "Monte Grappa" was bound from Montreal to Trieste, the "Pittsburgh" from New York to Bremen

By Peter Gray

THE radio record of the rescue, as told in the log of the messages which passed between the "Pittsburgh" and the doomed "Monte Grappa" on the night of November 15, 1922, is an eloquent narration of a modern wonder.

One feature of the rescue not stressed in published accounts was the nicety with which Captain Thomas Jones of the "Pittsburgh" laid his course for 185 miles to intercept the sinking "Monte Grappa," whose speed diminished from 8 to 3 knots an hour.

It was a masterly piece of judgment, a kind of super-navigation. When the "Monte Grappa" of Trieste, with her cargo of grain shifted, sent out here S. O. S. she was steaming about 8 miles an hour, and her course was North 60 degrees E. The "Pittsburgh" turned toward her at 16 miles an hour on a course South, 80 degrees E. The courses of the two ships formed two sides of a triangle. Yet Captain Jones calculated his course and speed so exactly that after running more than 15 hours, in a gale and heavy sea, he was able to intercept the then helpless "Monte Grappa" in the nick of time. Other ships had heard the "Monte Grappa's" call, but none had acted on it with the precision and effectiveness of the "Pittsburgh":

A summary of the "Pittsburgh's" radio log of the rescue follows:

At 1.47 a. m., eastern standard time, all shore stations stopped transmitting for the S. O. S. of the "Monte Grappa."

At 1.52 a. m., St. Pierre, Newfoundland, was repeating the "Monte Grappa's" position, lat. 43° 18' N., long. 41° 55' W., and message, "list to port in heavy sea."

At 2.10 a. m., Cape Race asked, "Any ship going to assistance of 'Monte Grappa'?" In two minutes the "Pittsburgh" replied, "Our lat. 44° 25' N., long. 45° 49' W. Distance from the 'Monte Grappa' 186 miles. Steering for him."

Five minutes later the "Monte Grappa" asked the "Pittsburgh," "What is your distance from us?" The "Pittsburgh" replied, "185 miles, speed 16 knots."

One minute later the "Monte Grappa" replied, "Our course N. E., speed 8 knots."

In another minute the "Pittsburgh" replied, "Course, S. 66° E."

Any sailor can visualize the relative position of the ships from this information. Captain Jones was entering on a chase with death that to many men would have been blind man's buff.

At 2.44 a. m., the Belle Isle station asked if the "Pittsburgh" was going to the assistance of the "Monte Grappa" and was answered in the affirmative.

One minute later the American steamer "President Taft" asked the "Pittsburgh" if the "Monte Grappa" wanted immediate assistance and answer was given.

A little later the "Mongolia" of the American Line and the "Seydlitz," a German ship, received information from the "Pittsburgh" of the "Monte Grappa's" position.

The Pace Quickens

Long before daylight, as the "Pittsburgh" raced through a rough sea, it became evident that the plight of the "Monte Grappa"

was growing more serious as the night wore on.

At 4.03 a. m., she sent a more urgent appeal to the "Pittsburgh." It was "Please stand by."

This was followed at 4.26 a. m., by the message, "We require immediately one of the boats to come alongside."

At 4.56 a. m., the "Pittsburgh" again checked up the "Monte Grappa's" position by asking "What is your course?"

The answer was "Wait." This was not reassuring. Three minutes later the "Monte Grappa" was asked the same question and gave the same answer. In another three minutes the required facts came through. "Our course N. 55° E., speed 5 miles." It will be noticed that the speed of the "Monte Grappa" had lessened three knots, and this made the problem of Captain Jones increasingly difficult.

At 5.22 a. m., Captain Jones gave the "Monte Grappa" his position and speed, adding "Can you steam toward us?" The answer was, "Impossible to steer toward you. Be alongside as soon as possible."

The "Seydlitz" also was steaming toward the "Monte Grappa," but at 6.26 a. m., on learning of the "Pittsburgh's" progress, she resumed her course for the English Channel.

At 8.34 a. m., the steamship "Lackawanna"

Pamphlet on Coil at Nominal Cost

THERE has appeared Bureau of Standards Scientific Paper No. 455, Tables for the Calculation of the Inductance of Circular Coils of Rectangular Cross Section, by Frederick W. Grover. This paper gives tables which have been carefully calculated, by means of which the inductance of multilayer coils may be quickly and accurately computed by the simplest of arithmetical operations. The tabulated values in the tables are correct to 1 part in 10,000. The necessity for long and tedious computations directly from the complicated formulas and for selecting the most suitable formula for a given case are thus avoided. The formulas on which the tables are based are collected for reference, and the theoretical problems involved and the limitations of each formula are discussed. Examples are given to illustrate and explain the use of the tables. The calculation of mutual inductance for certain cases of multilayer coils is treated. This paper should be regarded as supplementary to Bureau of Standards Scientific Paper No. 169, Formulas and Tables for Calculation of Mutual and Self-Inductance, which covers many different kinds of inductance coils. A copy of Scientific Paper No. 455 may be purchased for 10 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C.

asked the "Monte Grappa," "Do you need any assistance?" to which the "Monte Grappa" replied, "It is already coming—'Pittsburgh.'" Captain Jones periodically checked up the "Monte Grappa's" speed and course. At 10.39 a. m., he sent the message, "If you carry the same course and speed we ought to be up with you by 7.00 tonight."

Captain Jones' faith in his ability to reach the "Monte Grappa," if she kept afloat, is shown in this message, sent at 3.23 p. m., from the "Pittsburgh":

"At 8.30 Greenwich mean time will you please send up a rocket and repeat every fifteen minutes. How many people have you on board? Compliments."

The answer of the "Monte Grappa" gave Captain Jones the measure of the job he had before him. It was, "Will send up rockets. Have 45 men on board. Very likely will be obliged to abandon ship. I have no lifeboats."

Closing In

At 4.00 p. m., the "Monte Grappa" asked the "Pittsburgh," "Do you see our rockets?" The answer was "No."

Twenty minutes later the "Pittsburgh" flashed a message that must have been among the most joyful the captain of the "Monte Grappa" ever received. It was, "We have seen your rockets and are bearing down on you." To this the answer was "O. K."

In another twenty minutes the "Monte Grappa" reported, "Now we will send up another rocket. Let me know if you see it." Seven minutes later she asked, "When do you expect to be alongside?"

The "Pittsburgh" replied, "Steaming for you 16 knots; can you see our masthead lights?" The answer was "Cannot."

At 5.26 p. m., the "Pittsburgh" asked the "Monte Grappa," "How is the sea alongside of you?" "On starboard side quiet; that is, not breaking," was the answer.

At 6.05 p. m., the "Monte Grappa" reported, "Must abandon ship." To this the "Pittsburgh" responded, "Will take you off right away."

There was an interchange of messages as to the number of boats to be sent. Then these messages were exchanged:

"Pittsburgh": "Stop your ship."

"Monte Grappa": "We are stopped."

"Pittsburgh": "Sending two boats to starboard side."

"Monte Grappa" "When your boats leave, give long whistle."

"Pittsburgh": "Yes."

At 6.34 p. m., the "Pittsburgh" sent the message, "Boat now coming."

An hour and 12 minutes passed before a message came from the "Monte Grappa" saying, "A boat now coming."

The "Pittsburgh" then answered, "Second boat just left for you."

It was 9.39 p. m., when the "Pittsburgh's" radio operator made this entry in his log: "Crew of 'Monte Grappa' all rescued and aboard. All 'Pittsburgh's' boats back. Resumed normal watch."

The closing entry in the "Pittsburgh's" radio record of the day was: "10.25 p. m. broadcast derelict warnings to all stations."

Get Radio Goods That Stand the Test

By C. White, Consulting Engineer

LACK of knowledge, or, perhaps, neglect of certain fundamental points is frequently a source of multifold trouble. It is a shame that any results are obtainable with poorly constructed apparatus. If such were the case, only the better grade of goods would be placed on the market. But, nevertheless, the great educational work that radio journals are carrying on is sure to result in the eventual blacklisting of all manufacturers who refuse to let quality be their standard. The radio manufacturer is just like the rest of us; he is human, subject to error, and by no means infallible in judgment. Hence, we must not be too severe and must consider that the vast majority are in the radio game to stay and are doing the best to improve the field. What is really needed is constructive, not *destructive*, criticism. It is only by the general getting together of amateurs, professionals, and manufacturers that standardization and many other desired improvements will be forth coming. National Radio Week is just the thing to bring such facts to light.

As an example of neglect, let me first bring to light the phones used in radio reception. There has been, perhaps, no other article of the radio trade that has suffered so much as the telephones. The fact that they are outwardly easy to make has attracted many although their knowledge is rather limited. The principle of the radio, or, in fact, any telephone receiver is that of the electromagnet. The feeble signal-current passing through the coils of wire in the phones causes the diaphragm to be moved backward and forward in rapid succession, thereby translating electrical impulses of the received current into corresponding sound waves. The volume of the sound emitted depends on the strength of the electromagnets. Fundamental electrical engineering tells us that the strength of any electromagnet is a direct function of the number of turns of wire on the magnet and the current flowing through these turns—in technical language, the number of ampere-turns (the ampere being the measure of electrical current).

Since in a radio or telephone circuit the actual current flowing is exceedingly small, hence to get a fairly strong magnet we must place a larger number of turns than would be necessary if the current were

greater in value. To do this and still keep the size of the coil within the limits of the space available within the receiver piece, we must resort to the use of extremely fine wire. Now, since the number of turns is many and the size small, we have grown accustomed to rate a receiver in terms of the resistance of the coils instead of the ampere turns, which would have been the logical and more scientific thing to have done. But, so long as we kept to one kind of wire, (copper), we were strictly safe in so doing because the resistance was a measure of the relative ampere turns. Naturally, a pair of phones rated at 3,000 ohms was looked on as superior in every way to a pair rated at 1,500.

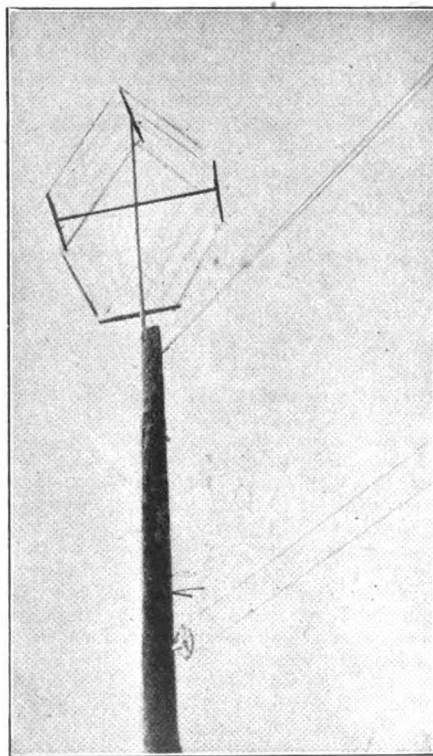
This was O. K. until some dis-

honest manufacturers deliberately wound German silver wire on their phones in order to raise their ohmic resistance. Since German silver has more resistance per unit length of the same cross-sectional area than copper, it was perfectly true that a few turns of it would give a resistance many times greater than many turns of the same size of copper wire. But how about the number of ampere turns? The manufacturer was either ignorant of the fact that the basic fact underlying good phone-design was ampere turns and not the indirect measure of ampere turns, resistance, that is desirable; or, he was trying to rely on the fact that the average radio-man thinks of phones in terms of their resistance. Such deception can not last long, especially when amateurs are learning to ask for the better make of apparatus. Some, no doubt, are aware of the fact that certain makes of phones are better than certain other makes regardless of the resistance ratings.

While the number of ampere turns is the fundamental determining factor in phone design, there are other minor considerations which play a large part in the value of the instrument. A pair of phones used for radiophone reception should have a resonant point at about 870 cycles. This is much desired because telephone engineers have proved that the average electrical value of the human voice is 870 cycles, although the range of human sound vibrations varies from 200 to 2,200 cycles. Extensive experiments have so definitely verified this fact, that telephone receivers are all made to have, or give, the maximum response at about 870 cycles. A radio receiver made for voice reception should not only give the maximum response at that frequency, but, also, be capable of reproducing the higher-voice frequencies with the minimum amount of distortion. In addition, a good pair of phones must use good steel in its magnetic circuit in order to keep the magnetic energy losses as low as possible.

Regarding the basic facts that amateurs commonly abuse: Vacuum tubes are delicate, scientific instruments and their behavior, or characteristics, vary greatly according to the type of the tube—and the manufacturer. We may list tubes, first, according to hardness; and, second, according to make. A care-

Aerial Atop Clothesline Pole



Novel aerial erected by J. O. Walsh, Bayonne, New Jersey.

IN response to RADIO WORLD's call to amateurs and fans to send in for publication any radio stunt, experiment, or hook-up they may have found useful and which they would like to share with others, J. O. Walsh, 10 West 16th Street, Bayonne, New Jersey, contributes a photograph of his loop aerial set on top of a clothesline pole. Mr. Walsh states that he is "getting good work" from WEAJ, WJZ and WOR on a small outfit which cost only \$12.

Too Much Tuning

By Jack Turner

Radio Editor, "The Age-Herald," Birmingham, Ala.

MANY who listen in on the broadcast programs have a habit of changing from one station to another. The following is about the way it comes out of the loud-speaker when the "tuning hound" is "at the wheel":

"This is WWJ, the radiophone broadcasting station of the," — "Island where Robinson Crusoe and his good man, Friday, stayed." — "The first selection from the Fort Worth Star-Telegram," — "located in Cincinnati, Ohio," — "will be a vocal solo," — "played by Paul Whiteman and his orchestra." — "The radiophone broadcasting station of the Sweeney" — "School of Chiropractic," — "Jefferson City, Missouri," — "will next entertain the little listeners with a bedtime story. Now all you little boys, and all you little girls, too. To-night, I am going to tell you about," — "Senoras y caballeros. Fatima dietes malachrino portina ramases La Entrado nurica. Este es Habana, Cuba." — "Absolutely, Mr. Gallagher; positively, Mr. Shean!" — "The whole congregation

will now please stand and sing Hymn No. 294," — "Kiss Mamma, Kiss Papa." — "The service will be continued by reading the scripture," — "McNoot is groggy. The battle won't last much longer at this rate. He goes down for the count! One-two-three-four-five-six-seven-eight-nine," — "Ten o'clock, Central Standard time." — "The final results are," — "lost and any reports on this car will be greatly appreciated." — "As it is now," — "Three o'clock in the morning," — "We will relay the Arlington time signal." — "We take pleasure in introducing to our unseen audience Mr. Bluelaw. He will speak representing the Anti-Dance League. Mr. Bluelaw, ladies and gentlemen," — "The next number by The Jelly Jazz Hounds' Orchestra will be, 'Nobody Lied.'" — "The market reports as given us by the," — "Woman's Aid Society of this city, are as follows," — "Shelby County. A still was captured here to-day, after a hard battle between the," — "Ministers here." — "The next number from the Milwaukee station will

(Continued from preceding page)
fully designed radio-circuit may function wonderfully with a Radiotron of the U-V 200 type and still the performance of the same circuit with another make of tube might be very disappointing. You can not take a circuit that is designed for a hard tube and expect it to function perfectly with a soft tube even of the same manufacture. Amateurs in general think that a vacuum tube is a vacuum tube and that classification is unnecessary. Some, no doubt, go a step further and class them as soft, medium, and hard; but, few take the trouble to actually differentiate between the relative advantages and disadvantages of certain makes in various circuits.

The recent release of the WD-11 tube for general amateur work will cause many manufacturers to use it in circuits where it cannot be advantageously applied. The fact that it is lighted from a small dry cell is a most advantageous asset; but there are other points to be considered before its application. From recent laboratory reports it does not function very well in radio-frequency and superregenerative circuits, but it is very satisfactory in the average simple, or regenerative,

receiver. Before using any tube in your circuit be sure that is the most efficient for that type of circuit. Many mediocre results obtained are blamed on sets and circuits, where the real blame should be placed on the employment of the wrong type of vacuum bulb.

It is a good plan to be logical, scientific, and consistent. One of the most inconsistent practices is the use of heavy insulators on the antennae supports, but the lead-in wire is allowed to rub, or touch, the roof and the sides of the house without any insulation. Another bad practice is that of poorly grounding a set on a radiator. A good ground is often more essential to reception than an aerial. Another mistake is the belief that a double-wire aerial 50 feet long is equal to a single-wire aerial 100 feet long. The latter is far more efficient. It is well for the novice to try out aerials of different lengths. Sometimes very startling results may be obtained by lengthening and shortening an aerial. With a short aerial, it is generally much more difficult to tune. You will soon find that by experimenting that many items that you had hitherto regarded as very commonplace mean an efficient outfit.

be a solo, 'Drink to Me Only With Thine Eyes.'" — "Dah Dee Dah Dee, Dah Dah Dee Dah." — "As the professor has promised to make a speech," — "We will sign off." — "Good Night!"

Radio Plays Leading Part in Municipal Work



(C. World Wide Photos)

Bird S. Coler, photographed above, Commissioner of Public Welfare of New York City, found it necessary to raise funds for the needy of the metropolis. The "drive" had to be made quickly. Methods used in previous years were not only antiquated but did not promise satisfactory results. So Mr. Coler turned to radio. He broadcast his appeal from WHN, Ridgewood, Borough of Brooklyn. Mr. Coler is speaking into the microphone. Mr. Coler illustrates the proper method of talking into a radio microphone. Stand in a perfectly natural position and speak at the device; not directly into it, as if telephoning.

The Radio Primer

*For Thousands of Beginners Who
Are Coming into Radio Circles*

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

WHAT is the function of an antenna?

To radiate energy in the form of electromagnetic waves, or to absorb part of the energy radiated from a distant transmitter.

* * *

Name two types of aerials in common use.

The inverted L and the T aerial.

* * *

What general effect has the height of an aerial on the range of a station?

Usually the higher the aerial the greater the range. This does not apply in all cases.

* * *

Define the fundamental wave length of an aerial.

The wave radiated by an oscillatory circuit consisting of merely an aerial and ground is called the natural wave length.

* * *

What will be the effect on the range of the station if the insulation of an aerial is poor?

If an aerial is not efficiently insulated it considerably decreases the range of the station, if it does not render it entirely inoperative.

* * *

What is the function of a loose-coupler in a receiver?

The loose-coupler in a receiving circuit provides a means of tuning the open and closed circuits; also a means of transferring the energy from the antenna circuit to the local detector-circuit.

* * *

What is the effect of tightening the coupling in a receiving circuit?

It makes the circuit responsive to a wide range of wave lengths without delicate adjustment of the tuning elements because it increases the damping of the receiving circuit.

* * *

What is the advantage of having the coupling of a receiving transformer variable?

It enables one to tune his receiver "sharply," thereby eliminating interference from undesired stations. This is due to the fact that each transmitter has a different degree of damping.

* * *

How could signals be received the wave length of which is shorter than

the natural wave length of the receiving antenna?

By inserting a variable condenser in series with the antenna circuit.

* * *

What is the use of a variable condenser in parallel with the secondary of a receiving transformer?

The variable condenser in shunt (parallel) of the secondary of the receiving set serves to add capacity to the circuit and permits a finer degree of tuning of the secondary circuit than could be obtained by only varying the value of the inductance or the coupling.

* * *

Why are the windings of head telephones of high resistance?

The magnetizing force of any current-carrying coil depends on the number of ampere turns. Thus, to get the loudest response in a phone from very weak currents, it is necessary to use hundreds of turns of wire. Due to the fact that the coils cannot take up much space very fine wire is used. As we know, the smaller the size of the wire the greater the resistance. This accounts for the fact that all sensitive telephones are of very high resistance. Remember that it is not the resistance of the telephones that account for their sensitiveness, but the great number of ampere turns wound on the spools, which make the resistance high.

* * *

What are the names of some of the more common crystal detectors?

Galena, Silicon, Perikon, Ferron, Cersite.

* * *

How do you adjust a crystal detector to its maximum degree of sensitiveness?

Set the test buzzer into operation and alternately place the cat whisker on various points of the crystal's surface until the loudest response is given in the telephones.

* * *

What is the purpose of a crystal detector in a receiving circuit?

A crystal detector is used to convert the incoming radio-frequency into a direct current that is audible in the telephone receivers by only allowing the current to flow in one direction through the circuit.

Why Multilayer Coils Are Used in Radio Work

IN radio apparatus, coils of more than one layer, or multiple-layer coils, are frequently used, particularly when it is desired to obtain a coil of comparatively large inductance in a small space. Multilayer coils are also used in many other fields of electrical work. A simple form of multilayer coil is wound layer on layer in a channel of rectangular cross section. Coils of this type are useful in low-frequency work. Multilayer coils of this simple type, however, have a very considerable capacity between layers and are, therefore, not suitable for radio work in which the capacity of coils must be kept low. To reduce this capacity, means must be found either to reduce the potential between adjacent turns in different layers or to increase the distance between layers. The first method is employed in coils prepared with a banked winding, in which the wire is so carried as to achieve the winding of several layers simultaneously. For the method of increasing the distance between layers it is found that a small separation between wires brings about a very appreciable reduction of capacity, but beyond a moderate separation little is gained. In one type of coil adjacent layers are separated by thin pieces of insulation of perhaps 1 or 2 millimeters in thickness. In a type of coil known as "honeycomb" the wire is carried diagonally back and forth across the cross section while it is being wound, with the result that wires which run parallel to one another are separated by at least twice the diameter of the covered wire. In the design of electrical apparatus, and particularly radio apparatus, it is important to be able to calculate the inductance of the various types of multilayer coils.

Formulas for the inductance of simple types of multilayer coils have been derived by a number of scientists. It is also found that for the bank-wound, "honeycomb," and similar low-capacity windings used in radio work the same formulas apply as for a simple circular coil of rectangular cross section, provided that an appropriate correction be made for the space occupied by the insulation. The formulas are, however, complicated, and for any given case the necessary computation is tedious. Furthermore, there are a number of different formulas, some of which are most accurate for short coils, others for long coils or other particular types of coils, so that the engineer may find it difficult to select the formula which is best suited to his particular problem. If many calculations have to be made, some means of reducing the labor of computation and avoiding the difficulty of selecting the most suitable formula is a practical necessity.

Such aids which have, heretofore, appeared have taken the form of a single empirical formula to cover the whole range of types of coils or of charts from which the inductance, or some function simply related to the inductance, can be interpolated. These methods do not allow of any accuracy greater than about 1 per cent at best, and in some instances the curves have been based upon unsuitable formulas and give only a rough degree of accuracy.

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New American Radio Station Will Operate to Southward

By *W. R. Service*

ANOTHER ethereal link is being forged into the chain of radio stations on the coasts of the United States connecting this country with foreign lands. The new link will couple the United States with South America, the West Indies, and shipping in the South Atlantic Ocean, a section of the world not in direct contact with American stations, until recently, but where radio is rapidly expanding.

Arrangements have just been made by the Tropical Radio Company for the purchase of land and the erection of a powerful radiotelegraph station at Hialeah, near Miami, Florida. Within about 18 months, Mr. G. M. Davis, of the radio company, promises the public the use of one of the largest radio stations in this country, the estimated cost of which is approximately \$200,000. Later on, Hialeah will also be equipped with radiophone apparatus.

Already the company is handling radio business off the coast, operating on 3 kilowatts from the old Marconi Station at Miami Beach, recently leased from the Navy Department, and licensed WAX by the Department of Commerce a few days ago. The location of the station on the long arm of Florida, which projects several hundred miles farther towards the southern continent than any other point in the States, is believed an ideal location of handling radio traffic in that direction.

Hialeah's Equipment the Latest

Situated on a plot of ground covering 90 acres, two 437-foot transmitting towers, located about 1,000 feet apart, will soon be erected to hold aloft the great transmitting aerials. Apparatus of the latest type, including the new Langmuir 200-kilowatt tubes, is being built by the General Electric Company.

To avoid interference, the receiving apparatus will be located in a building five or six miles from the transmitting plant. Three antennae, reaching out in different directions from half a mile to two and a half miles in length, will be erected to catch the long-distance messages from the South. These receiving aerials are of the low-lying type, being erected on forty-foot poles. In the receiving station itself, sev-

eral Pickard loops to aid operators in reception and eliminate directional interference, will be installed. Operation at the station is to be under the direction of R. G. Mackenzie, who will have a crew of about twelve men.

Scope of Traffic and Extension

Prospects for traffic with Central American and far distant Southern stations are good. The United Fruit Company is now building radio stations in practically all South American countries. A week ago, their new station at Tegucigalpa, Honduras, established radio communication for the first time with the

United States with a message to President Harding. Next year, another large station at Nicaragua will be opened, it is reported.

Within a year, the United Fruit Company's ships will be equipped with radiotelephone apparatus as well as telegraph sets. Recently radio engineers of the company succeeded in telephoning by radio between their New Orleans station and a station at Almirante, Panama. Regular radiotelegraphic communication has been maintained between this country and stations in Central America since 1904, but it was eighteen years before a radiotelephone message was transmitted.

Extension Teaching by Radio

National Radio Chamber of Commerce Asks Educational Institutions to Co-operate in a Working Plan

By *Tresham D. Gregg*

Of Gregg & Gregg, Engineers and Managers, National Radio Chamber of Commerce

THE importance of radio broadcasting as a means of reaching a large number of people in the United States, otherwise inaccessible, is being forced home to us every day. There are, in the United States, almost 1,500,000 radio receivers, representing between three and four million radio listeners located within comfortable range of the speaker's voice of one of six hundred broadcasting stations—that is, stations equipped to send out telephonic communications. These listeners are for the most part youthful—of school and college age. Their number is rapidly increasing and will undoubtedly, within a very few years, total many millions of radio listeners.

The National Radio Chamber of Commerce appreciates the tremendous potentialities of this new channel of communication in the field of education and desires in some practical way to support colleges and universities in extending their influence through radio-extension courses to these listeners, a large proportion of whom would not otherwise be reached. Several prominent institutions of learning in the United States have made a beginning in this direction, and their reports of the encouraging success attending their efforts indicate that the possibilities of the new method are not underestimated.

Sixty other educational institutions are broadcasting educational and musical programs, forty-seven of them being colleges and universities. The combined area nominally covered by these institutions has been estimated to be seven or eight times the total area of the United States.

England and Germany have quickly grasped the significance of radiotelephony as a

means of educational contact, and preparations are being made to broadcast university extension courses in those countries.

Extension lectures may be broadcast from the college or university without interfering in any way with the local audience in the school. It is not now necessary that the school have its own broadcasting station. It may use a powerful central station, nearby, connected by the microphone in the lecture room. In some instances, the lectures are being followed up by questionnaires and suggested reading which are mailed to the listeners on request, examination sheets following at the end of the course.

The pioneers are already active in the field and the situation seems to indicate not only individual but concerted action on the part of schools of recognized standing to take advantage of this wonderful opportunity.

There are, however, a great many intricate problems connected with the subject of broadcasting which the National Radio Chamber of Commerce hopes to see solved within a comparatively short time. These problems have an intimate connection with the success of any considerable program of educational extension by radio.

The engineers of the National Radio Chamber of Commerce have collected much data which it will cheerfully place at the disposal of those educational institutions interested. It will be glad to render every possible assistance to them in reaching a clear understanding of the situation as its only interest in the radio field is to see that radio broadcasting assumes, in the course of its evolution, a sound economic position of the greatest possible usefulness.

Urges Enactment of Radio Bill

Secretary Hoover, After Working Out Many National Problems, Starts in Earnest to Clear the Ether of Radio Interference

WASHINGTON, D. C.—Herbert R. Hoover, Secretary of Commerce, is ready to start serious consideration by Congress of the pending radio legislation. Literally, the final passage of the White Bill, seeking to relocate radio waves, minimize interference and provide for the adequate regulation of national radio transmission, will be acclaimed by every amateur.

The bills presented in both the Senate and House last June lay dormant at the Capitol until Secretary Hoover returned from a protracted trip to the West Coast where he was busy with another national project. Immediately upon his return, he took up the question of the desired radio legislation with Representative W. H. White, Jr., of Maine, the House champion of radio, and author of the White Bill, with the result that it has been announced that hearings will start be-

By Carl H. Butman

fore the House Merchant Marine and Fisheries Committee without further delay.

Public Hearings on White Bill

Action is confined to the White Bill, designated as HR-11,964. Hearings will be presided over by Representative W. S. Greene of Massachusetts, chairman of the committee, assisted by Mr. White, who is chairman of the subcommittee on radio. The general public is invited to the hearing, and representatives of amateurs, manufacturers, commercial companies, broadcasters and even listeners-in are invited to appear with recommendations or objections to the proposed law. Secretary Hoover will be present, accompanied by his radio aides, and some Naval experts also plan to attend. The principal recommenda-

tions of the radio conference are incorporated in the present bill, but the public is now given an opportunity for a last word.

Bill Aims to Aid Radio Development

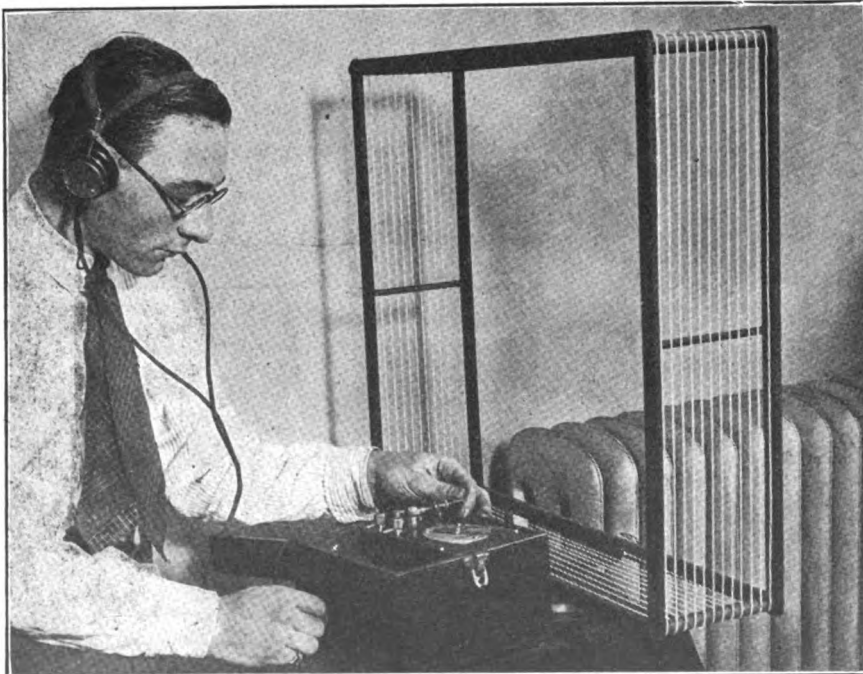
In general, the bill is intended to make for the future development of radio in this country on a purely American basis. It is planned also to clothe the Secretary of Commerce with sufficient authority that he may control the expansion, operation, licensing, and revocation of licenses. A redistribution of wave bands is scheduled in an effort to clear the radio "atmosphere" of unnecessary interference. Among the provisions of the bill is the granting of authority to the Secretary of Commerce to classify transmission stations, designate the service, and assign wave bands.

More definite regulatory powers for the Secretary of Commerce are also sought, especially with regard to decreasing interference. Whether or not licenses must be issued regardless of that officer's discretion is also to be decided. The existing law of 1912 is silent on many phases of the duties developing upon the Department of Commerce to-day, with thousands of stations in operation; neither are time limits for the duration of licenses specified. Governmental authority is doubtful where the revocation of licenses is concerned but the new bill grants such power to the Secretary.

Legislation Does Not Affect Receiving

No regulations are planned for receiving stations, the whole bill being devoted to the transmission of all radio messages and broadcasts. The status of the amateur and the listener-in established by the present law is left unchanged, except that the rights of the amateur are extended and additional wave lengths are assigned for his use. Much is left to the discretion of the head of the Commerce Department, as it is believed that radio has a future which may be jeopardized if too stringent and detailed regulations are enacted into a law. Regulations believed just and necessary to-day, under some circumstances, might prove a handicap to the natural development of radio within a space of a few months and hence broad powers are planned for the Secretary of Commerce and his advisory committee of twelve members.

Hears Pittsburgh and Schenectady on Crystal Set Using a Loop Aerial



(C. Kadel & Herbert)

Doesn't it make you sad when, after paying a big price for a radio set, you find that you can hear only the local stations? Then you hear of a radio fan with a cheap crystal set who picks up the distant stations. It sure does! But when you hear that this same fan gets these results on his crystal set with a loop aerial, you get a real thrill! Maurice Wald tried a loop aerial on his crystal set to see what would happen, and found that he could pick up Pittsburgh and Schenectady. The fact that his home is located on one of the highest pieces of ground on Manhattan Island probably accounts for his unusual results. The photograph shows Maurice Wald with his crystal set and loop aerial.

New and Unusual Circuit for Radio Experimenters

By C. White, Consulting Engineer

IT is a general belief that we must have some very definite means of coupling to make a vacuum tube oscillate; but such is not always the case. In the strict theoretical sense of the word, "coupling," we must have some method of accomplishing this; but so far as the physical aspect of the circuit is concerned, we can make a tube oscillate with apparently no method of coupling. This trick in the circuit illustrated herewith lies in the fact that, at a casual glance, the eye is deceived in observing that quite a new idea is presented. For those of my readers who are quite experimentally inclined, I heartily recommend this circuit for testing purposes; for, no doubt, they will be very much surprised at the ease with which it will oscillate once the correct value of grid leak and grid-leak condenser is found.

The correct constants for the grid leak and its condenser, naturally, are solely dependent on the characteristics of the tube used. With a soft tube more trouble will be encountered than with a hard tube, owing to the fact that the former is frequently quite erratic when used in a circuit of this nature.

Analyze this circuit in detail and see wherein it differs from the ordinary. So far as the tuning element is concerned, it is nothing more than a single-circuit tuner, consisting of a honeycomb coil whose size depends upon the desired wave-length reception, and common 23-plate air variable-condenser. The detecting circuit is, however, rather different from the ordinary circuit used with the single-circuit tuner in that the grid and filament of the tube are placed across the condenser instead of the tuning inductance. But this is perfectly permissible since there is a voltage across both when the signal current of the incoming wave is passing in the antennae ground-circuit. It will be noted that the grid leak is not shunted around the grid-leak condenser as usual, but is placed directly from grid to filament. The reason for this is that since we are taking our voltage across the 23-plate condenser instead of the honeycomb coil, the resistance of the condenser is very large in comparison to that of the leak, hence the total resistance of the actual

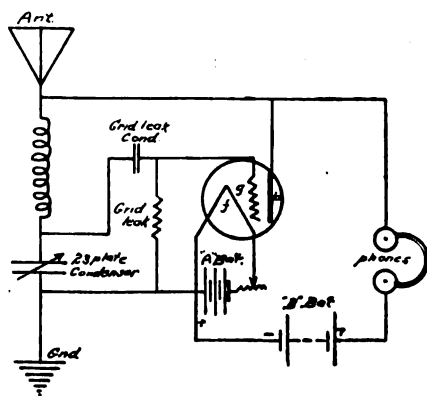


Figure 1—Hook-up of the circuit described by Mr. C. White in the accompanying article.

path from the grid to the filament would be many times that of the leak resistance inserted. By placing the leak, as shown, the resistance of the leak path is just about the same as that of the leak used provided perfect condensers are employed—that is, condensers that have a very high leakage resistance.

The phone circuit is in no way different from the ordinary nonregenerative plate-filament circuit. Up to this point, there is really no radical departure from that of an ordinary simple single nonregenerative receiver; but the connection from the plate to the top inductance terminal is quite out of the usual. This connection affords a by-pass for current to the grid and the filament; and by the choice of the right

size capacity for the grid leak, the coupling between the grid and the plate may be adjusted, electrostatically, to the correct value to make the tube oscillate within the desired range. Although this circuit, on first sight, seems to have no method of coupling, on careful analysis it obtains its coupling by the employment of the tuning inductance for a double purpose.

When carefully made and adjusted, this circuit represents one of the most inexpensive single circuits, using a vacuum tube, that can be constructed. Since it will oscillate with ease over its entire scale when once adjusted, it is a very efficient receiver for C-W work. But, owing to the nature of the adjustments that must be first made, I do not recommend this circuit to the novice with little or no experience in constructing oscillatory circuits. For the radio experimenter, this hook-up will prove to be very interesting. A good method of finding the right size grid-leak condenser is to insert a number of small mica condensers in parallel until the right amount of capacity is obtained. The grid leak resistance may be found by drawing a few lines with lead pencil over a strip of paper between the two terminal points or by employing any other of the well-known modifications of this method. Perhaps with a little care and experimenting, a very efficient circuit may be developed readily from this one.

Seven New Broadcasters

DURING the past week, the Department of Commerce licensed seven radio stations for broadcasting on 360 meters. The new stations are:

- WPAS—J. & M. Electric Co., Amsterdam, N. Y.
- WPAP—Theodore D. Phillips, Winchester, Ky.
- WPAQ—General Sales & Engineering Co., Frostburg, Md.
- WPAU—Concordia College, Moorhead, Minn.
- WWAD—Wright & Wright, Inc., Philadelphia.
- KFEP—Radio Equipment Co., Denver, Colo.
- KFHJ—Fallon Co., Santa Barbara, Calif.

"Courier-Journal" Returns to 360 Meters

ONE big broadcasting station after trying out the Class-B license on 400 meters for a short time, has returned

to the 360-wave. The Department of Commerce has just relicensed WHAS, "The Courier-Journal," Louisville, Kentucky, on 360 meters. This publication believes the 360-meter wave is better suited for its broadcasting, and more popular with the fans.

Radio Gives Mariners Aid

THE Mexican Government inaugurated a new broadcasting service for mariners on November 1. The service comprises the picking up and rebroadcasting of notices to mariners emanating from radio stations in America, Cuba, and vessels within their zone, by six Mexican stations on both the Pacific and Gulf Coasts.

Scheveningen Radio Station

THE Government of the Netherlands is enlarging the present radio station at Scheveningen, which soon will be ready for operation. It is designed to communicate with all parts of Europe.

Radiograms

The Latest Important Radio News Briefly Told for the Growing Army of Radio Fans

THE inauguration of an ocean radio-letter service on United States Shipping Board vessels is announced. Messages from a ship bound in one direction are to be transmitted by radio to a ship bound in another direction, for mailing, when the receiving ship arrives at her destination. The rate for this service will be \$1.20 for twenty words, including registration. Each additional word will cost four cents. Messages are limited to 100 words.

Radio has ended the isolation of one of the most lonely, if most beautiful, spots on earth. Pitcairn Island, storied spot in the South Sea Islands, whose residents have been forced to depend on news brought by occasional ships, has a complete radio plant. Visitors to the island, it is reported, brought a set with them, sold it to the natives, and taught a number of the young islanders radio reception and the Morse Code.

Beginning December 20 weather broadcasts now transmitted from the United States naval radio station at Miami, Fla., were transferred to the naval station at Jupiter, Fla. (NAJ). The weather will be broadcasted at 11:30 a. m. and 6 p. m. (seventy-fifth meridian time). Hurricane warnings will be broadcasted when issued and repeated at two-hour intervals until midnight. The transmission will be by spark on a wave length of 1,688 meters.

David Lloyd George, former Prime Minister of Great Britain, recently journeyed to Algeciras, Morocco, for a rest. Be that

as it may, his first request was for a powerful radio-receiving set so he could keep in touch with European capitals.

Call letters KFOG have been assigned to all ice patrol vessels of the North Atlantic International Ice Patrol. Any vessel desiring to communicate with the vessel on patrol regarding conditions in the ice fields should use the above-mentioned signal.

Experimental stations should, as far as possible, avoid using a radiating antenna for testing while other stations in the vicinity, including broadcasting stations, are operating. The early morning hours are probably best suited for testing.

The amateur radio station operated by Leon Deloy, at Nice, France, has been heard by Gene E. Witham, of Brooklyn. This is the first French amateur station heard by American amateurs. Gene E. Witham, of 126 Eighth-sixth street, Brooklyn, said that he was listening in on his wireless about 9:30 December 27 when he heard the word "test" repeated several times. It came in faintly in the Morse Code. There followed several French words which he could not understand. The sender then signed off with "8AB." Realizing that this was the signature of the night operator at Nice, France, Witham immediately sent a night letter to the American Radio Relay League at Hartford, telling of his experience. Witham is sixteen years old, and is a student at the Stuyvesant High School. He has a single-bulb detector instrument.

Radio Installed Patrol Wagon of Philadelphia Police



(C. P. & A. Photos) Interior of the Radio-Equipped Police Truck

THE Philadelphia Police Department patrol-wagons keep in constant touch with headquarters by radio. Some time ago, this idea was tried out in the City of Brotherly Love, and it was such a success that now all the patrol wagons are equipped with sets. By referring to the photograph the actual installation may be seen. It is both a transmitter and receiver. Lieutenant Harry Edwards is photographed at the set. The set is operated on a loop installed on the top.

This opens an entirely new field for radio, and it is only a matter of time when all police trucks in the large cities will be equipped with radio sets as shown in the photo. Owing to the fact that the sets are worked from a loop antenna, it is claimed that they are extremely directional and several incidents have been cited where people operating transmitters without licenses have been detected and, after considerable maneuvering, located. One may well ask how a set such as this manages to get sufficient current to operate a transmitter on a loop and which must, of necessity, have a very low wave-length and, necessarily, low power. But when it is remembered that the receiving station on each, as well as that at the central station, are extremely sensitive, it does not take very much to convince even the most sceptical that this is a most practical device.

Radio and the Woman

Crystal D. Tector Gives Her Views on the Exposition and Adds a Few Words About Radio's First Year

WELL, will wonders never cease? I was never so surprised in all my life as the other day. I was shopping and decided that I needed a new pair of shoes. Imagine my surprise when the salesman asked me if I had seen the "Radio Boot."

"My goodness! Have they shoes with radio sets in them now," I murmured.

"Oh, no!" replied the salesman. "That just signifies that it goes on and off in a flash, and right over your other shoes. You see, they're overshoes."

I wonder when they will cease to call every new thing that they bring out on the market "Radio." It is trying to think of other things when they are always flaunting the name "Radio" before your eyes.

* * *

EVEN in this age of enlightenment and daily newspapers some people never catch up with the times. A friend of mine was city-bound one day last week, and, as I had a slight headache, I asked her if she would get me a bulb, not thinking for a moment that she didn't know. Later in the afternoon she stopped in—And imagine what she brought me—a Chinese water-lily bulb.

* * *

FRRIEND HUSBAND gave me the most delightful two-step amplifier for Christmas, and I gave him six of the loveliest lace "hankies." Nothing like husband and wife knowing what to give each other for presents, is there?

* * *

A YEAR ago, when radio first started to boom, there were certain people that said, "Oh, it's just another fad! It will soon die out, and then a lot of people will be out a lot of money spent on expensive apparatus.

Instead of that, radio turned from a popular fad into a public service. It is going all the time—and unless you have the apparatus to receive it you will never know that it exists.

A great many prominent people have expensive radio sets installed in their homes, on their yachts, in their hunting lodges, in fact, any place where they want to keep in constant touch with the world. Many big business men have even gone so far as to have sets installed in their offices and employ expert operators to keep them in touch with the latest news.

How long before various branches of large business will carry on communication from city to city by radio is only a matter of time. Then will radio be one of the most important factors in business as well as private life.

Think of the many invalids whose lives are brightened through the agency of radio. Also the many men and women who are isolated on lighthouses and fire-stations throughout the land, who suffered for want of something to keep their minds active, but now are kept in touch with the outside world.

* * *

DID it ever occur to some of you when listening in that the man doing relay work with a spark set is doing it for your benefit? Many a man who, years ago, used to carry groceries after school to earn money to buy some new apparatus for his set, now writes R.E., or E.E., after his name. A number of them hold responsible executive positions with radio corporations. If one of these men interferes with you when you are listening in to a radio concert, see if you can't get your set to tune sharper before laying the blame on him.

* * *

LIKE a dutiful radio fan, Friend Husband took me to the American Radio Exposition. Those who didn't go will never know what they missed. The show was simply marvelous. The only unpleasantness I encountered was that F. H. was tired and impatient. Even the fact that they had a set of ivory and gold couldn't remove the grouch that had encompassed him.

I never saw such a wonderful display of simply marvelous apparatus. There were sets and sets and sets and sets. And one was more wonderful than the other, until you wondered where they would stop. There was a set so large that it would fill an entire room, and there was a set so small that you could carry it around in your vest pocket. There were sets that needed no aerial or ground—not even a loop.

I mustn't forget the wonderful program they broadcast there from WEAF. I haven't ceased wondering yet how it was possible to fill that entire hall with music. Just think of all the power amplifiers that were necessary. You could even hear the announcer's breath. It sounded like the north wind southing through the trees. And when he spoke—well, his voice just filled every corner of that wonderful building.

AND not only that, girls, but you should have seen the styles at the exposition. Friend Husband made the remark that he thought they had combined a fashion show in radio along with a fashion show for women; but, even at that, all the fashions in the world couldn't keep me any busier than I was looking at the different sets. One manufacturer, seeing me standing outside his gate, kindly invited me in and explained in detail just why all the people owning radio sets should use storage B batteries. I never met a more pleasant man in all my life, but F. H. says that he took me for a "hick" and wanted to sell me something.

* * *

ONE little incident that I carried away with me will remain in my memory for a long, long time. There was a little, thin youngster, who had worked his way through the crowd surrounding the large motor-truck that housed the speech-amplifying apparatus, which made it possible to broadcast the program from the exposition. He was looking up at the man working the instrument with longing eyes, and trying to keep his place in the eager, pushing, milling crowd. The operator looked down and, noticing that mite of a boy in the crowd, so interested that he did not seem to give attention to anything but the operator, called the youngster up to the truck platform.

"Whatcha want? I ain't done nuthin!" said the youngster, starting to back away.

"No, come on up here and I'll let you see how it works," the operator explained.

The youngster beamed like the sun, and walked up the ladder as if in a trance. The operator explained to him that this apparatus made it possible for this little boy to hear the speakers over the wireless. The delight written all over that boy's face will remain in my memory for many a day.

My Picture for This Week

By Crystal D. Tector



(C. International News)

I CHOSE this picture to illustrate my page this week, for two reasons: First because it is so extremely true to life; and, secondly, because it is the little daughter of a very dear friend of mine. The expression of rapt interest on the child's face is alluring, because, when photographed, she was so interested in the bedtime stories that she did not notice the camera. The set that is used is one of the newest things in radio. It operates on a small inside loop-aerial. My friend discarded his old set in favor of the new one because of that fact and, also, because the tuning is so simplified that his little daughter can easily handle it. It seems to me that loop sets are coming more and more into vogue. To my mind it is only a question of a short time when the outside antenna will be entirely discarded in favor of the loop which has proved so much easier to install and handle.

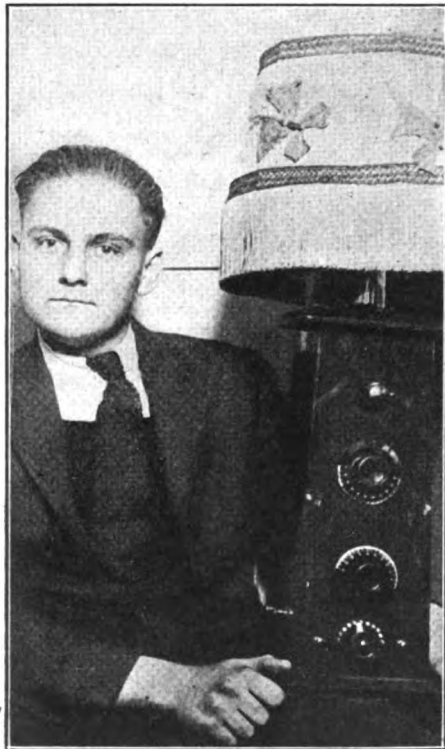
American Radio Exposition

IN a recent address before the New York Electrical Society, David Saranoff, vice-president and general manager of the Radio Corporation of America, made the following pertinent statements:

"Commercially speaking, radio is but some two years old, but in this brief span of time it has earned for itself, and properly so, the right to be termed an industry."

"Radio in its primary phase was a means of communication through technically trained men—radio operators. Then radio entered the home through wireless telephony, serving the entire family with entertainment, cultural, and other information. Its next application, I believe, will be to the individual."

These are the utterances of a man who knows radio. And they were exemplified to the last degree in the American Radio Exposition which closed its first successful event at the Grand Central Palace,



(C. Photonews, N. Y.)

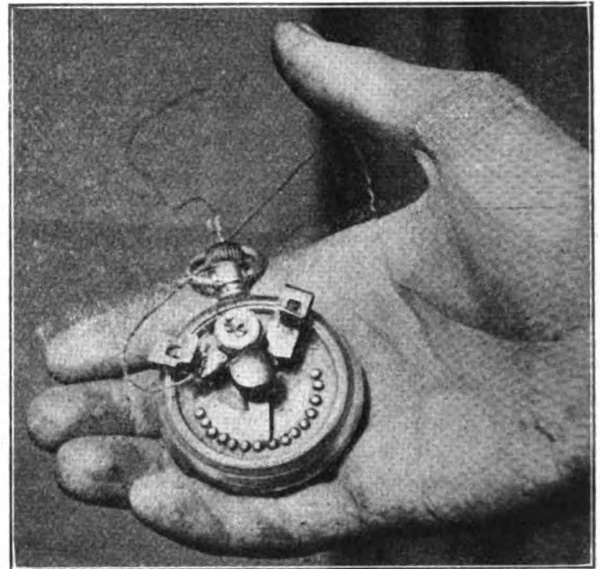
William Johnson, fourteen-year-old radioist, and his "radio lamp," which was one of the attractions of the exposition.

New York, at midnight on December 30. The old year went out in a blaze of hilarity, good feeling, and prolonged wishes for the success of the world's husky baby industry.

The show was a grand success. That fact was established soon after the doors opened to receive the thousands of interested spectators, many of whom had traveled from distant cities to see the latest and best in radio development.

The many new things were alluring. Craned necks and bulging eyes attested their attractiveness. It is hard for a writer whose space is limited to describe everything as fully as he wishes. For instance, there was a demonstration of the "talking movies," that marvel for which all "movie" fans are waiting. This film, which shows the operation of the vacuum tube, was accompanied by a talk

The photograph at the right illustrates one of the interesting amateur exhibits at the American Radio Exposition. The entire set is self-contained in an ordinary watchcase. The inductance is variable, as is shown in the photograph, by a 15-point switch. The inductance is wound on a piece of fiber fitted inside the watch, and has a wave range of 1500 meters. A range of 75 miles is claimed with this small set, using an outside antenna. This illustrates the ingenuity of various amateurs all over the country. The builder wanted a set that could be carried any place without the inconvenience that usually accompanies a larger set, so, as he says, "I just went ahead and made one out of my Ingersoll." An ordinary pair of headphones actually dwarf the set to insignificance.



explaining the tube's action recorded on a phonograph record. The reproduction of the record is kept in step with the picture on the screen by a very ingenious synchronizing device.

The talk was prepared by a Western Electric Company engineer and delivered into a high-quality transmitter, or microphone, while the film was being shown. The speaker's voice was amplified by vacuum tubes before being recorded. This resulted in the voice being reproduced in the fullest detail. The sensation on the hearer is thrilling. The voice reproduction is so natural that many people refused to believe that the demonstrator himself was not doing the talking.

Paul F. Godley, was an interesting figure when he talked on "The Present Outlook for Radio Art." He was personally introduced to the audience by Major Edwin E. Armstrong, inventor of the Armstrong regenerative and super-regenerative receivers. These two famous radiosts created as much enthusiasm as if they had been the President and Vice-President of the country.

The feature of the second day was a double marriage, broadcast over the United States and Canada. The ceremony took place on the mezzanine floor. Miss Helen Koller became the bride of Mr. John Brunchuezler, Miss Margaret

Girstner was married to Joseph Worn. Rev. B. F. Saxon, pastor of the Sixty-first Street Methodist Church, officiated. Both couples received a present of \$100 from the management and a wedding breakfast from the management of the exposition. One of the large exhibitors of the show made a present of the receiving set to each couple. A gentleman who asked to have his name withheld gave each bride a check in a sealed envelope.

Rudolph Valentino, the moving-picture actor, gave an interesting talk on "What Is the Matter with the Movies."

Among the many novelties were receiving sets that may be worked without operators and transmitters of high-speed messages which may be deciphered at will by the operator at the receiving end. Imagine the faint impulses of signals from France, Germany, Russia, England and Spain being put down on paper so that anyone with a knowledge of code may transcribe them! This caused people to gasp with wonder.

The amateurs had an attractive corner. Here were shown sets of amateur construction embodying ingenuity and workmanship. Imagine a complete crystal set in an ordinary bill-fold! Imagine a set being built at a total cost of 31 cents!



An example of one of the exhibits. Note the radio direction-finder in the center.

Gay With Radio Surprises

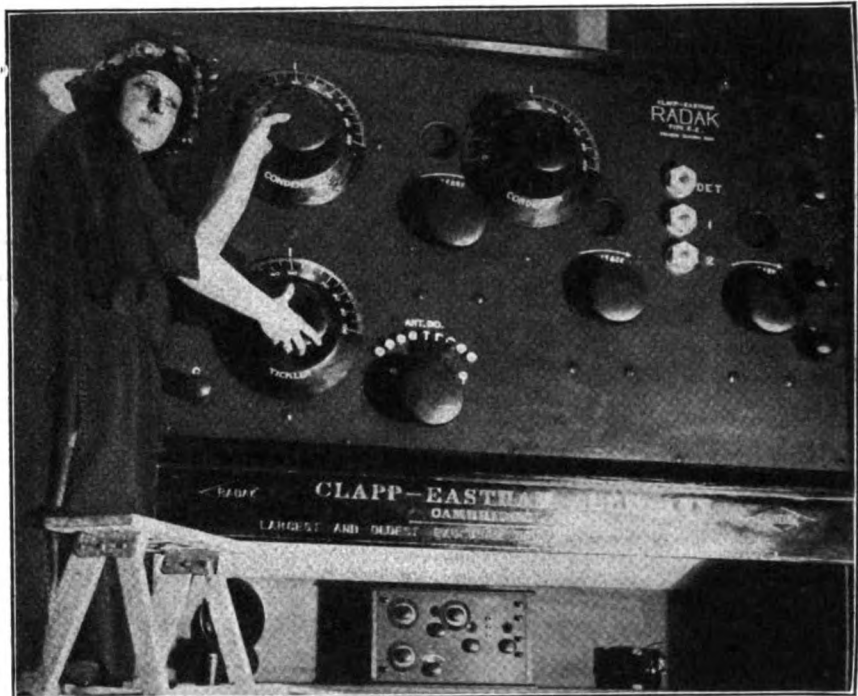
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Some of the amateur work was remarkable in construction and design. There were lamps made into radio sets with the bulbs under the shade. Radio sets in watch cases. Radio sets in cigar boxes. Radio sets in suitcases. In short, anything that seemed possible of holding a radio set was utilized in the most workmanlike fashion.

The show was in many ways, a manufacturers exhibit. Its main purpose was to put before the public the latest products and to show what first-class apparatus really is and the care taken in its manufacture. There was sets so large that one had to mount a stepladder in order to reach the controls. There were manufacturers of parts whose exhibits were chiefly to acquaint the man who constructs his own apparatus with the fact that it pays in the end to buy the best apparatus.

The Radio Mica Products Company reports the exposition a success from the point of view of consumer interests as well as dealer buying. The Micaphone mica diaphragms for radio head-sets are still among the biggest sellers in radio accessories and the new micaphone kode killer already has found popular recognition with radio amateurs. While this apparatus involves principles formerly used in commercial radio, this is the first practical embodiment of a radio-frequency wave-trap made to eliminate code when broadcast concerts are being received. Its simplicity and effectiveness appeal to both amateur and expert. On the mezzanine floor there is a standard 500 watt broadcasting set exhibited by the Western Electric Company. This particular piece of apparatus enabled visitors who had listened to programs from similar sets to have an opportunity to inspect it in detail.

Among the home-made sets were a large number built by middle-aged business and professional men.



(C. Kadel & Herbert)

When Miss Florence Beebe tuned in with this huge set, she had to stand on a stepladder. An ordinary-sized set is shown at the bottom of the photograph.

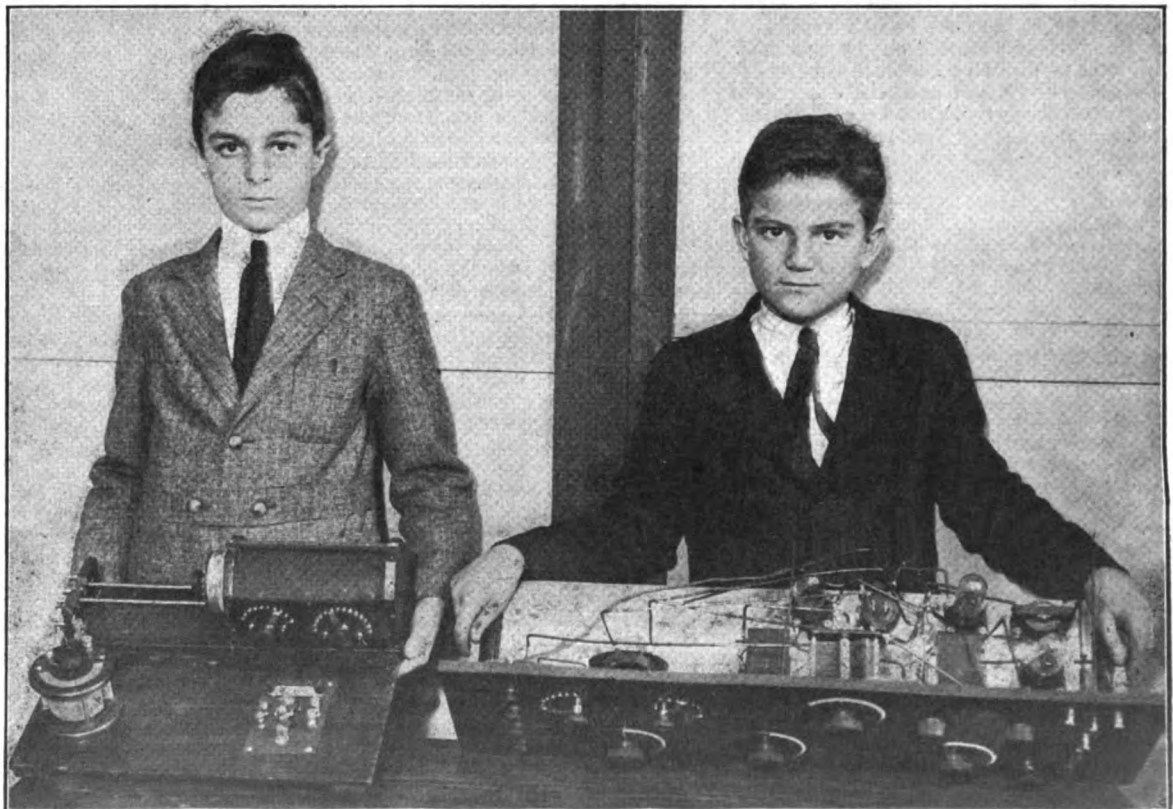
The booth that housed the automatic transmitting and receiving apparatus of the Radio Corporation of America, to receive and transmit high-speed messages across the Atlantic, was always certain to draw a crowd. The messages transmitted were typed on a special machine which perforated a paper tape. This tape was then run through the automatic sender which controlled the transmitting station. Messages were received on a machine somewhat resembling a stock

ticker, repeating the dots and dashes at the receiving end in the form of an irregular line, which was transcribed by the receiving operator on a typewriter, much the same as a stenographer transcribed shorthand. This machine made it possible to transmit messages at a speed of over 250 words a minute, to be transcribed at the leisure of the operator. If the station is tuned in, the operator could leave the set, confident that any-

(Continued on following page)

Radio sets made by boys were featured at the exposition. The two sets shown in the photograph at the right were made by the boys holding them. The set on the left is a loose-coupler type made by Aaron de Hess, aged fifteen. The set on the right is a three-circuit regenerative affair made by Richard Powers, aged thirteen. Both of these sets were entered in the prize competition. They are a fair sample of the many sets entered by boys and show a high standard of workmanship and assembling. Radio World wishes that it had space for photographs of all the wonderful sets made by boys and shown at the exposition. Many of them are truly marvelous and indicate that the younger generation is still increasing the ranks of enthusiastic radiolists.

(C. Kadel & Herbert)



With the DX Nite Owls

Hears Dallas in Kansas City

From C. A. Cole, 3614 Bellefontaine Street,
Kansas City, Missouri

ON a single-tuner regenerative receiver and one audio-frequency amplifier, I picked up WFAA, "The News," Dallas, Texas, one night last week (December 20), and heard him clearly all over the room, on a horn that I clamp on my earpieces. I wish to ask if this isn't good for a single-variometer set with a loading coil?

Good for Crystal Set

From John Martin, Saranac, New York

I HAVE been reading your wonderful weekly since it first came out. Due to the fact that I have only a crystal set, I have hesitated writing in for a DX record, but I have been doing such wonderful work during the past few weeks that I, too, am going to "get my feet wet." Below is a list of the stations copied in one evening on a set composed of 1 home-made loose-coupler, 1 variable condenser, Brandes phone, and galena detector. I listened in from 8 until 12:15 p. m.: WDAP, clear, not very loud; WGY, clear and loud; WJZ, clear and very loud; WEA, clear and very loud; WAAM,

The Editors of RADIO WORLD will be pleased to receive sketches of hook-ups of the various "DX Nite Owls" sending in records, with a view of publishing them.

Other letters from the DX "bugs" will be published from week to week.—The Editor.

indistinct but readable; WHAM, clear. I have heard several other stations nearer my home; but owing to the fact that they were nearby I did not list them. I think this very good for a crystal set.

Challenges Arthur Lindstrom

From B. L. McBride, Winchester, Tennessee

IN RADIO WORLD, No. 37, dated December 9, I noticed the record of Arthur Lindstrom, Larabee, Wisconsin. I want to congratulate him on his record, but I have one just as good: Mine was made on a home-made set, using Simplex variometers, Atwater-Kent vario-coupler, Standard transformers and G-E tubes. I have heard as far west as KHJ, Los Angeles; north to CFCA, Toronto, Canada; south to PWX, Havana, Cuba, and east to WJZ, Newark,

New Jersey. The total number of stations heard is 93 in 27 different States, one in Canada and one in Cuba.

A DX Correction

From James L. Fischer, 72 Spring Street,
Newman, Georgia

IN my DX record published in RADIO WORLD No. 36, December 2, you made a mistake. The circumference of the cage is 12 feet, not the diameter. I do not use any variable condenser. Kindly correct this. I now have a record of 102 stations outside the State of Georgia. I am hearing Porto Rico also.

Heard in Peru

From A. G. Beach, Schenectady, N. Y.

IN the far-distant harbor of Talara, Peru, 4 degrees and 30 minutes south of the equator, a radio concert broadcast on November 10 by WGY, broadcasting station of the General Electric Company, at Schenectady, New York, was clearly heard by R. H. Redlin, wireless operator of the steamship "Ardmore." This is a new distance mark for WGY—being a

(Continued on next page)

American Radio Exposition Gay With Radio Surprises

(Continued from page 17)

thing transmitted by the station would be faithfully recorded by the machine.

A device, the "wave separator," was perfected by the Crocker-Wheeler Co., one day before the exposition opened. It is claimed that this device enables a person owning a receiving set to absolutely eliminate any station but the one that he wishes to receive. A great degree of selectivity, it appears, was obtained by the use of this device.

One of the big features of the show was a huge set made by the Clapp-Eastham Co. This monstrous set was about 5 feet high and 10 feet long. In order to operate it, one had to stand on a ladder to reach the controls. It is a replica of the standard sets turned out by this company and magnified a hundred times.

Going to the other extreme, a set built into an ordinary watch was also on exhibition. It was a perfect working model. The builder claimed for it a range from 75 to 100 miles. The phones used with this set are larger than the set itself. This set is the work of an amateur, who attempted the smallest possible practical set that could be carried in a vest pocket.

A feature which attracted large crowds was a set constructed of imitation ivory with solid gold controls. A feature of this set was its absolute flexibility, made possible by the use of tiny plugs and jacks so that any arrangement of instruments might be used in any hook-up. The owner could experiment with any number of hook-ups without rehooking his set. The set demonstrated was made for the boudoir of a New York woman radioist.

There was also exhibited by the Radio Industries Co., a pair of huge phones which, when compared with the regular phones that every amateur uses, completely dwarfed them. Just to illustrate how large they were, the earcaps of these monstrous phones measured over two feet across. Heavy cable was used as cords. These phones were actual working giants—an exact replica of the regular phones manufactured by this company.

Another big feature was the Western Electric auto-truck containing the power speech amplifying apparatus. It was through the agency of this apparatus that made it possible for the hundreds of thousands of listeners all over the country to hear and enjoy the entire program of the exposition. This speech-amplifying apparatus made it possible for WEA to broadcast the program, and to permit every person in the exposition to hear the slightest whisper of the speaker or the softest note of any instrument being played.

A demonstration of how radio may be directed through walls of steel and concrete was given. It was a most remarkable performance. The inventor of the apparatus, Bernays Johnson stood behind a wall at least four feet thick and directing his voice at will through it. It is possible, according to Mr. Johnson, to place himself and his machine, which needs no aerial or ground, inside the largest steel vault in the country, in which captivity he will talk to outsiders without the slightest difficulty—metal doors and walls having no deterring effect. In his experiments, Mr. Johnson has taken his apparatus two hundred feet into a coal mine and talked through the solid walls very clearly. Mr. Johnson first made experiments on this form of radiophone in 1908 and has won many medals.

Mr. Johnson's radiophone is a radical departure from the present type phone, it being the first successful directive radiophone. It contains no elaborate motive generators or large power-tubes. Its entire motive-power is furnished by a few small dry-batteries which, in turn, actuate some unique transformers, these generating the magnetic wave. The wave is thrown out into the air in a whirling fashion and can be directed in a straight line just like a gleam of light through a search light.

With a device of this kind it is possible to selectively communicate with a countless number of stations. This remarkable radiophone not only transmits and receives the voice with uncanny clearness, but is equipped with a bell-ringing device

by which a bell rings when a "party" is desired, just like a present-day telephone. This is remarkable considering the fact that even the most elaborate radiophone stations require the receiver to keep the telephone receivers on his ears constantly while the number is being called.

A new type radio-receiving set with loud-speaker, which operates entirely by dry cells and has an equal, or better, reception range than the average two-stage set using storage batteries for the filament current, has been perfected by the General Electric Company. It was shown at the exposition for the first time by the Radio Corporation of America. This set, in an attractive mahogany cabinet, with none of the tuning or other knobs visible and with no external wiring except two silk-covered cords reaching from the rear of the cabinet to the antenna and ground, is known as the Radiola IV. It uses three of the new type G-E tubes, which consume 60 milliamperes filament current per bulb, or 6/100 of the current used by the present type UV-201 tube. The A battery, which is the storage battery in ordinary receiving sets, consists of three dry cells such as used for door-bells. These supply the filament current at 4½ volts. The B battery consists of four 22½-volt units, which supply 90 volts to the plate of the tubes. There is also a C battery, consisting of a small 3-film flashlight dry-battery, supplying 4½ volt to the amplifier grid. This combination insures the highest quality of loud-speaker signals.

The management announced that the prizes for the amateur contest, in which over a hundred radio sets had been entered, were as follows:

First prize, \$100, F. B. Ostman, Ridge-wood, Long Island, New York.

Second prize, \$50, Abraham Strausse, 60 East 109th Street, New York City.

Third prize, \$25, Arthur Faust, 1515 Eastern Parkway, Brooklyn, New York.

The judges of the contest were Kenneth Warner, eastern district manager of the American Radio Relay League of America, and Paul Godley, the first American amateur to receive American amateur signals in Scotland.

World's Champion Canary Sings in Radio



(C. P. & A. Photos)

Did you hear a little bird singing in your radio the other night? Well, this may be the bird. His name is "Baby Grand." He took first prize at the canary show in the Chicago Coliseum. Singing, with him, is Miss Edith Allen of concert fame. There were over 500 canaries in the final chorus for the gold medal. The photograph shows champion canary, "Baby Grand" and Miss Edith Allen singing in KYW station of the Commonwealth Edison Company, Chicago.



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Radio
The Reproducer Supreme

With the DX Nite Owls

(Continued from preceding page)

long stretch of 3,325 miles—although an even more remarkable record involving the town of Hilo, Hawaii, 5,300 miles from Schenectady, is undergoing verification.

The Hawaiian audience is declared to have heard WGY on an earlier date than did Mr. Redlin at Talara, Peru, but actual confirmation is as yet lacking. In the case of Mr. Redlin, however, it has been established by checking his statements with the concert given on the date he mentioned that, unquestionably, he heard most of the WGY program, listening in for over half an hour.

The distance record for a single number of an entertainment program is claimed by WGY, owned by the General Electric Company, at Schenectady, New York, on a report received from Hilo, Hawaii, about 4,951 miles from Schenectady, when the distance is calculated on the globe. The distance estimated by WGY on the map was 5,200, but this is subject to correction.

London, England, has heard WJZ, Newark, New Jersey. A ship in the harbor at Cherbourg, France, has heard WGY. These distances are about 3,100 miles.

The Detroit "News" frequently hears from ships in the Pacific Ocean, particularly "Easterner," which reports that between Australia and Panama, on October 13, it heard a WWJ concert and "greatly appreciated" it at a distance of 3,500 nautical miles, about 4,030 ordinary miles.

A letter from the operator aboard the

"Easterner" tells of hearing "The News" complete concerts three successive nights, October 11, 12 and 13, while en route from New York to Australia. On the last night the ship was 2,500 nautical miles southwest of Panama, latitude 9 degrees, south; longitude, 112 degrees, west, and a calculated great circle distance of 3,500 miles from Detroit.

* * *

With a Small Aerial

From Bernard Burkhart, 1105 Chicago Avenue, Freeport, Illinois

I AM using a Reinartz tuner and one step of amplification. On the night of December 22, I heard the following stations; WGY, Schenectady; WOR, Newark; WWI, Detroit; WOC, Davenport; WLAG, Indianapolis; KSD, St. Louis; KYW, Chicago; MOF, Anacosta; WOAF, Kansas City; WMAP, Duluth; WOS, Jefferson City, Missouri; WAAP, Wichita, Kansas; WGM, Atlanta; CHCC, Calgary; WMAF, Dartmouth, Massachusetts; WFAT, Sioux Falls, South Dakota; WSB, Atlanta; KHJ, Los Angeles. Eighteen in all. I consider this very good as my aerial is a 3-wire inverted-L type, only about 46 feet long and 20 feet high.

* * *

Cuba Heard in Kansas

EDITOR, RADIO WORLD: I have a chum who catches Havana, Cuba, on a 2-variometer, 1-tube set. He is only thirteen years old and made his own set.—Albert Brown, Stafford, Kansas.

Answers to Readers

I RECENTLY received a list of the official abbreviations from the Government Printing Office. There are two lists. One is in the form of questions and the other in the form of statements. How may they be distinguished?—Harry Cahn, New York City.

If a question there will be an interrogation point after it, as "QRM?" which will mean, "Are you being interfered with?" If the interrogation point is not used it means, "I am being interfered with."

What is the official wave length on which the government station NAA transmits time signals? I can hear it from the local broadcasting station, but wish to get it direct.—B. F. Mason, Tenafly, N. J.

The wave length on which NAA transmits time and weather forecasts is 2,500 meters.

I am enclosing a hook-up of my circuit—a single vario-coupler circuit with a variometer in the plate circuit. It does not regenerate unless I put in series with it a coil composed of a 1½-inch tube wound with No. 24 wire. Please explain my trouble.—Maurice P. Ward, Montreal.

Your circuit would function better if you inserted another variometer in the grid circuit. You can put the variometer you are using in your grid circuit and get better results. It should be placed before the grid condenser and leak.

Give me a good hook-up using the V-T 1 with one stage of amplification.—T. Peterson, 1507 North 4th street, Superior, Wis.

A hook-up suitable for your purpose was published in RADIO WORLD, No. 30, dated October 21; page 12.

1. Can a crystal set be made regenerative without the use of bulbs?

2. Is it possible to increase the range of a receiving set by using two crystal detectors instead of one?

3. Will a wire hung inside of a well make a good ground?—Stanley Hughes, Astoria, N. Y.

1. A crystal set cannot be made regenerative. This term is only applied to bulb or tube circuits.

2. No. No advantage will be attained by the use of two crystal detectors. As a matter of fact, it is hardly possible that two crystal detectors in the same circuit at the same time could be made to respond at all.

3. Yes. If the wire is hung in the water of the well you will have a very good ground.

In order to use my loud-speaker (Baldwin phone attached to phonograph) I have to run a wire about 35 feet down the hall. Is that the cause of my second step howling when WJZ is on? I don't get the howl except then.—Dx, New Rochelle, N. Y.

If you don't get the howl when other stations are on, it indicates that the length of the cord has nothing to do with the howl. Try turning down a little your detector and amplifier filament-current when he is on.

I am not able to erect an aerial on account of the landlord living in the house. Is there any other way that signals may be received than on an outside aerial?—James Diamond, New York.

If you have electricity in your house, you may use your lighting system by attaching a plug that you can buy in any of the radio stores. Caution! Don't use any ordinary plug. Buy one that is meant for the reception of radio signals through the agency of the lighting wires in the house.

Publish a hook-up of a variable condenser, 1 variometer, vario-coupler, detector tube, grid leak, condenser and A and B batteries.—Frank Oliveira, Manayka, N. Y.

This hook-up appeared in RADIO WORLD, No. 35, dated November 25.

Is there any stated range to a crystal receiving set? Is there any special crystal that is more sensitive to distance?—August Perle, East Lynwood, Pennsylvania.

A crystal receiving-set will generally receive broadcast signals from stations within a radius from 25 to 30 miles, and spark signals from 75 to 100 miles, depending on the transmitting station. For general amateur use galena is considered about the best crystal.

In RADIO WORLD, No. 30, dated October 21, you published a diagram of a set by Harold Day. 1. Will a Hart & Hegaman vario-coupler with the following windings be all right to use in this circuit? Primary: 6 taps of 1 turn each, 4 taps of 10 turns each. Secondary: 40 turns. The primary is 4 inches in diameter.

2. Would a variable condenser with a series-parallel switch improve this set?

3. What is the capacity of the grid-leak condenser?

4. What distance should the variometers and coupler be from each other?—J. A. Corriveau, 39 York street, Hartford, Conn.

1. Your vario-coupler will do nicely.

2. It is not necessary to have a condenser in series with this set as your single-turn switch takes care of the fine tuning.

3. The grid condenser should be .00025 mfd.

4. They should be separated not less than one inch apart.

Latest Foreign Radio News

FAROE ISLANDS, Denmark.—The charge for interior radio-telegraph messages within these islands will be 10 centimes per word; minimum, 1 franc for ordinary telegrams; and 30 centimes per word minimum, 3 francs for urgent radiotelegrams.

Portugal.—The coast station of Porto is now open for radio service.

Belgium.—The legal time was reestablished on October 8, last.

Denmark.—Beginning November 1, this year, the Danish interior charge will be 10 centimes per word; minimum, 1 franc.

Spain.—The coast station Vigo is provisionally closed for public service.

France.—The legal time was reestablished on October 8, last.

Norway.—Beginning November 1, this year, the interior charge on radiotelegrams originating in or destined to Norway will be 10 centimes per word, with a minimum of 1 franc for ordinary radiograms; and 30 centimes per word, with a minimum of 3 francs for urgent radiograms.

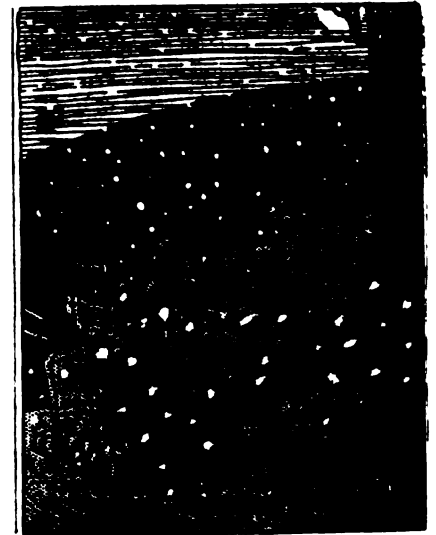
The Netherlands.—The government is preparing to enlarge the present radio station at Scheveningen. The station, which will be ready for operation in the early part of 1923, is designed to communicate with all parts of the continent of Europe and will be equipped also for wireless telephone broadcasting.

Samoa Islands.—Apia radio station, call letters VMB, wave 600 meters (spark), transmits daily, at 7:30 p. m. (Greenwich mean time), a weather bulletin containing a brief review of the local meteorological conditions, including barometric pressure, temperature, and the direction and force of the wind.

Broadcast Bill's Radiolays

By William E. Douglass

RING out the old, ring in the new!"—that's what we sung last night. I'll start at the beginning so you'll get the story right. Last week we had two foot of snow on top of rain an' sleet—since then the road's been opened an' sleighin' can't be beat. The weather's pretty frosty, but I thought it would be great to have a bobsled party New Year's Eve an' celebrate. So I made all arrangements with Ol' Obediah Brown, who runs the Elite Board an' liv'ry stables here in town, to fix us up a bobsled, packed with straw to keep us warm an' several extra blankets we could use in case of storm. Startin' out from our place we drove south to Farmington, an' west from there to Goose Grease Creek like we have always done. We set there tucked in warm as toast till we reached Walnut Hill, when Lem sed, "All gents out an' push, an' that includes you, Bill!" They're always pokin' fun at me, but I don't mind it much. I always hand a good one back an' let it go as such. The hotel down at Goose Grease Creek is called a "Road House" now—I



"When we drove up, I jumped out first."

s'pose to make it sound more up to date—but, anyhow, they sure know how to feed you an' I guess that counts the most, from soup to nuts, includin' chicken a la king on toast. Min makes a dern good hostess, she had called 'em on the phone so they had fixed things swell fer us with lots of class an' tone. While we may live in Brussels Sprouts, in what you call the "sticks," don't ever get the idee in yer mind that we are "hicks." We dance to New York music bless my soul—I most fergot to tell you 'bout the most important feature of the lot. When we drove up I jumped out first an' run in the hotel so when the rest come strollin' in they sez, "My ain't this swell! An' orchestra an' everything." I'd brought my set along. I 'lowed fer such a classy stunt we could at least have "song." The Supper Clubs big orchestra played all the time we ate an' fer our dancin' afterwards. Now I would like to state that while you may "ring out the old" us folks "ring in the new." I'll "sign off" now an' wish you all a Happy New Year, too.

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Radio and the Drama

ALAN EDWARDS, of "The Gingham Girl," now running at the Earl Carroll Theatre, New York City, is a radio fan and has a set in his dressing room. Between acts, the other evening, he called Bertee Beaumont into his room to listen to a lecture that was being broadcast.

"Listen to this, Bertee," said Edwards, enthusiastically, "Dr. Copeland is giving a talk on appendicitis."

"No, thanks," replied Miss Beaumont, "I'm tired of these organ recitals."

"R. U. R." is soon to be produced in Paris by Firmin Gemier, and now that the radio is reaching England's shores the review of this clever play sent out from WJZ will undoubtedly hasten the scheduled appearance of the Robots in London.

What is claimed to be the first record of an act having been booked for an important engagement by radio, took place in the case of Kitty Doner, who, with sister Rose and brother Ted, appeared at the Palace Theatre, New York. Miss Doner closed in England after a successful, though brief, season, and caught a boat for home. When one day out she sent a radio to her agent, Harry Weber, stating that the act would be available for New York bookings the week of December 3. Weber immediately got in touch with George Gottlieb, who books the Palace, and he offered the Palace for one week. Weber sent Miss Doner a radio on Wednesday morning, November 29, when the Aquitania, on which she was returning, was in mid-ocean. On the afternoon of the same day he received her confirmation and opened the following Monday.

Marriages by Radio

THE use of the radio for matrimonial ceremonies has been ruled illegal. It is held that mistakes enough are being made under the old-fashioned system.

Marriages over the radio have aroused agitation in several states, but it has remained for the attorney general of New York to issue a formal ban. The bride and groom in the case involved contended that there was no difference between broadcasting marriages and broadcasting the other fight news.

The attorney general was firm, however, and thus disappear all chances of husbands getting divorces on the ground they got the wrong wife due to static conditions.

Likewise, all prospects of wives winning separations on contentions that they got husbands from WJK when they expected them from KDW.

In fact, several serious errors of the sort have been reported already. A Newark (N. J.) druggist thought he was being married by radio to a prominent Detroit society girl a few weeks ago. He discovered two nights later that, owing to "static" he had married the author of the Uncle Piggly-Wiggly stories.

In Chicago, a well-known roofing manufacturer perfected all arrangements to take as his mate by radio the prettiest girl in Cos Cob, Conn. Through broadcasting errors he was united in wedlock to the "Rutgers College Glee Club in Songs and Instrumental Music, 8:45 P. M."

As a matter of fact, inquiry revealed he had a very close call from being married to "Sousa's Band in New and Novel Programme, 9:10 P. M."

And what happened to the Cos Cob

beauty? You'll never guess, Dudley. She found she had become the wife of both the Bison City Four and the keeper of the Arlington official time.

A New York woman who had divorced four husbands tried a radio marriage to a fifth and discovered she had become wedded to "the Fenwood Beach Firemen's Fife and Drum Corps in Patriotic Melodies."

And then there is the matter of confusion in broadcasting the wedding ritual:

Minister: "Do you snap-snap-click-snap Beatrice Marmalade take this eggs closed firm to be your Oil Can preferred, bid 34; asked 36 lawfully wedded woodchuck and chipmunk fable by Thornton Burgess?"

Answer: "Nothing could be finer than to be in Carolina, etc."

Minister: "Do you, George buzz-buzz take this muskrat story by Dr. Arthur Oat to be your lawfully wedded-oompah-oompah-ta-ra-ra-ta, tum?"

Answer: "I love the name of Nelly."

Minister: "I pronounce you symphony concert and bedtime story."—H. I. Phillips, in "The Globe," New York.

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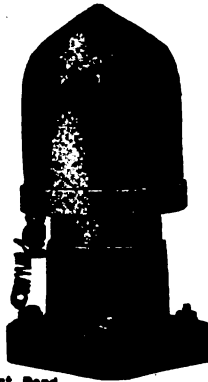
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Radio Manufacturers Organize for Patent Protection

WHAT is conceded to be a tremendous step forward in the clearing of patent entanglements and manufacturers' patent problems is the announcement of the formation of an incorporated group, termed the Independent Radio Manufacturers, Inc., with offices at 165 Broadway, New York City.

In an exclusive interview, Walter Russ, of Pennie, Davis, Marvin & Edmonds, attorneys for the group, declared it to be his opinion that the incorporation of the Independent Radio Manufacturers, marks the first important step forward in the clearing of the atmosphere surrounding the many patents and counter-patents clouding the radio horizon.

"At the request of a number of important radio manufacturing concerns," said Mr. Russ, "the Independent Radio Manufacturers, was organized to join various radio interests into a common cause, for defense or offense in connection with the radio patent situation. Stock is held in equal shares by all the members and the cause of one becomes the cause of all. Of course, any action by the group is subject first to the

approval of the board of directors, and it is very likely that in the event of patent dispute between members of the organization, such differences could in all probability, be arbitrated, or some other friendly settlement arrived at. "The advantages of concerted action are not limited to the division of expense, alone. For example, the radio-engineering talent represented by the various members of the Independent Radio Manufacturers, is such that much more technical data on the history of various inventions and important anticipatory material is available, to the group in a manner which would be possible in no other way. This information, at any time, prove invaluable to some one member, in need."

When inquiry was made in regard to new members joining the group, Mr. Russ stated that many new names have been submitted to membership acceptance and will, in all probability, be acted upon in the near future. Many manufacturers of radio apparatus, learning of the real advantages to the entire industry offered by the Independent Radio Manufacturers, Inc., are desirous of joining.

Radio Exports to Argentina

DURING the month of October, American exporters sent \$564,803 worth of radio equipment to foreign countries. The bulk of the shipments, totaling 138,022 pounds and valued at \$463,239, went to Argentina where some new transmitting stations are said to be under construction. Of the total equipment for that country, however, approximately \$300,000 worth is said to comprise receiving sets. This indicates that the radio boom has spread to the southern republics.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and exhibitions. Keep us posted by mailing full information.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

FIRST UNIVERSAL EXPOSITION OF INVENTIONS AND PATENTS, Grand Central Palace, New York City, February 17 to 23, inclusive, 1923.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Constructive Electric Toy Company, Jamestown, \$5,000; G. Wall, F. E. Palmer, P. R. Sullivan, (Attorneys, Rice & Ross, Jamestown, N. Y.)

Ellert & Kellogg, 46 California St., San Francisco, Calif.

Robert A. Heffley, 1516 Curtis St., Denver, Colo. H. J. Powers, 811 Ninth St., N. W., Washington, D. C.

W. H. Jackson, South Kentucky Ave., Lakeland, Fla.

Peerless Electric Company, Birch St., Zeigler, Ill.

Kimley Electric Company, Buffalo, make radio outfits, etc., \$50,000; W. S. & L. W. Kimley, A. F. Lotz, (Attorney, W. J. Hickey, Buffalo, N. Y.)

The Newberry Electric Store, 747 American Ave., Long Beach, Calif.

Homcharger Instruction Book

THE Automatic Electrical Devices Company, 120 West Third Street, Cincinnati, Ohio, manufacturers of the Homcharger, has issued a revised edition of its Instruction Book, which should be valuable to any radio fan whether or not he is using the Homcharger.

This book, besides containing simple directions for operating the Homcharger, contains a paragraph devoted entirely to storage battery maintenance. The information contained in this chapter will enable a fan to obtain the best service from his battery at minimum expense.

The novel feature of the Instruction Book, however, is its incorporation of a complete list of all the radio broadcasting stations in the United States, Canada, and Cuba. The book has been mailed by the publishers to all Homcharger users. Copies may be secured by anyone interested for 10 cents to cover cost of postage.

Heard at the Radio Counter A Conversation between Customer and Radio Clerk

(Part IX)

"GOOD morning, madam. What can I do for you?"

"Well, Willie was made a present of a radio set for Christmas, and I would like to get some information on how to operate it?"

"Certainly. May I ask what set it is?"

"Why—it is a small, oblong mahogany box."

Willie (interrupting)—"Aw, say maw, it's just a crystal set; and that ain't mahogany. Pop said so."

"I know what your father said, son. Please let me describe the set to the young man."

"I beg your pardon, madam; but, I think, it would be easier if you examined the sets on that table over there and picked out the one that resembles the set that you have at home. There are so many on the market we had better start off right."

"Well, it is exactly like that small one over there; only, as I said before, the box is mahogany."

"Say, maw, ain't that a nice motor over there?"

"Yes, son. Don't annoy mother."

"Well, madam, what seems to be the trouble with the set? A great many people have had wonderful success with similar sets."

"Well, we fooled around all day with it and we couldn't get anything out of it."

"Have you erected an aerial?"

"Yes, we put one up on the roof and, also, connected a piece of wire to the water pipe. I think the book said that was called an earth."

"They call that a 'ground', maw."

"Have you adjusted your detector properly?"

"Oh! you mean that thing with the little square of blotting paper in it?"

"Yes. You should remove the paper and then find a sensitive spot. Will you kindly step over here, then I can explain."

"We left the paper in there! We really thought that it shouldn't be touched. Maybe that is the reason it won't work."

"You are absolutely correct, madam. With that paper in there, Major Armstrong couldn't receive WJZ if he were but a mile away."

"Say, maw, ain't that lady got red hair?"

"Hush up, Willie! You mustn't make remarks about other people. Well, I surely thank you so much, Mr. Clerk. I am sure that it will work now that I know what is the trouble."

"Absolutely. You should be able to get very good results."

"Willie! Leave that dog alone!"

(To be continued)

Christmas Radio Dance at Grebe Plant

A. H. GREBE & CO., Inc., gave a Christmas radio party to their employees and their friends, on Saturday evening, December 23, 1922, at the Grebe factory, Richmond Hill, Long Island, New York. The dance music was furnished by the Phoebe Snow orchestra and was broadcast from Station WEAF, New York City. Loud-speakers in the factory distributed the music so that it was clearly heard. The affair was largely attended and the dancing by radio proved to be the popular attraction.

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Latest Radio Patents

Receiving Transformer and Circuit

No. 1,434,854. Patented December 12, 1922.
 Patentee: Ralph S. Piper, Chicago

MR. PIPER'S invention is a wireless input-circuit and has as one primary object an improvement in the character of coupling between the antenna circuit and the oscillation circuit of the detector tube commonly used in such circuit. The quantities of energy concerned in the operation of such circuits is almost infinitesimal, and one purpose of this invention is to conserve all the energy possible and present it to the input circuit with the least possible loss.

The best possible condition for energy transference from one circuit to another through a magnetic coupling of the same, requires the use of a tight or close coupling. All low-frequency commercial power cir-

some of which may be as closely coupled as in ordinary power-transformer circuits and that the functions of a loose coupling may be relegated to certain other portions of the winding which present a decided loose coupling characteristic. The result of this arrangement is that the tight coupling portions will give exceptionally good energy transference and there will yet be sufficient flexibility in the coupling, as a whole, to permit of the establishment of reasonable relation upon which the efficient operation of a reception set is conditioned as regards detection and amplification."

For S O S Signals

No. 1,438,567. Patented December 12, 1922. Patentee: Robert E. Winstanley, Jr., Boston

MR. WINSTANLEY'S invention is described as an apparatus which, when properly adjusted, will automatically send signals without a trained operator, and will continue to send signals until the apparatus is adjusted for the automatic transmission of a different signal, or is stopped.

The apparatus includes a plurality of methods constructed and arranged to send, when properly operated, a predetermined

provided which controls the starting and stopping of the apparatus. The apparatus may be installed in a small cabinet in the pilot house of a vessel. When cover of this cabinet is opened for access to the selector switches, the master switch will be actuated to start the apparatus to automatically send out a continuous distress (S O S) signal, together with the ship's signal letters. The apparatus is arranged to cause this signal to be continuously repeated until the various selector switches for the latitude, longitude and nature of distress have been adjusted, whereupon, upon the adjustment of the last selector switch, the continuous distress signal is discontinued and the selected signals are sent out, together with a short distress signal, which is repeated so long as the cover is open or until the selecting switches are readjusted. If during the continuance of the sending of the distress signals, the distress is relieved, as for instance, there is a fire and the fire is extinguished before assistance arrives, "Nature of Distress" selector-switch may be adjusted to send an "All is well" signal, also the information that assistance is no longer needed.

New Tuning Coil

No. 1,435,759. Patented November 14, 1922. Patentee: Floyd Swink, St. Louis, Mo.

THIS invention relates to a tuning coil, and has for its primary object the construction of a coil that is more accurate in its operation and which can be more sensitively adjusted. It is claimed by the inventor that it has wider adjustment than the commercial apparatuses now on the market.

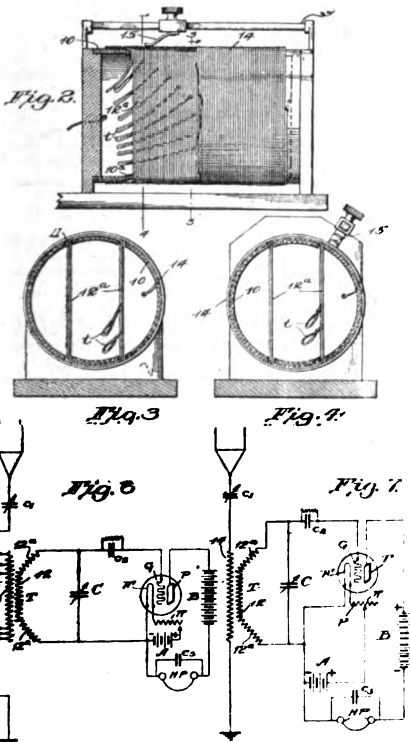
Rheostat for Testing Set

No. 1,436,212. Patented, November 21, 1922. Patentee: Adolph R. Swoboda, Newark, N. J.

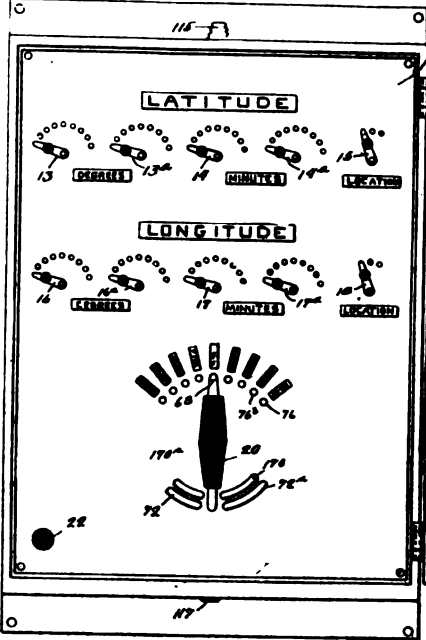
MR. SWOBODA claims that he has invented a rheostat economical to manufacture, reliable in operation, and accessible for the establishment of connections under difficult conditions.

The embodiment of the invention is a rheostat intended for use in a testing set wherein there are a considerable number of pieces of apparatus mounted closely together. The rheostat is required to be both directly and remotely operative. The provision for remote control involves the connecting of a large number of conductors to the rheostat and the connections must be made after the rheostat is installed in the testing set.

The making of a large number of soldered connections in a crowded position is a difficult undertaking, but Mr. Swoboda claims that his invention reduces the difficulty very appreciably by means of an adjustable terminal-block on which the necessary terminals are mounted. After the rheostat has been installed in the testing set, together with the other pieces of apparatus, the terminal block may be adjusted so that the ends of the terminals present themselves to the best advantage possible under the existing conditions.



Five important diagrammatic views of Mr. Piper's circuit.



Panel layout of Mr. Winstanley's device for sending out signals of distress.

uits are coupled in consonance with this principle; but in the case of wireless reception-circuits—which, of course, are of very high frequencies—the input circuit is concerned not alone with energy transference but must discharge other functions, such as detection and amplification. Accordingly a compromise must be made between a close coupling which would give the maximum power-transference and a more or less loose coupling which has sufficient elasticity and flexibility to permit resonance between the several circuits involved.

"As far as I am aware," says Mr. Piper, in describing his invention, "it has been the practice to extend this loose coupling characteristic throughout the range of the coupling. Usually the coupling circuits are made movable with respect to each other, and hence no part of the circuits can be said to have a strictly close coupling.

"I have discovered that it is possible to divide the coupling into sections, or portions,

signal or message. A plurality of selecting switches is provided which are manipulated to select the desired signal, or group of signals, and a master, or control, switch is



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Small Crystal Sets Hold Their Own
Less Expense in Cost and Maintenance, Give Excellent Results for Short Range

WITH hundreds of broadcasting stations, either installed or about to be erected in the United States, there is a movement, particularly in large centers of population, toward the use of crystal sets in preference to vacuum tube sets. In the case of the vacuum-tube set, radio fans are familiar with all the difficulties encountered. When either the A battery or the B battery runs down, there is trouble; and the trouble is not so easy for the amateur to find. When tubes burn out, there is additional expense; and just before they burn out, there is a great deal of distortion, which prevents the hearer from receiving a perfect rendition of what is going on at the broadcasting station.

In the case of the crystal set however, the buyer makes his purchase for \$15 or \$25, strings up his aerial, connects his ground lead, adjusts the crystal and immediately is able to "listen in." While it is true that greater distance than 25 to 50 miles is not obtainable, nevertheless that which is heard over the crystal set is an absolutely faithful and actual rendition of the voice or music at the broadcasting station. There is no oscillation, squeaking or squealing, which is so characteristic of regenerative tube-sets.

Many radio enthusiasts have several types of sets in their homes and it is often a fact that when an important speech or symphony concert is being broadcasted from a station 25 to 50 miles from the operator's home, the operator connects up his crystal set rather than the vacuum-tube set. With a good pair of telephones to his ears and with a good make of crystal set, the operator can hear with perfect exactness the tone quality of music with all its beautiful shadings, or he can hear the voice intonations and enunciation of the speaker in a manner quite unobtainable with tube reception.

All this costs not over \$25.00 for a complete outfit, including antenna equipment and telephones. There are no replacements; nothing to wear out; no batteries to re-charge; no tubes to be bought and if he is satisfied with receiving the nearby stations, his set should cost him practically nothing for upkeep.

On the subject of crystal sets, it should be noted that there are on the market crystal sets with a wave-length range from 180 to 3,000 meters. Most of the old-type sets have a wave-length range of 150 to only 800 meters and some even as low as 500 meters. As soon as Congress passes the new law recommended by the radio board, broadcasting will be done on much higher wave lengths and several stations can be operated in the same locality at the same time, so that a good crystal set should have a wave length range at least going up to 2,000 meters and will be able to receive the broadcast material which will undoubtedly be sent on higher wave-lengths than the 360-meter wave length, to which they were formerly restricted.

Most crystal sets do not have a variable condenser and this should be compensated for by having two binding posts on the crystal set, one for long antenna and one for short antenna. The former should have an antenna condenser connected in series with the aerial lead. In fact, a variable condenser does not give maximum efficiency in a crystal set.

Tapped coils are usually preferable to sliding tuners, as sliding tuners frequently wear out or become circuited. A tapped coil set is a life long investment. With two binding posts, one for long antenna and one for short antenna, the operator will be able to accommodate his set to the conditions possibly limited and to which his antenna can be erected.

Brooklyn has a radio club in one of its high schools, organized in 1910. Its success is reported as meteoric.

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Detroit "News" Music Heard in Hawaii
 Orchestra's Playing Carried Through Ether 4,400 Miles in One-fiftieth of a Second

A DISTANCE record for the reception of a complete program of radio entertainment was established between the Detroit "News" broadcasting station, WWJ, and A. F. Costa, postmaster at Wailuku, Hawaii, November 23.

On that midnight, the Detroit "News" orchestra played "Three o'Clock in the Morning" in the studio in the News Building and was heard "clearly and distinctly" in the Hawaiian Islands at about 6:30 p. m. The sun moves that slowly between the two points. The distance is figured at, approximately, 4,400 miles. It would take the discharge of a cannon five hours and forty-one minutes to travel from Detroit to Hawaii without the aid of electricity—if that were possible.

But the notes of music on the wings of radio arrived on the beach at Wailuku in about one-fiftieth of a second after leaving the antenna of "The News." Thus radio contested the flight of time and the extent of space.

The letter received by "The News" from the Hawaiian postmaster states: "It sure was some sweet music!" There were substantiating witnesses. The report from the postmaster tallies with the station log. Mr. Costa heard the whole program of the orchestra without interruption.

The distance record for a single number of an entertainment program is claimed by WGY, owned by the General Electric Company, at Schenectady, New York, on a report received from Hilo, Hawaii, about 4,951 miles from Schenectady, when the distance is calculated on the globe. The distance estimated by WGY on the map was 5,200, but this is subject to correction.

London, England, has heard WJZ, Newark, New Jersey. A ship in the harbor at Cherbourg, France, has heard WGY. These distances are about 3,100 miles.

The Detroit "News" frequently hears from ships in the Pacific Ocean, particularly the "Easterner," which reports that between Australia and Panama, on October 13, it heard a WWJ concert and "greatly appreciated" it at a distance of 3,500 nautical miles, about 4,030 ordinary miles.

A letter from the operator aboard the "Easterner" tells of hearing "The News" complete concerts three successive nights, October 11, 12, and 13, while en route from New York to Australia. On the last night the ship was 2,500 nautical miles southwest of Panama, latitude 9 degrees, south; longitude, 112 degrees, west, and a calculated great circle distance of 3,500 miles from Detroit.

The Bed Spring Helped Out

EDITOR, RADIO WORLD: The other day my aerial blew down and I couldn't listen in. I had heard a lot about using the bedspring as an aerial, so I decided to give mine a try. You can imagine my surprise when, after WJZ had stopped, I tuned around and was able to pick up WRW, Tarrytown, New York, and WGY, Schenectady, New York. This was all done on one W-D 11 using the circuit described by George W. May in RADIO WORLD No. 35, dated November 25, using a variometer and condenser. The broadcasting was easily understood. I have done some wonderful work with this set, including WGM and WDAP with a regular aerial. I think that this wins the "Fur-Trimmed Safety Razor."—L. Donoheld, New York City, N. Y.

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Advantages of Code

Why Radiotelegraphy is a Most Necessary Form of Communication

NOW that the radiotelephone is perfected and we have concerts and speeches broadcast, why bother with the radio telegraph? This is one of the questions the novice in radio thinks of first. The answer is worth knowing and it brings up a lot of extremely interesting things, writes Hiram Percy Maxim, president of the American Radio Relay League, in "The Tribune," New York.

Speech is at best inexact. When language was invented it was never contemplated that there would be telephones with metal diaphragms. Sounds were adopted which were very similar, and it required quite a good bit of practice for even such an exquisitely delicate mechanism as the human aural organs to distinguish between them. Witness the very slight difference between the sounds of "P" and "B," or "T" and "D" or "M" and "N." The alphabet is full of such similarities. The letter "S" and the double "Th" which we English speaking people use, but which is almost impossible for the rest of the world to master, are very difficult for the telephone diaphragm to duplicate.

The result has been that speech transmitted by telephone is somewhat doubtful, and questions arise continually as to what the exact meaning was. We all know how often we have to spell out a word when using the telephone, and even that is not satisfactory, for we have to say "T" as in Tom or "V" as in Victory or "S" as in Sam. By using some familiar word we are able to get across the letter which cannot be understood when pronounced alone.

Thus when we have anything exact, such as messages or railroad train despatching, we use the dots and dashes of telegraphy. It is easy to be sure with telegraphy for we can count the dots and the dashes and that is all these is to it. When one learns what letter is one dot, what is two dots, what is three dots, what four and what five, and what letter is one dash, what two dashes and so on up to five, and what the combinations of dots and dashes are, it is amazing how indistinct and confused the transmission can be and yet be absolutely clearly understood. Telegraphy, therefore, is the necessary form of communication in a great many services.

Blame It on Inductance

EDITOR, RADIO WORLD: I have been reading your magazine for a long time and enjoy it very much. I have a Grebe Receiver and have done some very fine work with it. I recently noticed a freak while operating my set. We are situated in the suburbs of Montclair, New Jersey, and my aerial runs parallel to the party telephone-line for a distance of 100 feet. While tuning around I heard a two-sided conversation on this line. By that I mean that I heard both people talking. I tuned around and happened to hear a party's name mentioned with whom I am well acquainted. It then occurred to me that the person talking was my brother. Going to the door I heard him telephoning in the lower hall over the regular telephone.

I have since experimented and found out that I can tune in all the telephones talking on the party line that connects with my phone.

I have found that this freak, or phenomenon, is caused by the fact that my ground is the same as that used by the telephone company; but, as I do not cause any interference on the line, I have not changed it. I ask you to withhold my name because some of my neighbors might want to know why I smile at them so knowingly of late. —73 Om Gb., F. L. C.

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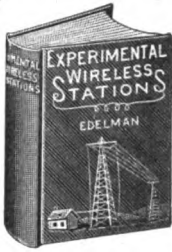
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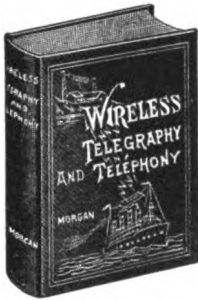
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THE COLUMBIA PRINT

Room 326

1493 Broadway New York City

RADIO WORLD

TELEPHONE, BRYANT 4788
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE
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Knowing the Broadcaster

THE beginner who listens in over his radio set sometimes hears a strange conglomeration of noises, says "The Globe," New York, whose identity he is unable to place. To his mind there is only one kind of a transmitting station—a broadcasting station—and even then he is at a loss to know just what apparatus is used in that particular station. A few notes on the different types of transmitting stations might be a clue that will lead to their identification.

First of all, there is the broadcasting station, as you know it. The generators of the high-frequency radio currents in all present-day broadcasting stations are of the vacuum tube type. These tubes have been found to be the most satisfactory where continuous waves of fairly low power are necessary. The power used in a broadcasting station usually ranges from a few watts to one kilowatt.

Sometimes, however, in commercial work, other types of high frequency undamped wave generators are used for the transmission of voice. One of these types is the arc, and another the high frequency alternator. The latter can be used much more successfully than the former, because it is steadier. Both of these are used more for continuous-wave telegraph transmission, in the large transoceanic stations, than they are used for telephone transmission. In fact, they have only been used experimentally for the last named purpose. Many ship stations have adopted the arc in place of the spark transmitter, because of the sharper wave that it gives. Most of the medium and low-power telegraph transmission is still carried on by means of the familiar spark transmitter.

Wants Name of Station Heard

From E. M. Pace, 423 Farmer Street, Vicksburg, Mississippi

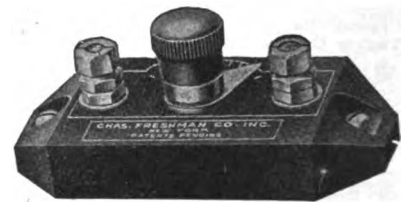
ON December 16 and 17, between 11:30 p. m. and 12:30 a. m., I was listening in with my set and heard some station broadcasting Harry Lauder's songs, including "Roaming in the Gloaming." I have every reason to believe that this was a Pacific Coast station. To satisfy my mind, I will thank you to publish this letter. Someone who reads it may tell me the name of the broadcasting station in question, and may take the trouble to drop me a card or letter. He will certainly confer a great favor on me. I was using at the time a single and practically "dead" 22½-volt B battery, therefore I could not keep the set tuned in long enough to get the station's call letters. I am anxious to find out who it was.

A good article is always imitated!

Be sure you receive the

FRESHMAN

Variable Grid Leak and Micon Condenser Combined



Price only \$1.00

3 Points to Remember

1. It is hermetically sealed in a mould to prevent moisture from affecting the grid resistance.
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Manufactured by

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on a postal card. We would like to get the name of every RADIO WORLD reader, so we expect to send out a special message to our readers. It will interest you. Be sure to send us your name on a postal card and address it GIFT DEPT., RADIO WORLD, 1493 Broadway, N. Y.

That Armstrong Circuit

So much interest has been displayed in the special article, "TESTED INVENTION OF MAJOR ARMSTRONG AMPLIFIES SET 100,000 TIMES," by John Kent, that appeared in RADIO WORLD No. 13, dated June 24, 1922, the publisher decided to put aside a number of copies for those who were not able to get this issue when published. Copies will be sent, postpaid, on receipt of 15c, or send in your subscription, \$6.00 for one year (52 issues), \$3.00 six months, or \$1.50 three months, and subscription will be started with the issue containing the article about Major Armstrong's Amplifier.—RADIO WORLD, 1493 Broadway.

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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

CLOSING OUT—Westinghouse RC set, \$104.00; Grebe CR-9 Receiver, \$104.00; Grebe RORK amplifier, \$42; Oard Phantom Receptor (no serial-no ground), \$135.00, regular price \$175.00; Crosley No. VI, \$23.00; Aeriola Senior, \$53.00; Sterling Rectifier, \$10.00; Brandes Phones, \$6.85; Dictograph Headset, \$6.85; Workrite Variocouplers, \$2.95. All new apparatus. Big discounts. Send stamp for complete list. N. E. RISTEY, Spring Grove, Minn.

COMMERCIAL RADIO OPERATOR—With ten years' experience and holding first-class first Grade license, desires position as manager of Broadcasting or Telegraph station. C. D. Morris, 195 N. Liberty, Delaware, Ohio.

BACK NO. RADIO WORLD WANTED—The publisher wants copies of Radio World of April 22. Mail us copies and current issues will be sent you in return. RADIO WORLD, 1493 Broadway, New York City.

VENTRILOQUISM taught almost anyone at home. Small cost. Send 2c. stamp today for particulars and proof. Geo. W. Smith, Room M-643, 125 N. Jefferson Ave., Peoria, Ill.

PATENTS
Protect your invention today. Write for 1922 Illustrated Book Free. Radio, Electrical, Chemical and Mechanical experts. Over 30 years' experience. A. M. Wilson, Inc. (Radio 3 ARE), 219-18 Victor Building, Washington, D. C. (Successors to business established 1891 by A. M. Wilson.)

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EXCHANGE JOLLY, INTERESTING LETTERS through our club. Stamp appreciated. Betty Lee, Inc., 4254 Broadway, New York City.

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EXCHANGE LETTERS with friends everywhere. Pleasant pastime. Information for stamp. Smith, Box 3125, M. Portland, Ore.

WE NEED RADIO WORLD, dated April 22 and August 5. If you have copies you don't require, mail to this office and current issues will be sent you for them. RADIO WORLD, 1493 Broadway, New York.

CASH FOR OLD GOLD, Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magnets Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 337 Hippodrome Bldg., Cleveland, Ohio.

BROADCASTING MAP of the United States appeared in RADIO WORLD No. 8. Sent on receipt of 15c. coin or stamps; or start your subscription from that number (\$6.00 for 52 issues). RADIO WORLD, 1493 Broadway, New York

Attention! Fans and Amateurs!

Have you built your own receiver?
Are you experimenting with any particular hook-up?
Are you improving your set?
Are you doing any interesting constructive work in radio?
Why not share this knowledge with your thousands of brother fans who read RADIO WORLD every week?

We want pictures of receiving sets with descriptions of how you overcame some difficulty, or of any additional part or unit that you have added to obtain better results. These are the things that, probably, the other fellow is looking for. Send in your information; pictures or whatever you have done to improve the art.

Remember the beginner is looking for them.

We intend to print in this paper, each week, pictured information and description of value to radio amateurs. If you have found a newer or better way of doing anything, don't keep the secret but tell it to your thousands of brother fans.

Send in a photograph of your set with or without accompanying diagrams and measurement. State whether you figure in the picture yourself, or not, and without any expense whatsoever to you we will make an engraving and publish it. Be sure to write your name and address plainly on photograph.

Send in your picture at once, or if you have not made a set or done anything else in making radio material, tell the boy next door all about this offer.

Address Technical Editor

RADIO WORLD, 1493 Broadway, New York City, N. Y.

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Used Bird-Cage for Aerial!

From Charles Seymour, 140 North Sixty-first Street, Philadelphia

A COMMON bird-cage for an aerial! Maybe this is interesting and again someone may have "beat me to it" and written previously of this sort of "stuff."

While working in the cellar I noticed our discarded canary-cage and the thought struck me that it should produce results if my four-foot loop did. Anyhow, for the fun of it, I dismantled it so that I had only the top and side-wire section. I soldered a six-foot lead to it, set it on the dining-room floor, connected it to my three-tube set and in came 360-meter station, WNAT, and later WCAU (360 meters) with the efficiency of my roof antenna, except for selectivity. It also works well as a counter-poise ground and improves my set very much if I use this in conjunction with my water-pipe ground—of course using then the roof antenna. It did still better when I hung it on a clothes line.

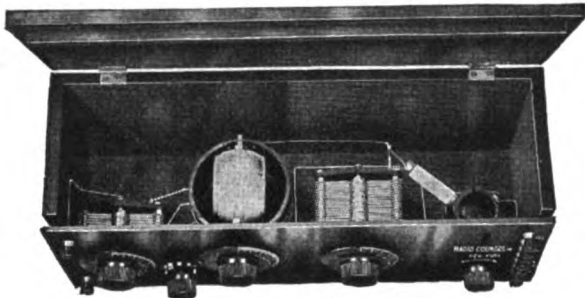
A 400-meter station, WFI, on that same day, did not come in well, nor has any other class-B station in Philadelphia.

How Radio Waves Carry On

I T is a puzzle to many radio listeners, says "The Times," New York, why the radio waves of a musical concert, after striking one antenna, continue on through space for many miles, giving the same entertainment to thousands of others. It is true that each time the radio wave comes in contact with an object which will absorb some of its strength, such as an antenna or steel structure, a portion of the energy is absorbed. It has been estimated that the energy absorbed by a receiving antenna is about one-millionth of an ampere. The radio waves in striking the antenna leave enough energy for the listener to enjoy the concert and then pass along to the next antenna as if nothing had happened. The Hertzian waves strike the antenna wire in much the same way as a wave strikes a person bathing in the surf.

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The ASSEMBLY \$27⁵⁰ Detector and Tuning Unit

A high-grade tube set that costs less than the price of parts used. Super-sharp tuning through *double tuned circuit* and Litz-wound rotor. A real tube set for the price of a good crystal set. All the fun of assembling—but correct assembling made absolutely certain and easy. Supplied in assembly form, panel drilled and engraved, all parts packed inside cabinet, including all wires cut and bent and turned, ready for soldering. Complete Instruction Sheet showing inside and outside connections. If your dealer can't supply you, send check or money order for \$7.50, balance \$20 and freight C. O. D.

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You want this sure-selling Assembly Set. It meets the needs of the biggest buying class—those who want a real tube set at a low price. Attractive discounts. Order now for early delivery. Solve your book problem with the Radio Reading Course set of five books. A fast selling item. Write for discounts and order sample copy. Full line of "Quality" parts.

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April 1—A 500-Mile Radiophone Employing a 5-Watt Tube, by Frank A. Hahnel. "Tell Me, Please, How Will This Set Receive?" by E. L. Bragdon. Short Cuts in Receiver-Circuit Design, by O. C. Roos. Making a Short-Wave Regenerator, by Fred. Chas. Ehlert.

April 15—First Principles of Electricity as Applied to Radio, by John P. Miles. Your Storage Battery, by E. L. Bragdon. What Makes Radio Possible, by Edward Linwood. Ground Connection as Vital as Antenna, by Fred. Chas. Ehlert.

April 29—Valuable Pointers on Aerial Construction, by Edward Linwood. What Is Meant by Tuning, by E. L. Bragdon. Radio-Frequency Amplification and Regeneration, by Frank Armstrong. Honey-Comb Coils and Condensers, by Edward Linwood. Charging the Storage Battery, by E. L. Bragdon. How to Construct the Variocoupler, by Frederick L. Rumford.

Each copy sent on receipt of 15c. per copy, or the three copies for 45c., or better still, send your subscription beginning with any one of these numbers, and we will send this paper for 52 issues, and you will then have a complete file for ready and constant reference. RADIO WORLD, 1493 Broadway, New York.

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Five Books \$1⁹⁷
on Radio

Five complete radio instruction books, teaching the elementary Theory, Design, Construction, Operation and Maintenance of radio apparatus. Gives you a thorough grasp of the whole subject.

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Tony The Barber on "Da Rad-I-O-U"

(Registered U. S. Patent Office)

By Ed Callow

HELLO Peep! Deesa time I speaka to you about wan greata machine.

It is calla Rad-I-O-U.

Grabba da speecha—da song from da fresh air.

De Rad-I-O-U was firsta invent by greata Italian man—Signor Marconi.

Wan million peep! try to improva da work of Signor Marconi.

I buy Rad-I-O-U for da shop—pay fiva dol' down—feefita centa week.

Getta da louda-speak for da shop—use—a da softa speak for da wife.

Da customer in barber shop talka too much—da barb no can do da work.

Da Rad-I-O-U maka da customer leesen in—no speaka out.

Da barb now can make da clean shave—no cutta da ear—da chin—da lip.

Firsta time I mak' lessen in some butcha shop geeva da price of da sheep—da roasta beef.

Wan time da doc in Public Health, Unita State, geeva talk.

He tella you how to sit in da chair an' resta da feet.

Wen you talla da barb how to sit an' resta da feet, he go craze in da head.

Wan time wan wise guy, Bureau Standard, Washeenton, D. C., geeva da talk on impure shaveeng soap.

He try to steala da customer from da barb.

Try to make da biz for da safa-raze politish.

Wan day lady from Bosta, Massachus, Lydia Peenk, geeva talk on how to make da apple sauce. Wat we care for apple sauce?

All we want is Rad-I-O-U talk on new sauce for spaggett.

I lika da grand op'. Deesa come from capital New York State.

Leetla town calla Schnect'. You gat best Italian op' wen you connect weeth Schnect.' Greata stuff!

Da speech on how to maka da incoma tax maka me sick.

Wat we need is some wan to tal how to make da mon to pay incoma tax.

Herba Da Hoove first breenga Rad-I-O-U to Unita State.

He theenk we need more wave on da land.

If he come into shop of Tony Da Barb he gat acquaint weeth evra kinda wave—marcella wave—plain water wave—electric wave—wava da flag.

Herba Da Hoove mak' greata mistak—he try to gat congressaman to passa da bill to controlla da wave.

We tal Herba Da Hoove to lay offa Rad-I-O-U wave control.

Coma to barber shop gat nice—a marcella wave on da dome.

Resta da hand an feet—hear Congressaman broadcuss hot air into da fresh air.

Life Would Be Ideal If—

RADIO tubes grow on trees—and the trees blossomed three times a year in any climate? It didn't cost a young fortune to make up a 6-tube radio-audio-frequency set?

Some great philanthropist started a factory and made sets to present free to all the amateurs in the country?

We all could have gone to the American Radio Exposition?

You could transmit without making bad friends of all of the broadcast listeners in the vicinity?

Tubes didn't need B batteries?

The radio shops would run "Penny Sales?" "Buy one—and for an extra cent you can have two?"

When you have company they wouldn't ask a lot of questions you can't explain?

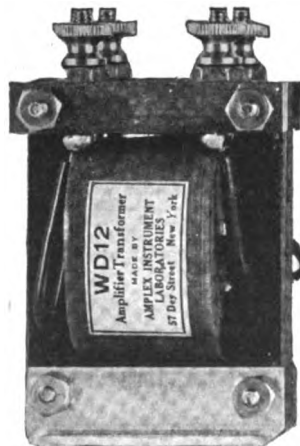
Anyone could work an Armstrong superheterodyne?

The folks wouldn't kick when you went to listen in to the DX boys and have to stay up late to do it?

Somebody would invent a battery that didn't run down or need charging?

W. D. 12 Amplifier Transformer

Especially designed for use with
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Make YOUR Volt-and-a-half tube set "speak up" like a six-volt set.

W.D. 12 Transformer gives No Distortion—Maximum Amplification.

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For smacking flavor, delicacy of aroma and a cheerful invigorating influence, drink the best tea - Ridgways Tea.

Also sold in 1 lb., 1/2 lb. and 1/4 lb. TINS

A Generous Sample will be sent on request. Address: Ridgways, Inc.,
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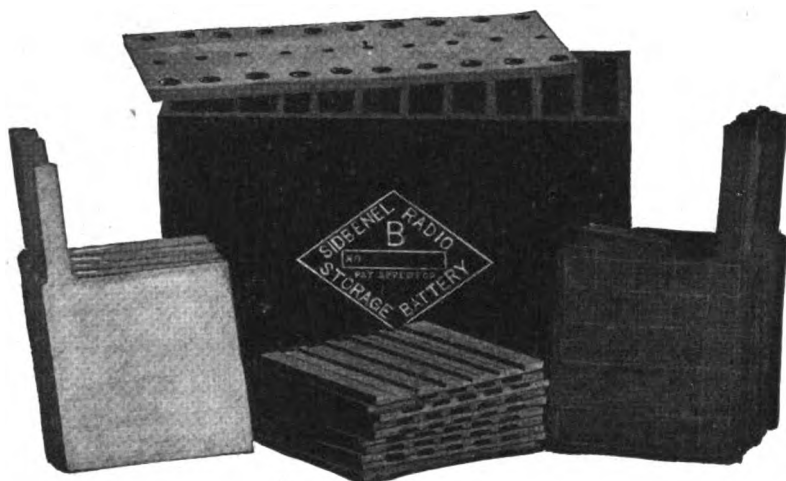


GOLD MEDAL San Francisco 1915



GRAND PRIZE San Diego 1916

This "B" Battery Will Last 5 Years



A single charge will last approximately six months. When the battery becomes discharged, you do not have to throw it away like other batteries. You simply connect it to any ordinary lamp socket or farm lighting plant generator—turn on the switch and within a few hours you have a battery fully recharged at a cost of less than one-half cent, ready for another six months' use.

The container (patent pending) is made of genuine pure Brazilian hard rubber and has ten individual cells molded into it, which make the container measure only 2½ in. x 3 in. x 4½ in. for complete battery.

Each battery gives 22½ volts and can be tapped at any desired voltage from 2½ up. For higher voltage simply connect additional units in series.

The weight is only 2½ pounds complete. The units are guaranteed not to leak and are practically unbreakable. With this type of battery signals will come in exceptionally loud and clear.

The battery is shipped to you partly assembled. All you have to do is to connect the plates together, which takes less than ten minutes to do. The directions are simplified and include illustrated drawings for assembling the battery.

Over 100,000 Sidbenel Storage "B" Batteries were sold throughout the world in the last few months.

It is the finest and most economical battery ever produced for radio service.

Special patented plates, which are already charged and formed before leaving the factory, containing a special composition for eliminating howling and screeching, are used. This gives it a greater capacity far exceeding that of any other battery.

New model, Type C 200, price unassembled, one unit.....\$4.25
 New model, Type C 20, price assembled, one unit\$4.65

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 1663 JEROME AVENUE, NEW YORK

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NEW RADIO BOOKS

Telling How to Operate a Radio Set—How to Build a Set—Principles of Vacuum Tubes and Other Radio Problems

How to Make Commercial Type Radio Apparatus

By M. B. SLEEPER

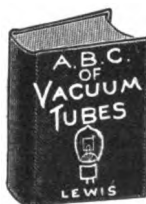
This book describes in detail many commercial types of spark and vacuum tube telephone transmitting and telegraph and phone receiving equipment of all kinds. The experimenter will be able to get a world of ideas for the design and construction of his next piece of radio equipment from the very clear descriptions and the 96 clearly illustrated figures.....PRICE 75c.



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A book that gives you not only clear diagrams for all kinds of telephone and telegraph receiving and transmitting sets, but simple descriptions of each circuit shown and spaces for notes of results obtained. PRICE 75c.



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By E. H. LEWIS

Assoc. L. R. E. and Radio Instructor
 Written particularly for the person who "knows nothing about radio" but who would like to gain an understanding of the elementary principles of operation of vacuum tubes and various circuits in which they are used for the reception of radio-telegraph signals and radio-telephone music and speech. Illustrated..PRICE \$1.00

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By M. B. SLEEPER

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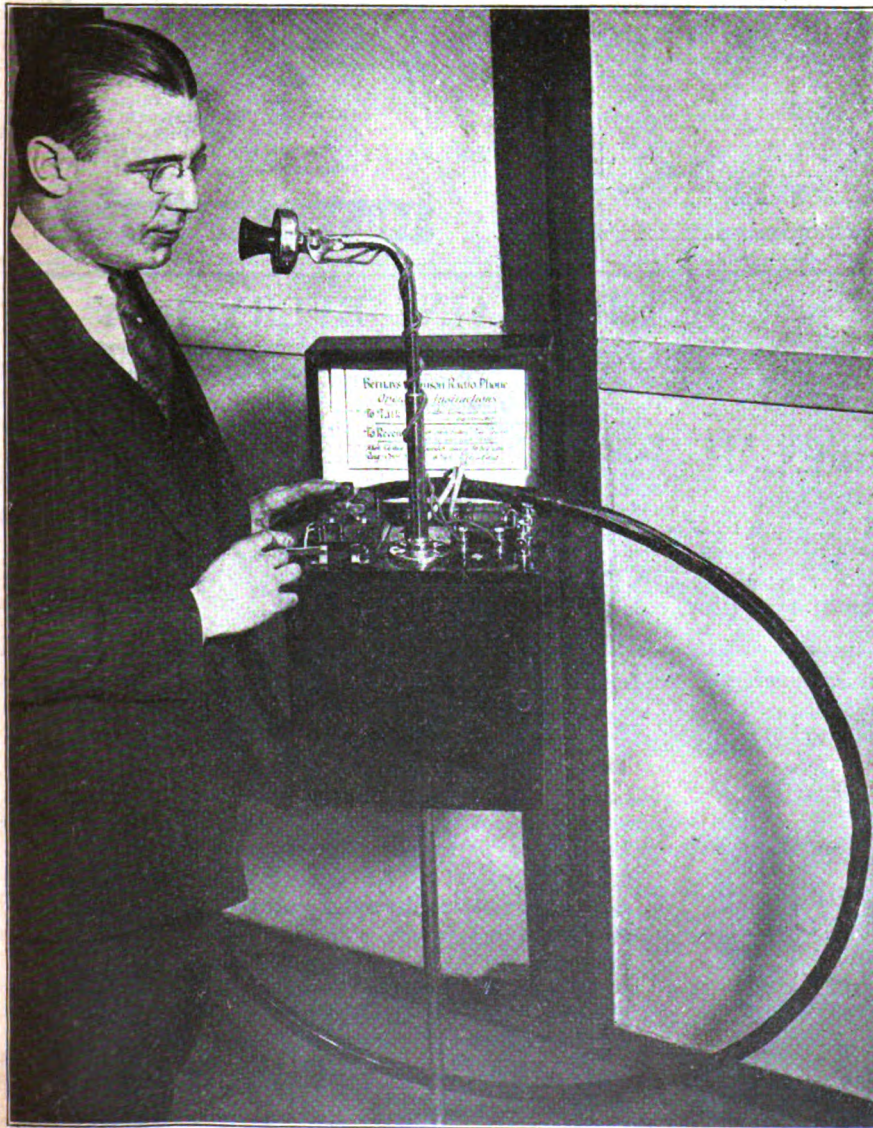
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For complete story of this remarkable invention, see page 25 (Both photographs: C. Kadel & Herbert)



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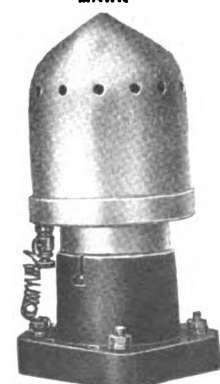
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VOLUME TWO OF
RADIO WORLD

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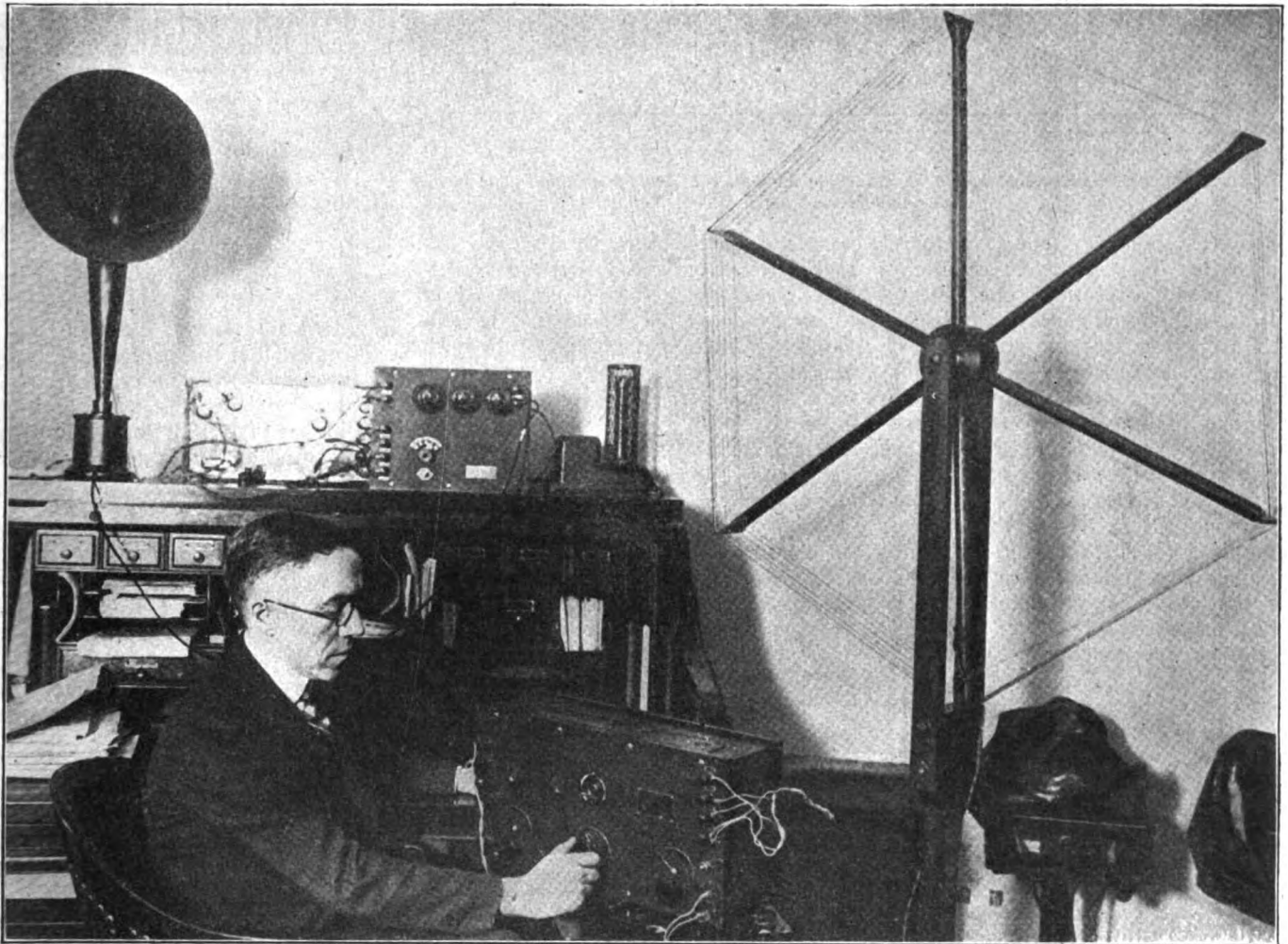
Vol. II, No. 16. Whole No. 42

January 13, 1923

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New Government Radio Set Has Valuable Hints for Amateurs

By Harold Day



(C. Wide World Photos)

A fitting illustration that radio is commanding an important place in governmental circles of the United States. The loop used in the set photographed was probably modeled after Mahatma Ghandi's spinning wheel, at least that is what it suggested to Mr. Day when he first examined the photograph. But by using an hexagonal loop, more wire may actually be strung on the loop than by the use of a square. This may give Radio World readers some new ideas in designing of loop aeriels. The illustration also shows that radio-frequency as used with indoor aeriels is becoming more and more common. It is only a matter of time when, probably, the only sets using outside aeriels will be the transmitting and the long-wave stations. If you study the photograph closely, you will notice that a resistance is used hooked into the regular lighting-current with an additional device to eliminate the commutator ripple from the circuit. This, also, is an idea that is coming into use more and more.

SOMETHING to cheer the amateurs' hearts. The accompanying photograph shows Congressman V. M. Brennan, of Michigan, listening in on the proceedings of the House of Representatives by radio. Mr. Brennan has introduced a bill to provide for the broadcasting of the

proceedings and debates in both branches of Congress. In Mr. Brennan the American amateur has a staunch friend and an enthusiastic radio fan. The set shown in the photograph is a radio-frequency layout using a loop. A power amplifier and horn may be seen on the desk above. Mr. Brennan

considers the radio set as important in his office as a dictaphone or a stenographer because it keeps him in constant touch with everything of importance that takes place. With three steps of radio-frequency and a power amplifier it is possible to hear every word spoken in the halls of Congress.

(Continued from preceding page)

Secure them firmly by means of three brass wood-screws which go through the panel from the front into the soft-wood base. Tighten them firmly, holding the panel rigid against the base. Mount the vacuum-tube sockets and the radio- and audio-frequency amplifying transformers on the base. When purchasing the radio- and audio-frequency amplifying transformers, be sure to secure those having the proper mounting symbols at the binding posts, so as to tell where the proper wire connections are to be made. This method will reduce the chances of making a mistake. In the internal wiring of the set, note that the writer has marked these connections on the amplifying transformers in Figure 4.

When all this is completed, the three fixed condensers are then mounted on the base in true relation to their respective connections. We are now ready for the internal hook-up, or connecting up, of this set. But before this is done, the figure, or diagram, illustrated in Figure 4 should be studied carefully as the most trifling mistake in the wiring will cause trouble.

There is a wire which connects with the negative side of the A-battery binding-post which, in turn, connects with one of the filament sides of each of the vacuum tubes, and which, also, connects with one of the connections on the potentiometer. There is another wire which connects with the positive binding of the A-battery which, in turn, connects with one side of each of the two rheostats. The remaining side of each of the rheostats connected with the remaining post on each of the vacuum tubes of the filament. This wire also connects with the other side of the potentiometer.

The remaining, slider connection, of the potentiometer connects with the secondary of the audio-frequency amplifying transformers on the filament side. The opposite side of the audio-frequency transformer, marked G, connect with the binding post marked 2.

The primary connections of the audio-frequency amplifying transformer are as follows: P connects

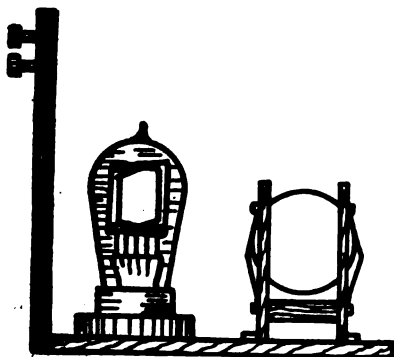


Figure 3—Diagrammatic side view of the set. The transformers should be mounted as far from the bulb as space will permit.

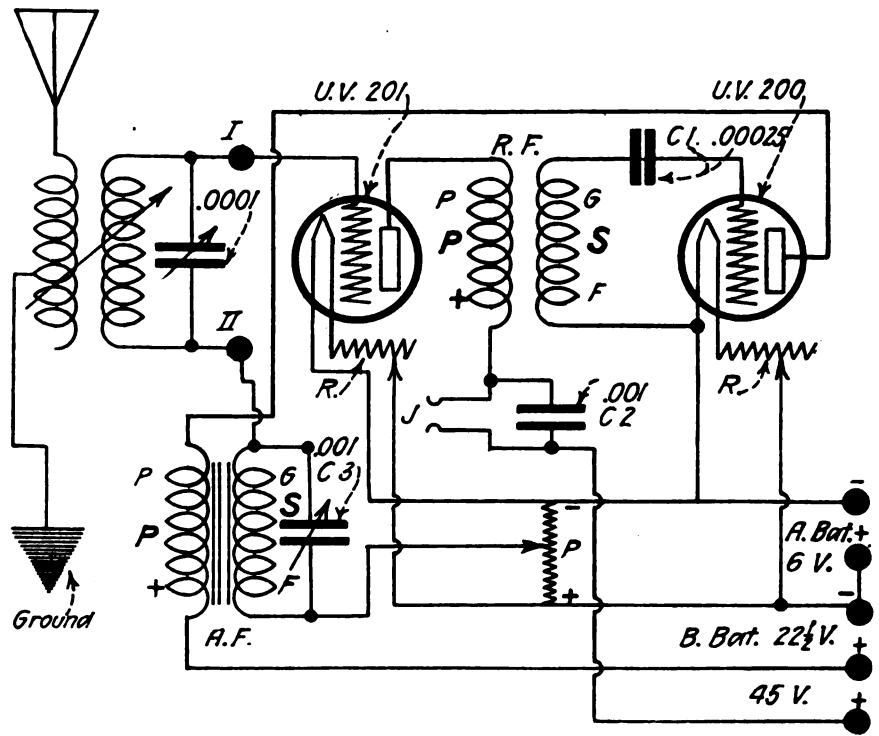


Figure 4—Schematic diagram of the hook-up of the apparatus. Note that the secondary of the audio-frequency transformer is hooked back to the end of the tuner.

with the plate of the detector tube. Positive connects with the 22½-volt positive binding post of the B battery. The fixed condenser, which is connecting across the secondary of the audio-frequency amplifying transformer is of .001 mfd., capacity. It is employed to allow the radio-frequency currents to pass. This applies to the fixed condenser which is shunted across the phones. There is a wire which connects with the lower blade of the jack which, in turn, connects with the positive binding-posts of the 45-volt B-battery connections. The upper blade of the jack connects with

the positive post on the radio-frequency amplifying transformers. The P, or plate, side of the radio-frequency transformer connects with the plate of the first tube, or the amplifying tube.

The secondary connections of the radio-frequency transformer are as follows: The G, or grid, connects with one side of the grid condenser. The other side connects with the grid of the second, or detector, vacuum tube.

The F, or filament, connects with one side of the filament of the second, or detector, vacuum tube. The grid of the first, or amplifying vacuum-tube connects with the binding post marked 1.

All connections are now made. The wiring should be of No. 14 bare copper-wire covered with varnished tubing. It should be rigid and straight.

The vario-coupler is connected in as shown in Figure 4. As in radio-frequency, the potentiometer is used to control the circuit. Its adjustment is rather critical. If the slider is carried over too far on the negative side, a loud howl is the result. Ordinarily the carrier waves of the broadcasting station are not heard because this set will not oscillate so as to make it possible to produce beat notes, which frequently happens in regular regenerative sets.

The principal advantage in using a set of this kind is the saving in vacuum tubes. Only two tubes are used, whereas all other sets use three tubes to get the same results.

The writer will gladly answer any questions regarding this set that do not require research or experimental work, if accompanied by a self-addressed, stamped envelope.

Radio Amateur Backbone of Country

Department of Commerce and Labor Pays High Compliment to American Operators.

THE increase in amateur activities so far as the radio amateur is concerned is being heard throughout the country. Recent reports issued by the Department of Commerce and Labor place no less than that of 17,000 licensed radio amateur operators on the fast-growing list.

This figure has taken practically the government officials into camp, and they now acclaim the radio amateur the backbone of the entire country. They say that these young men constitute a reserve of trained operators, some of whom have already done their bit in the recent World War. They proved themselves to be far superior to the average commercial operator when in communication in their line of work.

With this increased amount of amateur stations, and with the tendency of the growing demand for more licenses, one can imagine what the air must sound like, especially when on 200 meters, the wave allotted to them for their own operating use.

To the Radio Amateur with Little Money to Spend

By C. White, Consulting Engineer

NOTWITHSTANDING the fact that, during the past year, the progress and market for amateur radio-material enormously increased, development was quite logical and not so wild as most people imagined. When radio started on its way to greater popularity, due to the establishment of large broadcasting centers, many of my friends said it would not last since it was only one of those public fancies which, in the course of time, simply die a natural death. Such has not been the case, and, to the contrary, conditions in sales and service of radio supplies have multiplied.

By careful practice of economy it is not a very hard task to keep within the bounds of our money supply, or budget, for radio purposes. I shall endeavor to briefly outline several economies that may be practiced by various classes of novices. For simplicity of treatment, let us divide the general classification of novices as follows: first, the novice who has very little to invest in a radio outfit and does not wish to spend much on keeping the set in working condition; second, the novice who wants a small and highly efficient receiver without going to the trouble and expense of a storage A battery; third, the novice who wants a highly efficient type of outfit that will bring in distant stations with volume and great clarity.

For the first class of novice I would recommend a good crystal detector hook-up, provided he lives within twenty-five miles of a large broadcasting station. He should not purchase a type of crystal detector receiver which will have to be almost completely junked when he desires to expand his radio receiver for longer ranges. For ordinary broadcast and short-wave reception, he would do well to purchase a variometer as the tuning element, a .0005 mfd., mica condenser as a tuning condenser to be placed in series with the variometer, and a .001 mfd., mica condenser to be used as a by-pass condenser to be placed across the phone terminals; and, of course, a good crystal detector in a substantial mounting. When he wishes to expand this circuit to a single-circuit regenerative, all that he will have to do is to purchase a variable condenser, another variom-

eter, and the necessary accessories to go with the vacuum tube. As a crystal-set owner he will practically have no cost of operation since dry cells and other types of batteries will not be necessary.

Getting Down the Costs

For the second class of novice I recommend any type of receiver that employs a detector tube and any number of stages of audio-frequency amplification he thinks it advisable to purchase; but I would not consider any more than three stages with a regenerative detecting and tuning unit. The type of tube to be used is the new W-D 11 dry cell tube. The tube requires an average plate voltage of 40, but takes only $\frac{1}{4}$ ampere at $1\frac{1}{2}$ volts to light the filament. To economically operate a single tube, a No. 6 dry cell will serve the purpose very well, lasting, under normal conditions of employment, from two to four weeks. Now, since the life of a B battery ranges from six months to a year, and, under certain conditions, even longer, it is easy to see the cost of operating a two- or three-tube outfit will be around \$1.50 a month; that is, allowing an ample sum to be set aside each month for the purchase of a new B battery when the time comes. Quite a bit of B battery expense may be reduced if the amateur will purchase unassembled cells and solder the connections himself. With the money that is saved by the elimination of a storage A battery and its attendant expense, the novice may purchase one or more stages of audio-frequency amplification. Although the W-D 11 tube has all the above characteristics, it has two rather serious faults: first, it cannot be used for radio-frequency amplification; second, when used in the ordinary type of mounting in a receiver, it gives out a loud microphone sound every time the cabinet is jarred, even in the slightest manner.

The first fault is not very serious, since there are quite a number of amateurs who do not wish to delve into radio-frequency amplification, and the second can be cured by designing the tube mounting especially for a W-D 11 tube. The method is very simple. It consists in allowing the tube socket to remain loose

and not firmly attached to the framework, or the cabinet, as is customary. The leads running to the socket should be made of flexible wire in order not to transmit any metallic microphone wave to the socket. To keep the tube and the socket in its place, the socket should be attached to a piece of $\frac{3}{4}$ -inch felt, which is, in turn, attached, or glued, to the supporting framework. With the tube socket supporting-system modified to meet the above specifications, there will be no annoying hum no matter how hard the cabinet is tapped with the finger or otherwise jarred. Remember, in addition, that the W-D 11 tube is a hard tube and will not efficiently function as a detector with less than 40 volts on the plate, and that it has a very fine oxide filament that will stand little or no punishment from over-voltage before it is permanently damaged; do not impress more than 1.5 volts across the filament.

For the third class of novice I would recommend a three-tube superregenerative receiver or a reflex receiver using three or more tubes. If the novice is well informed regarding the tuning operation of a superregenerator, he will do well to get one, otherwise he would take a chance. But with reflex, or superregenerative, circuits the cost of operation for home use is apt to be very high unless strict economy is followed to cut down expenses. With such sets, a storage B battery is really the only thing to use since the plate current will be rather high, especially when a number of power tubes are employed. The A battery should be of the radio type of storage battery. The radio type is more desirable because it is so designed that it holds constant voltage on longer periods of continuous discharge than the ordinary automobile starter type. Naturally the amateur with such batteries to supply filament and plate power must have an ample and good way to recharge the same. It is most likely that a motor-generator of some sort, depending upon the initial power supply, would prove far more economical in the end than a tube rectifier. The amateur will do well to investigate the various types for A and B battery recharging apparatus now obtainable.

My New Noninterfering Detector

By *Harold P. Donle*

Chief Engineer Connecticut Telephone and Electric Co., Meriden, Conn.

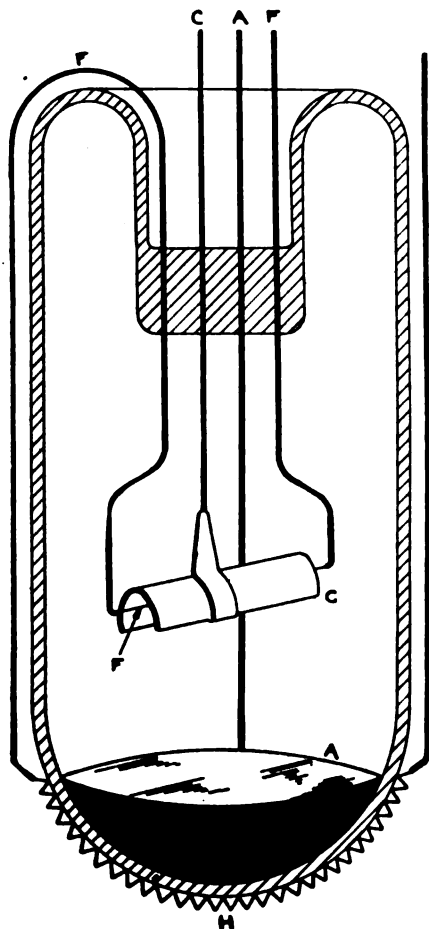


Figure 1. Diagrammatic illustration of the construction of the Donle noninterfering detector tube. In this illustration, (F) is the filament, which after passing through the tube, is cemented to the outside of the glass, where it acts as a heater (H), for the anode (A) which is metallic sodium. This heater's purpose is to maintain a proper operating temperature for the anode. (C) is the collector electrode, made of metal and located directly above the filament (F).

The photograph at the right shows the inventor, Mr. Donle, and his new tube, which, because of its inability to produce oscillation, is known as the "noninterfering detector." One of the peculiarities connected with the operation of this tube is that if the telephones are placed in the collector electrode-circuit instead of the anode circuit, the signals will be received with practically the same intensity.

ONE of the least efficient elements of modern radio is, despite the large amount of development since coherer days, the detecting system. Our best detectors are insensitive things when compared to galvanometers or telephones, and there appears room for considerable advance in increasing detector effectiveness.

The ordinary three-element tube as a simple detector is not nearly sensitive enough to satisfy the present demands. Many attempts have been

made to increase this sensitivity by including within the tube a gaseous atmosphere and while extremely effective detectors have been thus produced, they have required very delicate adjustment and in the majority of cases were not stable and required constant attention. Furthermore, it has been found practically impossible to reproduce in quantity tubes of uniformly maximum sensitivity.

The three-element electron tube and regenerative circuit is largely used at present for reception of radio signals. While it gives excellent results and certainly far exceeds in response any other method disclosed to date, nevertheless it has certain disadvantages and its widespread use has created a situation which is bound to retard the popular use of radio.

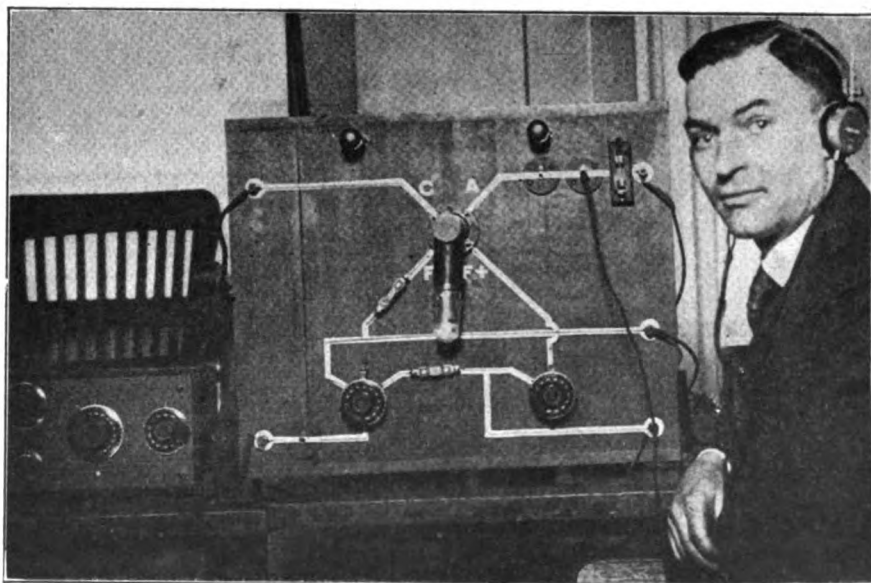
By using the three-element detector in a regenerative circuit greatly increased sensitivity is secured, but if regeneration is carried far enough to give worth-while response, there is produced considerable signal distortion. Furthermore, adjustments are critical, the slightest variation in capacity destroying the operating adjustment. What is still more important, the radiation from many regenerative circuits, particularly in the hands of inexperienced operators, creates an alarming amount of interference which if continued will seriously hamper reception of the present broadcasting programs.

There seems to be a definite need for a receiving tube which under no condition can radiate any energy from the

antenna to produce interference, which can be easily adjusted, which is not affected by the body capacity while the circuit is being tuned, and yet which secures all this at no sacrifice of sensitivity and loudness of response.

For several years we have conducted experiments on many different forms of detectors, and particularly upon detectors employing ionization of metallic atoms. This was a most promising field of development since such ionization was found to be readily controlled and stable. As one of the results of this work we have developed the present tube which is the logical result of experimental work which we have done along these lines. This new tube has none of the disadvantages of regenerative and gaseous detector systems above mentioned. Its method of operation seems to involve many interesting phenomena, which are radically different from those occurring in other tubes.

The construction of one form of this tube is illustrated diagrammatically in Figure 1 where F is the filament, A is the anode, which may be of metallic sodium in the bottom of the tube, and H is the heater, which is a short length of resistance wire cemented to the outside of the glass directly underneath the anode. This heater maintains the anode at proper operating temperature. C is the "collector" electrode of sheet metal bent into a "U" and positioned above the filament with its open side toward the anode.



(C. Photonews)

Harold P. Donle and his noninterfering detector.

Next! The Set that Works without an Operator

By R. L. Dougherty

THE automatic tape-recorder is a device that promises to play an important part in radio-telegraphy. The boast that is being made for it is that it will not make mistakes—and making mistakes is one of the faults that the human being cannot overcome. The tape-recorder not only will transmit and receive messages automatically, but at a rate of speed that cannot be distinguished by the human ear.

The recorder is a cousin to the recorder now in use in cable offices. It is known as a "syphon recorder." It was developed by Lord Kelvin in the first days of transatlantic cable telegraphy.

In this new recorder a very light coil is placed over the core of a very powerful electro magnet. This magnet is connected to the amplifying side of a receiver in the same way as telephones in every-day use. When an electrical impulse surges through the large magnet the small light coil moves in a vertical field. This actuates a very light arm, which is also attached to the smaller coil by means of a light link. At the other end of the arm is a pen, which rests lightly on a moving

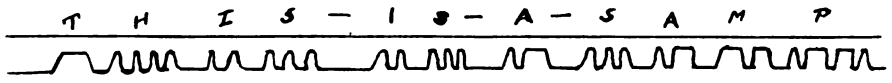


Illustration showing the manner in which a message is received. The long lines above center are dashes; the short ones, dots.

strip of paper. It easily may be seen that when the coil is pulled down the pen-arm will move up, causing the pen to make a vertical mark. So long as any current from the amplifier is flowing through the larger magnet the pen will stay up, but the moment the current ceases the pen-arm falls. Due to the fact that signals are sent automatically the dots and dashes are always of the same length in respect to each other; that is, a dash is approximately three times as long as a dot; and, therefore, it depends on both the speed of the moving tape at the receiving end and the speed at which the signals are being transmitted just how long a mark the pen-arm shall make.

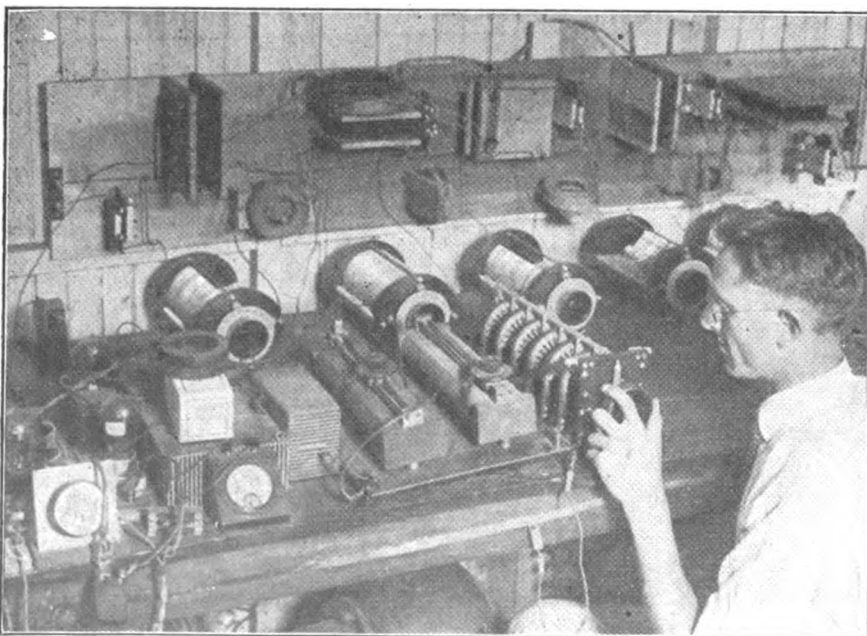
This device, which at present is being used in the reception and transmission of high-speed messages on very long wave-lengths, has proved an innovation. A man sits at a typewriter, and as the tape passes before

him he transcribes it in much the same manner as a stenographer transcribes her shorthand notes. Therefore, the messages may be sent at the high speed of 80 or 100 words a minute and transcribed at the receiving operator's leisure. This little machine is said to be infallible. Any one who has sat for hours with a pair of phones over his ears, listening to faint flute-like signals flashing through space and copying, copying all the time, will appreciate what this means to an operator who is obliged to work at high tension.

At the transmitting end there is a special typewriter, which perforates a moving tape. The keys of the typewriter, instead of being type-face, are punches. The tape passes through a machine in which short and long dots are made the agency for the generation of the waves, which flash across limitless space at the speed of light—186,000 miles a second!

Multicontact Switch Tunes 6 Circuits

By Donald Macgregor



(C. Kadel & Heibert)

This highly selective circuit is, in reality, six circuits in one. To tune it requires the multicontact switch shown in this photograph. This circuit is used for transoceanic radiotelephony.

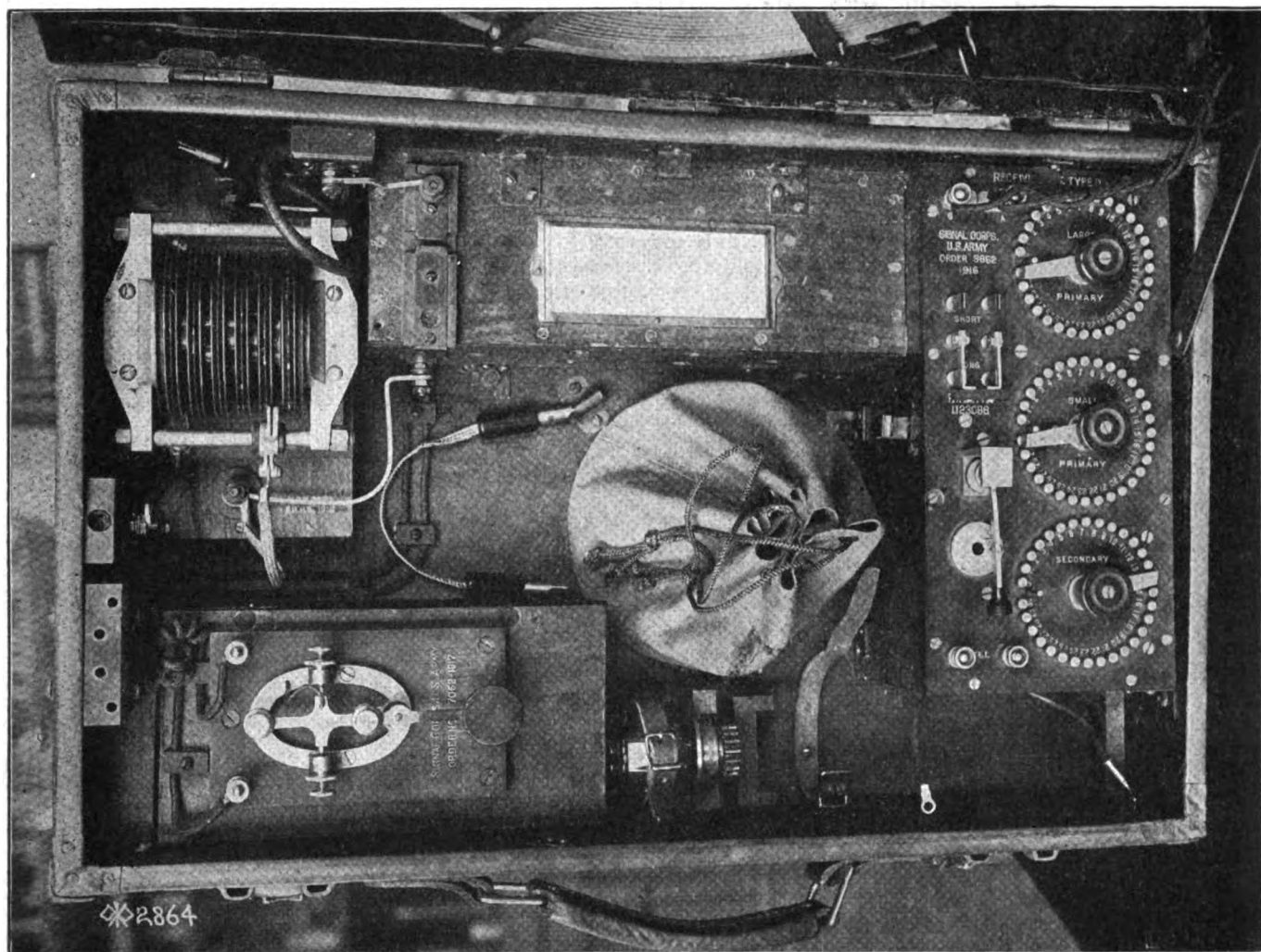
WHILE most amateurs have discovered that the single circuit is the easiest to handle and is very selective in tuning, experimenters are not satisfied. The accompanying photograph shows a "selector switch" by which it is possible to tune in six circuits at the same time. It is used for transoceanic radiotelephony, and is highly selective.

While the photograph shows the circuit in the experimental stage in one of the large research laboratories of the country, it has been discovered that, by the use of the selector switch, which permits any one of six circuits to be used, stations which cannot be tuned in with one circuit respond very readily to another. This opens a field of intensely interesting experimentation.

Imagine being able to tune six circuits at the same time with one switch! It seems impossible, but nothing is impossible in radio or anything else these days.

Use of the "Quenched Gap" in Radio

By S. R. Winters



Looking down at a portable, quench-gap radiotelegraph transmitting outfit used by the Signal Corps of the United States Army.

THE term "quenched gap" owes its derivation to the principle in electricity that a short electric-spark between cool electrodes is quenched instantly. Air becomes a nonconductor of electricity almost immediately after the electric spark is broken down, or as soon thereafter as the current is reduced to a low value. Such behavior is more orderly and positive if the sparking chamber is airtight.

The conventional form of quenched gap shown in the accompanying photograph of a portable radiotelegraph transmitting outfit used by the Signal Corps of the United States Army, comprises a series of flat copper or silver discs, the surfaces of which range from seven to ten centimeters in diameter at the sparking point. The faces of these discs are about two-tenths of a millimeter apart.

High electric voltage-charging involves the use of a number of small quenched gaps in series, thus providing the requisite length of gap or "electric bridge." The electric spark

jumps, or hurdles, all of these gaps, one after the other. The copper or silver discs are separated by rings of mica, or paper. A motor-driven blower cools these discs. The latter are commonly provided with projecting fins, fishlike, as a means of radiating electric heat. One commercial design of quenched gap is provided with air spaces between the pairs of discs, these serving as successive gaps. The amount of voltage used is the determining factor as to the required number of gaps, the ratio being about 1,200 volts for each quenched gap.

Only within recent years has this form of electric energy been employed on a supply frequency as low as sixty cycles a second. Recent experimental data indicate that it is feasible to use quenched gaps with 60-cycle supply. The results are evenness of tones and satisfactory communication by the use of a variable series resistance in the primary electric circuit of the transformer. It is likewise adaptable when employing a transformer of the resonance design with an uncom-

monly high secondary voltage. When varying the series resistance, the spark rate may be accordingly changed, as needs may dictate, to 60, 120, or 240 cycles a second. Such adjustment is beset with difficulties if line voltage variations are encountered.

Radio engineers consider the outstanding advantage of the quenched gap compared to the rotary gap to be its serenity of operation. The extremely short gaps and the imprisonment of the electric spark are conditions which obviate the noisy characteristic of the obstreperous rotary gap. The Radio Communication Section of the Bureau of Standards and the Signal Corps of the United States Army indicate that when employing a 500-cycle supply with a quenched gap, it is conventional to so adjust the voltage and the number of gaps that there is one discharge to the half cycle or 1,000 sparks each second. All in all, government wireless experts are of the opinion that the quenched gap will continue to function satisfactorily under close coupling.

The Radio Primer

*For Thousands of Beginners Who
Are Coming into Radio Circles*

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

WHAT is the meaning of the normal rate of discharge as applied to a storage cell?

This is the number of amperes that may be safely drawn from the cell without injury to the plates. This value may be found by dividing the ampere-hour capacity by the hour rating of the cells.

* * *

What is sulphating?

Sulphation, as applied to storage cells, is a snow-white deposit which forms on the plates. It is due to letting the cells stand idle too long on a discharge, or from too much overcharge. The sulphation of a cell means its complete ruination, as the active element is destroyed.

* * *

Name the precautions necessary when placing a battery "on charge?"

1. Open the vent caps in order to allow the gas generated in the formation of the charging of the plates to escape freely.
2. See that the electrolyte thoroughly covers the plates.
3. Make sure that you have the correct polarities.
4. Make sure your resistances are in the circuit. (Generally, a battery of lamps.)
5. Never allow the battery to heat up. If it is evident that heat is being generated, disconnect and allow to cool before resuming charging.

* * *

What is a lightning arrester?

An arrester generally consists of a very small air gap enclosed in a glass tube in which there is a very high vacuum.

* * *

Why is a lightning arrester safe?

Lightning has the property of always taking the shortest path to the ground. Therefore, owing to the fact that the coils in the circuit have considerably more resistance than the resistance across the minute air-gap, it will naturally take the path of least resistance—across the vacuum gap.

* * *

Why do they exhaust the air in such a gap?

As air has a high resistance to electricity, the less air in a vessel of such an article the lower the interval resistance.

Which is safer, a lightning switch or a vacuum arrester?

A lightning arrester is the safer because it is automatic. As the average human being is not infallible, he frequently forgets to throw the switch, leaving the set connected with the aerial. This cannot happen in the case of the arrester as it functions automatically.

* * *

Why must the positive (+) of the B batteries always be connected to the plate of the tube.

As the filament of a tube gives off negative electrons, we must put a

positive charge on the plate. This is due to the fact that, unlike poles, have a close affinity and attract strongly. Had we put a negative charge on the plate we would have a like charge on the two elements and they would repel each other. Likes repel; unlikes attract.

* * *

How is it possible to determine an amplifying tube from a detector?

Place the tube in the socket, put from 45 to 55 volts on the plate, and turn on the filament current. If, when the filament has become heated, the bulb turns blue around the plate switch off the current. This blueing denotes a soft or gaseous tube, and a detector. If it does not blue up when 55 volts are placed on the plate you have an amplifying tube (hard tube).

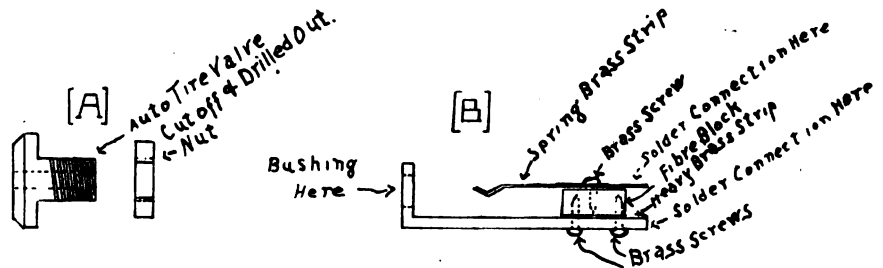
* * *

Why is a grid leak necessary in the circuit?

The grid leak is a little safety valve which allows the negative electrons stored up in the grid condenser to escape after a train of oscillation have charged the condenser to its capacity.

Easy Way to Make Switch-lever Bushings and Single-circuit Jacks

By Lester C. Doerr

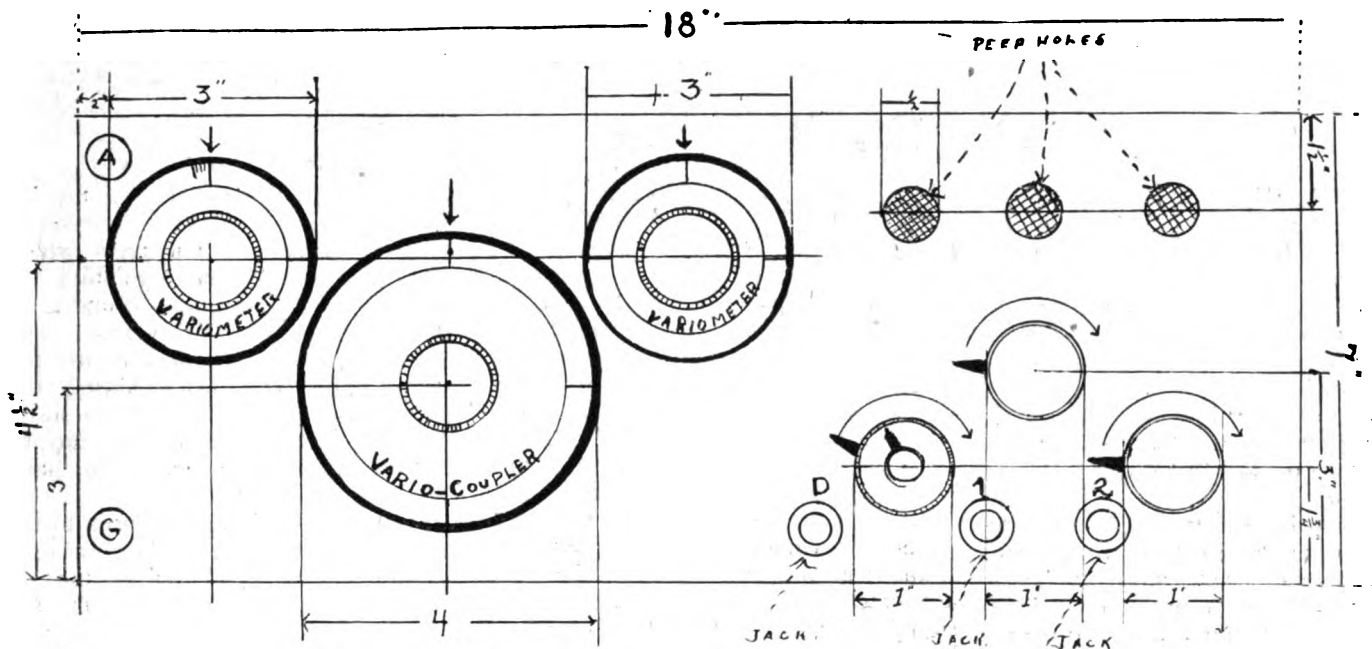


Details to follow in making switch-lever bushings and single-circuit jacks described by Mr. Doerr in the accompanying article. (A) is the bushing. (B) is the jack.

HERE is a little hint which may be of value to the radio experimenter. Old valves from automobile or motor-cycle inner tubes, usually found around the workshop, provide a source of neat and inexpensive switch-lever bushings. To make a switch-lever bushing, take a valve of the smaller size and cut it off to proper length with a hack saw. It should be just long enough to allow the nut to be screwed on after it is inserted in the panel. Then smooth off the rough end with a file so the nut will screw on easily. After this, drill out the hole large enough to take the bolt, or rod, to be used. These valves are of brass and nickel-plated, so a little polishing is all that is necessary to make a very presentable article.

The larger valves may be used to make telephone jacks, especially of the single-circuit type. They are easily made. The accompanying drawings show the construction of both switch-lever bushings and single-circuit jacks. If the experimenter desires to do so, other types may be made with a little more work.

Another wrinkle is the use of .22-caliber cartridges for switch points. Holes should be drilled in the panel just large enough to make a tight fit. Connections may be made either by wedging the wire into the hole beside the cartridge, or, preferably, by soldering. They are more attractive if polished. If the experimenter owns a rifle, they will cost him nothing but the trouble of saving them.



Panel layout for a regenerative set, embodying two variometers, vario-coupler, detector, and two steps of audio-frequency. Suggested by Cranby Meyers. Drawn by R. L. Dougherty.

How I Planned My Regenerative Receiver-Panel

By Cranby Meyers

THE three-unit regenerative circuit has come into popular use, and a number of amateurs may wish to build their own. The obstacle that stumps many of them is how to arrange all the instruments on the panel in order to conserve space and at the same time have a panel that looks at least half way snappy and workable.

Here is a layout I have worked out on my own set. I have given it to several other amateurs who built their own sets and they were so well satisfied that I thought other build-your-own fans would be interested.

I was limited, in the first place, to a panel 7 by 18 inches owing to the fact that my desk had just that much space in it; and, as I was desirous of putting it in the desk, I drew my plans accordingly. I think I have made the plans so clear that everything is fully explained in the drawing. However, if a large dial is used it will give the panel a better balance and finish because all the rheostats are at the other end of the panel.

It will be noted that, on the detector, I am using a vernier rheostat. I found that this is just as necessary in fine

tuning as is the variometer because I am using the W-D 11 tubes. At the same time they will amplify a signal very much better if the rheostat is turned down just a little bit.

I hope that this will help some of the fellows who are building their own and are stumped at the idea of efficiently laying out a panel that has a balanced appearance. A few hours spent in carefully drilling the holes and paying close attention that everything is laid on neatly will repay the builder a thousand times, and he will have a perfect piece of apparatus.

Every DX Night Owl Will Want This Article!

"DX Work With a W-D 11," by Ortherus Gordon, with Full-Size Diagrams for Building, in Next Week's RADIO WORLD, No. 43, Dated January 20—A Most Important Contribution to DX Work. Mr. Gordon, writing to the Editor of RADIO WORLD, says of his article:

I WANT to say that, if you wished, you could print an unqualified guarantee that a radio receiver built along the lines shown and connected up as shown, will meet the demands of the most fastidious amateurs. Night after night, I do things with this little set which would put the complaints of the ordinary DX night owl to shame. I am feeling now, more so than when I prepared the article for you, that it is my outstanding contribution to amateur progress during the past year.

Last night, on an 80-foot aerial, 35 feet high, single wire, I tuned out WMAN at Round Hill, South Dartmouth, Massachusetts, and brought in WDAJ at College Park, Georgia, which is considerable distance for a peanut tube with no amplification. Tuning out Round

Hill is a feat in itself, for this station is only twenty miles away and comes in like the prodigal son—all at once and all over the place. Bringing in a station which is nearly a thousand miles distant on a dry-cell tube is genuine DX work.

I should be glad to hear from any amateur who makes this W-D 11 set and to compare work done with it. I've been a radio bug for a long time now, but I've got bitten all over again with this W-D 11 outfit, and my brow is as feverish as ever.

Yours very truly,

ORTHERUS GORDON.

57 Smith Street, Fall River, Mass., December 31, 1922.

Battleship to Fire on Radio-Controlled "Iowa" in War Game

WASHINGTON, D. C.—Indirect firing of 14-inch guns by one battleship at another under way, but out of sight over the horizon, will be undertaken for the first time early in March at the Naval maneuvers in Panama Bay. The target will be the radio-controlled "Iowa" of Spanish War fame, unmanned and unarmed, but operated by an officer on the "Shawmut," several miles away.

Radio will bear two very important parts in the battle practice of the combined United States fleet, this year: the maneuvered target ship will be sent out to sea under radio direction. When she is out of sight, indirect fire at her will be undertaken by the aid of radio observation and spotting furnished by airplanes.

The "Iowa" is a twenty-five-year-old warship. She has more than served her time. For the past two years, she has been known as Coast Battleship No. 4, honored here and abroad as the first radio-controlled ship of war. Her actual bombardment with heavy gunfire from the "Mississippi," designated as the attacking vessel, has occasioned considerable interest not alone in the Navy but in Congress. Secretary Denby's invitation to the members of the Senate and House Naval Affairs Committee to witness the tests, has brought a flood of requests for transportation to Panama Bay, in March, for the scheduled bout. A program of several varieties of battle practice gives promise of an unusual spectacle seldom witnessed except in actual warfare and then only by officers and men in the engagement. The Navy is not thinking of the spectacular side, however, but seeks to determine whether its present methods of range finding and fire-control, and the instruments used are efficient, and this is the first time an opportunity has been afforded. The effect of gunfire on armored vessels is well known as other battleships have been anchored and blown to pieces by our expert gun pointers and trainers.

Literally the "Iowa" is a modern, steam "Flying Dutchman," without skipper or crew. Some time ago, far-sighted radio engineers of the Navy developed a special method of radio-telegraph control for the "Iowa" based on the inventions of John Hays Hammond, jr., and aided by engineers of the General Electric Company. Today it works perfectly—her water and oil tanks are filled, her oil-burning boilers and engines are started by a skeleton crew of caretakers. Her con-

By Carl H. Butman

trol ship takes her over, and the crew abandons ship. By means of radio, her engines are speeded up and slowed down, her rudder is thrown to port or starboard, or maintained at a desired angle, and she performs within a fraction of a second at the will of the "master mind" aboard the control ship which may be ten miles distant. A special feature of her equipment prevents her running away, stopping her if the control is broken, or the aerials are shot away. If no radio-control signal reaches her "electric-mechanical brain" for so long as fifteen minutes, the fires are extinguished, the engines stopped and everything shut down. This enables the crew to again board her, repair defects and start her on another "flying dutchman" cruise.

Five basic problems of gunfire will be undertaken with the old "Iowa" as a moving target, in an effort to simulate as nearly as possible wartime conditions. Towing a target for gunfire restricts the angle of fire somewhat to avoid hitting the towing vessel. With the "Iowa" under radio control and the "Shawmut" a safe distance away, this objection is obviated.

In the first practice only, the secondary batteries—the 5-inch rifles—of the "Mississippi," will be used. The purpose is to determine whether a rapid rate of change of range can be covered by our present fire-control system. The "Iowa" will be run at varying speeds while under fire; thus observers will learn whether fire control apparatus can meet the requirements.

The second test will be for the 14-inch turret guns of the "Mississippi" and will represent maneuvers which might be expected when two ships are engaged, where frequent changes of course are made by both vessels. The idea is to test out whether or not the "Mississippi" can keep hitting the enemy ship undisturbed by the shifts of course and whether the instruments now employed are adequate for such firing.

Turret guns will also be used in the third practice, where a ship, engaged by another, makes a decided turn to right or left. The effect on the accuracy of fire is sought and it is also desired to learn whether it would be possible to discern such a movement quickly enough to correct the training of the guns without affecting the accuracy or rapidity of fire.

Night Attack and Indirect Fire

The fourth event scheduled will simulate a night attack. It will be the most spectacular, probably, as it includes the use of searchlights, star shells, and other artificial means of illuminating the moving target-ship. Here, again, only the 5-inch rifles will be employed.

In the fifth and final gunnery exercise, a test of the use of 14-inch guns for indirect fire is planned. It will be the first time an effort to study the desirability and practicability of this method of fire has been tried by ships at sea. In clear weather this would mean a range of over 25,000 yards, but in hazy weather or over a smoke screen, this method might be used at a range of about 15,000 yards. In this maneuver, aircraft will be used for observation and spotting, radioing constantly to the "Mississippi." It is understood that no aircraft will take an offensive part—that is, no bombs will be dropped as was the case a year and a half ago in the maneuvers off the Virginia Capes.

As it is not desired to sink the "Iowa," special projectiles will be used. They will have very thin walls and supersensitive fuses. These shells will be filled with high-explosive charges. It is expected that when direct hits are made they will all explode on the armor plate of the vessel and break up rather than penetrate her. Since the World War the "Iowa" has not been kept in the same condition as a vessel in active service. She is far from the last word in warships and her armour and water tight compartments are not modern. It is possible, therefore, that if she is hit many times at weak points, she may sink.

The Boy's Radio

By C. A. Boulton

THE boy sat in his room one night
Just listening with all his might.
His mother called, but he would not go
Because he loved his radio.

He gets the stations far and near;
And everything comes loud and clear
Except the warning voice below—
Which does not come by radio.

His mother goes up to his room
And incidentally takes the broom.
But here's one thing she didn't know:
It's dad who has the radio.

An hour goes by. The lunch is cold,
And yet we don't hear mother scold,
For she has let the luncheon go
To listen to the radio.

Chief Characteristics of the W-D 11

By John Kent

WHEN a man has dabbled in radio a certain time, he wants to "roll his own." One of the great stumbling blocks is whether he will use the regular 6-volt tube or the new 1½-volt (W-D 11) tube. This little tube, through the agency of being a wonderful detector and a stable amplifier, is rapidly claiming the attention of the entire radio world. Due to the fact that the filament is oxide coated and of low temperature, it only glows a dull red when in use.

But owing to the fact that the base is entirely different from that in current make of tubes, it requires either

an entirely different socket or an adapter.

The characteristics of W-D 11 were compiled by the experts of the Radio Corporation of America and are as authentic and correct so far as it is possible for such things to be. They are as follows:

Filament—Oxide coated. Low temperature. Current consumption, 0.20 ampere. Terminal voltage, 1.1 volts. Source of voltage, standard 1.5-volt dry cell.

Plate—Voltage for detector, 22.5 volts. Voltage for amplifier, 22½ to 45 volts.

Grid—Condenser capacity, .00025 leak, 2 megohms.

Output impedance—20,000 ohms at 40 volts plate-voltage.

This little tube is very stable in action and, probably, one of its greatest recommendations is its absolute freedom from noises common to other tubes. Another recommendation—one that is very necessary in these days of regenerative circuits—is its absolute stability of oscillation. It is one of the finest little oscillators on the market. Owing to the fact that they are standardized they may be used either as detector or amplifier.

Radio Develops Chicks

EXPERIMENTS conducted by John T. Thomas in an incubator hatchery at Columbus Grove, Ohio, have demonstrated that radio has a beneficial effect in stimulating the growth and development of young chickens and produces strong and sturdy fowls. The discovery was accidental but confirmation of such results was proved by a series of tests and experiments covering a period of several months. Mr. Thomas hatches approximately 3,000 chicks a week, requiring his personal attention almost hourly day and night. With a view to relieving the monotony of the long hours of vigil he installed a wireless outfit, over which he received broadcastings for his own entertainment, consisting largely of musical concerts.

It was not long after Mr. Thomas sought this diversion that he noticed that the radio programs were having the effect of lulling his little chicks to sleep. Without the music they were restless and nervous, but as soon as the instrument was tuned they became quiet, and soon were asleep. The result of the abundance of sleep and relaxation was more rapid growth, better health and physical condition and stronger development.

(Continued from preceding page)

but the Navy Department desires that the five tests be made without any such mishap. Her radio-control apparatus is of considerable value, being the first remote-control system for a full-sized seagoing vessel in the world. Then too, future radio-control development in the Navy will undoubtedly be based upon this, the first radio warship.

The "Iowa," now at Norfolk, will be towed to Guantanamo, Cuba, by the "Prometheus," and from Guantanamo will be towed to Panama Bay on the Pacific Side of the Canal.

Captain W. D. Leahy, commanding the "Shawmut," will virtually control the "Iowa" during the maneuvers, with Lieutenant-Commander R. F. McConnell in charge of radio installations. Ensign Hertz will also assist in radio-control work.

576 Broadcasters Started the New Year

On January 1, 1922, There Were About 5 in Existence.
Class-B Stations on 400 Meters Now Total 25

By Washington R. Service

TOTAL broadcasters on January 1 numbered 576, according to the records of the Radio Section of the Department of Commerce. A year ago there were but four or five such stations. The growth has been phenomenal and still continues, although in a less rapid degree than during the first seven months of 1922.

During the month of December, 31 broadcasting stations were licensed, and 20 dropped out for one reason or another, showing a gain of 11.

Of the total broadcasters today 25 are in the B class, transmitting on 400 meters, a privilege granted only to the best stations which apply for this means of getting out of the regular broadcasting band.

The future of radio as a popular pastime depends to a large extent on the pending bill in Congress, especially as to the re-allocation of wave-lengths. It is of interest to all fans as by this means the ether will be cleared of much interference. But the future also depends upon broadcasters and the great radio public of "listeners-in." What they want will probably be granted. If radio broadcasting is to become a public utility, as is predicted, the public must back it up and insist on necessary laws, regulations, and authority for the Secretary of Commerce to work out.

Eight new broadcasters were licensed during the last week of December. Seven were licensed on 360 meters. The new stations are the following:

WRAM—Robert E. Compton, and Carthage College, Carthage, Illinois.
WQAC—E. B. Gish, Amarillo, Texas.
WPAW—Radio Installation Co., Inc., Wilmington, Delaware.
KFCM—Richmond Radio Shop, Richmond, California.
WPAX—S-W Radio Co., J. R. Shumate, Jr., Thomasville, Georgia.
WPAV—Paul Tinetti & Sons, Laurium, Michigan.

KFAZ—C. H. Weatherell, Reddley, California.

The eighth station, class B, on 400 meters, is:

WCAE—Kaufmann & Baer Co., Pittsburgh, Pennsylvania.

Broadcasters Deleted from Commerce Lists

In December the following 20 broadcasters were dropped from the rolls of the radio lists:

WLAD—Arvanette Radio Supply Co., Hastings, Nebraska.

WAAV—Athens Radio Co., Athens, Ohio.

KFBJ—Boise Radio Supply Co., Boise, Idaho.

WKAM—Adam Breed, Hastings "Daily Tribune," Hastings, Nebraska.

WJAH—Central Park Amusement Co., Rockford, Illinois.

WMC—Columbia Radio Co., Youngstown, Ohio.

WCAZ—Robert E. Compton, Carthage, Illinois (new license and call, WRAM, December 29).

WAAG—Elliot Electric Co., Shreveport, Louisiana.

WCJ—The A. C. Gilbert Co., New Haven, Connecticut.

WDAN—Glenwood Radio Corporation, Shreveport, Louisiana.

WAAR—Groves-Thornton Hardware Co., Huntington, West Virginia.

WFAR—Hall & Stubbs, Sanford, Maine.

KDYR—Pasadena Star-News Publishing Co., Pasadena, California.

WPAN—Levy Bros. Dry Goods Store, Houston, Texas.

KGF—Pomona Fixture & Wiring Co., Pomona, California.

WAAO—Radio Service Co., Charleston, West Virginia.

KFBA—Ramey & Bryant Radio Co., Lewiston, Idaho.

WJAC—The Redell Co., Joplin, Missouri.
KYF—Thearle Music Co., San Diego, California.

Radiograms

The Latest Important Radio News Briefly Told for the Growing Army of Radio Fans

GREETINGS from Vice-President Calvin Coolidge broadcast from WGY, in Schenectady, by use of the pallophone, were heard in England, according to a cablegram received from Arthur Brooke, 69 Renshaw Street, Liverpool. Mr. Renshaw's cable reads: "Using an indoor aerial forty feet long, heard your program broadcast both December 23 and 24. Christmas Eve I used loud-speaker and five tubes and was able to pick up your entire program."

Charles B. Cochran of London, sent holiday greetings by wireless to friends in New York. To insure as prompt delivery as possible through the general holiday closing, the Radio Corporation of America, on receipt of the messages, phoned them to the office or home address of the recipient.

Newark's WOR broadcasting station announces the reading of the new Roosevelt Boxing Rules by James J. Corbett for the benefit of boxing fans.

According to Secretary Denby, the United States Navy will fight vigorously any attempt to bring its radio operators under commercial license. This was the Secretary's declaration following the statement of Secretary of Commerce Hoover before the House Merchant Marine Committee, urging that all radio operators, including those of the Navy, be compelled to take out licenses from the Department of Commerce under the proposed Radio bill. Secretary Hoover declared that inasmuch as the Navy Department was accepting commercial business it

should not be an "outlaw" among other broadcasting agencies. That broadcasting of Sunday night sermons should not have priority over amateur transmitting stations was contended by Andrew E. McNaughty, president of the Wireless Association of Pennsylvania.

An interesting weekly feature of WGI is the broadcast every Saturday evening at 6:30 on the condition of highways in Massachusetts and bordering States furnished by the Automobile Legal Association. This broadcast gives the motorist information on the condition of the trunk lines highways over which he is liable to drive during the coming week, and is of great assistance in saving time and temper over detours and poor roads.

Gene E. Witham, a Brooklyn lad, succeeded in picking up the weak signals from a French amateur station, located in Nice, southern France. A Reinartz tuner, equipped with a single vacuum tube, was the only apparatus used. The CW signals were heard for nearly twenty minutes.

Lester Drummond Payne, an old-time radio operator and a brother of the managing editor of the London "Daily Mail," was found dead in his shack on board the Norwegian steamer "Louise Nielson."

It is estimated that there are close to two million radio receiving sets tapping the ether lanes in the United States at the close of 1922, and that this number will increase to at least three million by the end of 1923.

Each Friday afternoon, at 1:30 o'clock, you will hear from WLW, Cincinnati, a lesson on the guitar. These lessons will be given by J. F. Roach and will be in the exact form of phonograph records made by Mr. Roach for students. After the lesson Mr. Roach will play two solos accompanied by Mrs. Roach, pianist.

Additional weather forecasts and warnings will be broadcast from NAT, the Naval Radio Station at New Orleans. These broadcasts, on a wave of 1,832 meters, are for the district included in Louisiana, Arkansas, Oklahoma, and Texas and comprise weather forecasts, river conditions, and a summary of the conditions over the United States twice daily. The scheduled calls for a broadcast at 10:30 A. M. and 10:00 P. M. at 75th meridian time.

Where the aerial on vessels at sea has been damaged good results have been obtained by operators throwing winding wire in spiral fashion around the operator's body and using that in the place of the aerial.

Play-by-play radio reports of the Penn State-University of Southern California game on New Year's Day were handled by KDKA from Pittsburgh. The movements of the players were described over the telegraph from the gridiron at Pasadena, California, and translated by an announcer at the Pittsburgh broadcasting station.

KDYS recently received fifty-four telephone calls, asking for an encore of one of its program numbers.

In an effort to improve the programs of the various broadcasting stations, the Pacific Radio Trade Association and the broadcasters have agreed to omit mechanical music between 8 and 10 in the evening and to cut out all broadcasting between 7:30 and 8 o'clock so that fans may have an opportunity to listen in on long-distance stations.

England received radio messages of twenty-three American amateurs in one day recently.

Radio has a children's hour. From 5 to 5:30 P. M., every day except Saturdays, has been set aside at WGI specially to entertain children. On Monday, there are hero and adventure stories for boys; on Tuesday there are fairy tales for the little ones; on Wednesday there are animal stories; on Thursday stories of the world we live in are told, taking themes from land and sea that answer many questions in the minds of growing boys and girls; Friday evening is for the girls around the Girl Scout age; Sunday afternoon will find Bible stories and various myths and legends on the program.

My Set and How I Made It

By Donald W. Kleitsch

2121 East Fourth Street, Duluth, Minnesota



Donald W. Kleitsch at his set.

MY set is a single-circuit tuner with a detector and one step of audio-frequency. I use a graphite-pressure rheostat, to control the detector filament, and find that it gives very much finer tuning. I also use a wire rheostat for the amplifier filament, 200-radiotron tubes, and 201 for detector and amplifier. The body capacity, when tuning the condenser, gave me a lot of trouble, so I shielded it with aluminum and connected the rotary plates to the aerial. After doing this, I practically eliminated capacity effects. A phone condenser is placed across the De Forest amplifying transformer. I use a 43-plate condenser in the aerial circuit and a 2500-thousandths fixed-condenser in the grid circuit. This set has a range of about 150 to 650 meters. The cost—without tubes, batteries, or phones—was about \$34. I have received Schenectady and Lockport, New York; Pittsburgh; Fort Worth and Dallas, Texas; Denver, Colorado; San Francisco; Atlanta, Georgia, and many others.

Radio and the Woman

What the Great Game of Radio Brings to a Woman Who Has a Set in Her Home

By Crystal D. Tector

EVER since Friend Husband and I learned code, we have taken a great deal of interest in C-W fans on the 200-meter wave. You'd be surprised what distance you can cover on the lower wave-length. I used to think that it was great to tune in Davenport on one tube; but on nights when programs are not so interesting, we always tune in around 200 meters and listen to the "sixes and sevens" trying to get the messages through and their "hooks cleared," as they call it. We have become quite expert in the code. It is really a lot of fun.

THE other night, when Friend Husband went to his lodge, I called in Mrs. K—, my neighbor, to listen in with me and otherwise pass the time. We sat there listening in, and as my friend doesn't know code, I had to keep up on from 360 to 400 meters. About 11 o'clock, we happened to get Havana. PWX had several wonderful tenors and baritones singing some extremely sentimental Spanish music. Mrs. K. and I just sat there and listened—and listened! Suddenly, the door opened with a rush and F. H. hurried in. "Say, you're a fine one!" he exclaimed, looking straight at me. "Mr. K. came home from the lodge with me and has been worrying about Mrs. K. And here I find you both listening in—and it's two-thirty in the morning."

Perhaps I was really thoughtless; but, even at that, you don't hear PWX every night in the week.

I WONDER when I will cease to be taken as a radio expert by the woman readers of this column. This week, I received over thirty-five letters from various women, all asking me to give them advice. I think I will have to apply for a R. E., pretty soon.

NOW I know that I'll never get any rest. Since F. H. has put up that loud-talker with the power amplifier and the Vincent Lopez orchestra is transmitting from WJZ, all my friends want to do is come over and dance.

"I WISH you all a Very Happy New Year!" These were the very words, with a pleasant southern drawl, that issued through the loud-speaker in my radio room. We were having a radio New Year's party and there were a number of friends present who have sets at home.

"Oh, I wonder who is announcing from WHN tonight! He seems to be a Southerner!" exclaimed one of my friends who prides herself on the fact that she has such a wonderful set for DX work.

The announcer had said: "This is station WGM, the Atlanta 'Constitution.' We will now continue with our program."

"Oh! that can't be possible," continued my friend. "Why, I can barely hear him with the phones on. And here he is, loud and clear! Oh, my dear, how do you do it?"

And the evening was spoilt, so far as my friend was concerned. Of course, I didn't tell her that Friend Husband had just put in a Power amplifier along with three steps of radio-frequency; but I don't like to start the New Year off wrong, so I'm going to tell everybody else and then maybe somebody will tell my astonished friend.

I RECEIVED a letter from a young girl in the Middle West. While what she says is unusual, it is the old story told in a slightly different way. She says that she had an appointment to broadcast a little talk on social science from one of the large stations. She was a total stranger in the town. When she had finished the announcer, of course, told the listeners that any one who wished to communicate with the talker could reach her care of the station. The next morning she received a letter from a young man in a neighboring town, requesting a meeting if it could be arranged. She, being a stranger and lonesome, thought it could, and asked the station operators if any of their acquaintances could formally introduce them. The introduction was arranged and—well, this happened about four months ago. Along with the letter she sent me an announcement of her engagement. Friend Husband became unduly hilarious when he read the letter. "That should teach a lot of young fellows not to meddle around with broadcasters," he remarked in his best "I-am-a-lawyer" tone of voice.

But say I: "Cupid will not be discouraged even if he has to turn to radio for help."

* * *

A YOUNG man writes me that his sister insists he shall install a loud-speaker in the parlor so that music from the local station may be heard when she is entertaining her beau. The young man wants to know if this is possible.

Surely; but it has this drawback: If my correspondent is of the type not satisfied to listen to one station for any length of time his sister probably will be greatly disappointed, and may have a great deal to say after the "show is over."

* * *

FRIEND HUSBAND came home the other night emitting an odor that resembled a popular beauty shop. His nails were manicured almost to distraction and his hair was bright and glossy. After cross-questioning him the truth escaped. He visited a barber shop in New York City, and he said: "They had a radio set and the program was so interesting I simply had to hear it all; and, as it wasn't a public lounging-room, I had to have some valid excuse, besides being shaved and having my hair cut, to stay and listen to it all; so I had everything done except a permanent wave."

My Picture for This Week

By Crystal D. Tector

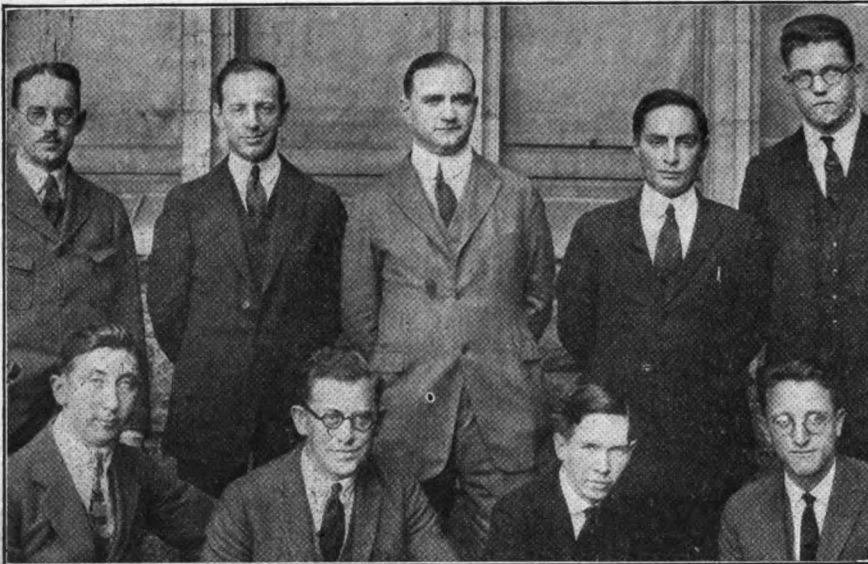


(C. Kadel & Herbert)

YOU will remember that, in last week's RADIO WORLD I mentioned the fact that there was a set at the American Radio Exposition made in ivory and gold. I have just received a letter asking me if I thought everybody "was as ignorant as that." It "got my dander," so that I went on the warpath and told Friend Husband that if he expected to live in peace with me this year, he would have to secure a photograph of this set so that I could convince the skeptics that sometimes when it glitters, it really is gold. Here is the photograph!

The little wires and knobs in the upper left-hand corner are miniature jacks and plugs of solid gold, by which any combination of instruments may be connected without the trouble of rehooking the set from the back of the panel. This, of course, is a very great improvement as it allows any number of circuits to be tried out. The panel is of ivory.

Radio's First D as These P



(C. Kadel & Herbert)
(Above) A group of the engineering specialists of the research department of the Radio Corporation of America. Upper row (left to right), Messrs. Van Dyck, Weinberger, Dr. A. N. Goldsmith, director, Shapiro, Rarson. Bottom row (left to right), Messrs. Rooker, Miller, Dickey, Ringel.



(C. Underwood & Underwood, N. Y.)

Captions by John Kent



(Left) American amateur radio operators, members of the American Radio Relay League, failed in their attempt to receive messages from amateur stations in France and England, owing to the low power of the transmitting in those countries. That the results were unsuccessful is due also to the fact that a number of American amateurs neglected to keep an absolutely "quiet air" during the tests. Here are three of the men who looked after the American end of the test at the Relay League station at Hartford, Conn. Left to right, are Hiram Percy Maxim, president of the League; F. H. Schnell, traffic manager, and Kenneth B. Warner, secretary of the League.

(C. International News Reel)



(C. International News)

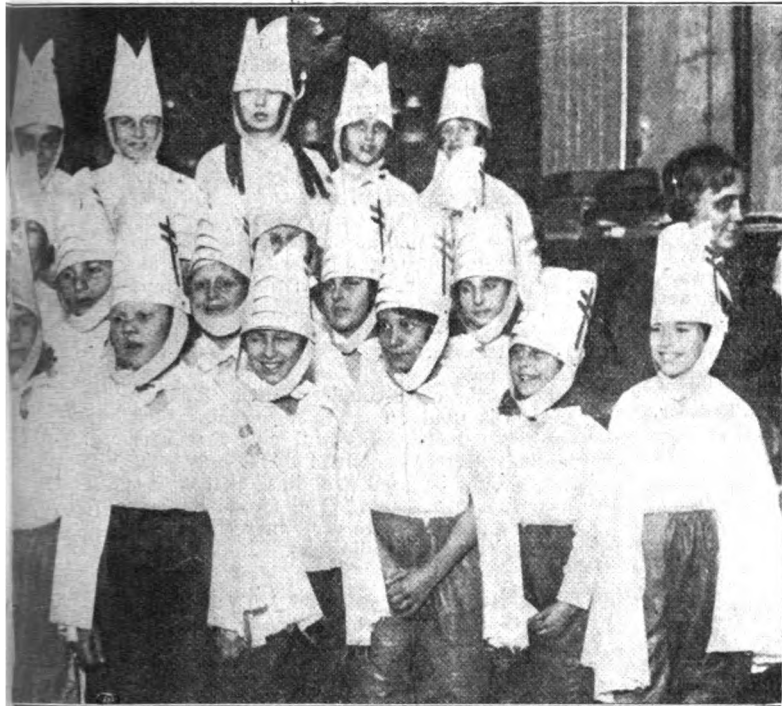
(C. Wide

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Days of 1923 Are Busy Photographs Show



(Left) Pupils of the Dennison School, Washington, D. C., who make a specialty of singing health songs in order to make the public purchase tuberculosis seals to increase the fund for the prevention of that dread disease.



(Left Photos) Crew of the steamer "Minnekahda," who established a radio communication between ship and shore. Their radio was heard 4,000 miles. (Left to right) C. B. Delahunt, G. H. Harvey, T. J. Nunan.

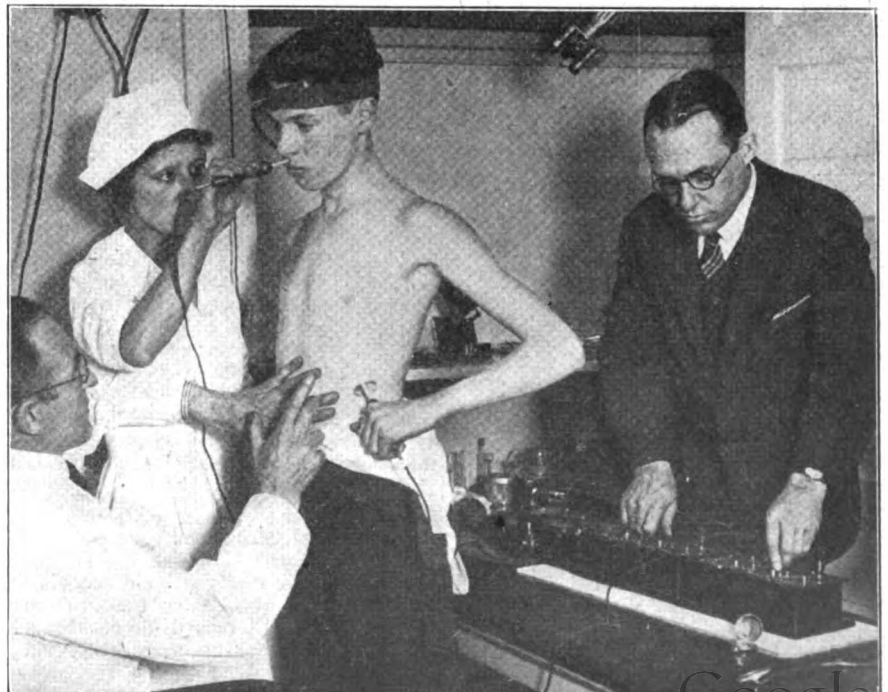
A battery powered radio transmitting-set was installed on the Overland steamer from San Francisco to Chicago and concerts were broadcast over a distance of 1,000 miles. Miss Eleanor Whittemore, violinist, is playing a Kreisler composition.

A method used for locating disease on the subject (not the patient). The sample of the patient's blood is obtained he may leave, as all the tests are conducted on a healthy subject. The theory is that the radio waves of blood acting through the brain centers causes nervous reflexes in the "subject," producing dull sounding areas in the abdomen corresponding to disease sought for. Every disease has a certain known vibratory frequency. V. Hillman (on extreme right) is tuning in on the disease sus- pected. The nurse is applying an electrode to part of subject where the disease is indicated, this indication being determined by Dr. Clarke Francis who is shown tapping the subject's abdomen. The subject is facing the geographic West when the tests are being made.



(C. Kadel & Herbert)

(Above) Many radio experimenters have constructed diminutive sets, but it was always necessary to add a head-piece. B. S. Lowellen of Minneapolis has constructed an entire radio outfit in a one-piece head-set, crystal detector and tuning coil. The circumference of the instrument is that of an ordinary telephone receiver and it is three inches in length. This picture shows the set hooked up to a waste basket as an aerial. Concerts can be heard for a distance of 12 miles.



(C. Kadel & Herbert)

With the DX Nite Owls

Fine Record from Oregon

From Arthur Chapelle and Charles Salveto, Woodburn, Oregon

I READ with interest the Atlantic Coast amateur's DX records, also those from the middle and western states, in your highly valued RADIO WORLD. I do not see where they have anything on us even with their advantage in time, whereby they can listen to western 10 o'clock programs at midnight, while we have to listen to eastern 10 o'clock doings early in evening, when every 2 by 4 station is on the air, a dozen ships along the coast are reporting position on 350 (but so broad it can be heard anywhere from 200 to 500), and a few B stations are trying to monopolize the air just to make it interesting.

As static hibernates, records grow better, so this will be a "has-been" before you read it. Still we wish to submit it for the Night Owls to hoot at.

Honeycomb coils, home-made set, two tubes, no radio-frequency. One hundred and twenty-five phone stations in 24 states and 5 provinces heard in two months. The following, all over 1,000 miles away, include:

WAAL, Minneapolis, 1,460 miles; WAAP, Wichita, 1,400 miles; WBAP, Fort Worth, 1,585 miles; WCAS, Minneapolis, 1,460 miles; WCX, Detroit, 2,000 miles; WDAF, Kansas City, 1,510 miles; WEAY, Houston, 1,800 miles; WFAA, Dallas, 1,610 miles; WGM, Atlanta, 2,150 miles; WGY, Schenectady, 2,400 miles; WHA, Madison, 1,650 miles; WHAS, Louisville, 1,965 miles; WHB, Kansas City, 1,510 miles; WJZ, Newark, 2,425 miles; WLAG, Minneapolis, 1,460 miles; WLW, Cincinnati, 1,990 miles; WOAI, San Antonio, 1,695 miles; WOC, Davenport, 1,600 miles; WOI, Ames, 1,460 miles; WOQ, Kansas City, 1,510 miles; WPE, Kansas City, 1,510 miles; WSB, Atlanta, 2,150 miles; WTC, Manhattan, 1,380 miles; WWJ, Detroit, 2,000 miles; KSD, St. Louis, 1,700 miles; KYW, Chicago, 1,700 miles; CJCG, Winnipeg, 1,250 miles; CHCB, Toronto, 2,125 miles; DM4, San Antonio, 1,700 miles; KOB, Roswell, 1,250 miles; KNJ, Roswell, 1,250 miles; KFAD, Phenix, 1,010 miles; KDYW, Phenix, 1,010 miles; KDZA, Tucson, 1,100 miles.

Thirty-four stations, totaling 55,000 miles! Most of this has not been spasmodic, but quite consistent. For instance, WSB was heard eight successive evenings, and the Night Hawks at WDAF are steady diet, while we get our energy from Schenectady quite regularly. Next!

Covered a Radius of 1,700 Miles

From G. W. Perkins, Thomson, New York.

I AM a constant reader of your excellent weekly and would not be without it. Recently I have seen lists of stations heard by many radio fans and hope you can find space for the list below. All of these stations have been heard by the writer. Mine is a home-made speaker, consisting of an old Victor horn with Stromberg-Carlson phones attached. These stations come in loud enough to be heard in a room 20 feet by 30 feet. The set is single-circuit, detector and two stages of audio: WGY, WGI, WHK, WOR, WJX, WWJ, WRK, WLK, WOH, WGL, WMH, WHQ, WRL, WBZ, WJZ, KYW, NOF, WOQ, WNO, WPB, WWZ, WNJ, WGR, WFI, WCX, WSB, WOO, WHB, KSD, WWL, WWI, WOC, WAH, WBD, WLW, WRP, WIP, KDKA, WHAZ, WFA, WBAY, WAAM, WHAB, WHAS, WEA, WNAZ, WOAI, WDAP, WMAK, WBAK, WDAW, WMAQ, WHAM, WLAH, WQAA, WFAA, WJAX,

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups of the various "DX Nite Owls" sending in records, with a view of publishing them.

Send hook-ups of your sets provided they contain anything unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

WDAF, WDAJ, WCAE, WMAF, PWX, WCAD, KOP, WCAE, WRW, WCAL, CFCA, WAAP, 3XD—nearly all verified, covering a radius of over 1,700 miles.

DX Depends on Apparatus

From Frank S. Myers, Box 194, Berkeley, California.

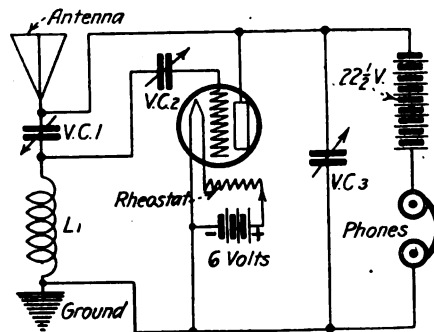


FIGURE 1

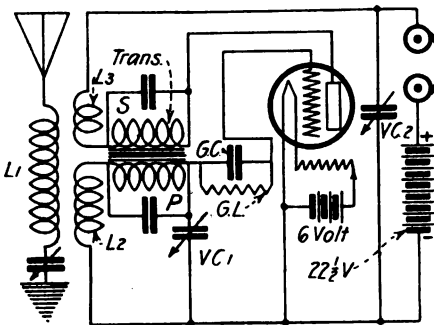


FIGURE 2

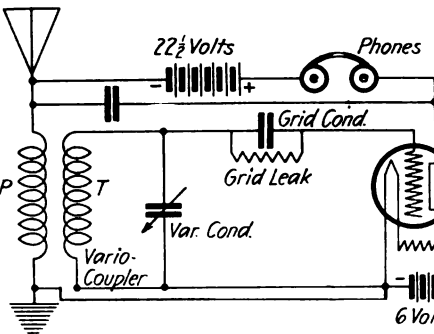


FIGURE 3

Schematic designs of the three hook-ups described by Mr. Myers in his interesting letter and showing the advantage of using only first-class apparatus.

I HAVE been a reader of RADIO WORLD since Vol I, No. 1, and your DX page interests me most. Continue it. I wish the claimers of DX records would send in their hook-ups and, also, name the instruments used in them. DX records do not depend so much on the hook-up necessarily, but on

the apparatus used. Any old condenser or phone will not do.

I am sending you three hook-ups out of the hundreds that I have, which include the hook-up of Mr. W. Miller in various forms.

The following are used in No. 1: Remler-Giblin coils; Thordaison condensers, .001 mfd.; U-V 201 or RAC., 3 tubes; also W D 11-A. I use an automatic filament-current adjuster known as the Amperite. It eliminates all rheostats. I also use variable B battery and Baldwin phones and radio-cut wire. A. C. H. Sharp Tuner Dials are used on all condensers. They give a one-thousandth part of an inch turn. No hand-operated condenser and vernier combined will give such fine adjustment.

The same apparatus is used in No. 2 and No. 3, except No. 2 has a triple coil mounting, three Remler-Giblin coils, and an audio-frequency transformer. I used an Amer-Tran transformer. They go fine with radiotrons.

In No. 3 a vario-coupler is used. The secondary is used on the plate circuit. Only first class instruments will give first class results. Remember that! The only dials that should be used are those that give a "hair line adjustment." The second hook-up will, I am sure, prove very interesting. Let us hear from you radio fans.

On a One-Slider Crystal

From George L. Marial, 523 Beverly Road, Milwaukee, Wis.

I HAVE a one-slider crystal set, and I think it is working fine. Here are my stations. I only have a chance when the four local stations are silent: WAAR, WCAY, WHAP, WIAO, WOC, KYW, WGY, WHB, WWJ, WDAP, WBAP, KSD, WLK, WLW, ZXY, WCX, WMAK, WGM, WAAF, WBU, 9-CIW, WSV. Also "The Star, Kansas City (WDAF), and the Horlowa Radio Co., Rock Island, Ill. (not listed). Any one wishing my diagram please write.

Antenna in Attic

From Ralph E. Taylor, 913 East Huron, Ann Arbor, Mich.

I HAVE been greatly interested in the results the "radiophono" has obtained and published in RADIO WORLD. I have a set of my own construction. I use the standard honeycomb hook-up. The coils are tapped, and, consequently, home-made. I employ one tube. I have heard stations from over the entire country—from Texas, Oklahoma, California, Massachusetts, and about twenty-one other states. I get PWX, Havana, Cuba, frequently; also several Canadians.

The above record is quite common on an ordinary amateur antenna. My antenna, however, is situated in the attic, which is covered by a tin roof. The antenna consists of 4 strands of No. 12 copper, 30 feet long.

Using neither antenna nor ground, I receive WWJ and WCX quite audibly; also WGY and KDKA very faintly. Several times I have hooked onto the springs in a bed for an antenna. This made a very good substitute, gathering in music from WGM, WDAF, and several others. If the fans cannot tune in to this please tell them to continue to send in their results.

With Straight Regenerative-Circuit

From J. J. Cannon, Mauch Chunk, Pa.

HAVING read with interest the letters of the broadcasting fans published in your valuable paper—and some of them

With the DX Nite Owls

(Continued from preceding page)

have me beaten for long-distance reception—I am sending you my list. Local stations: WWZ, WBAY, WEA, WJX, WGAC, New York; WOO, WIP, WNAT, WCAU, Philadelphia; WRW, WGY, WHAM, WMAC, WHN, WHAZ, WRP, 3-XW, WBAK, WBAG, KDKA, KQV, WJZ, WOR, WBZ, WNAC, WGI, WHK, WLW, WWJ, WWI, WGR, WMAK, WBAF, WVP, 2-XKA, WSZ, WMAF, WBAK, KCP, WJAX, WPI.

Long-distance stations: WOH, WLK, Indianapolis; WCAY, WAAK, WIAO, Milwaukee; KYW, WMAQ, WJAZ, WDAP, Chicago; WLAG, Minneapolis; WHY, Martinsville, Illinois; WMAT, Duluth; WCAP, Decatur, Illinois; WOC, Davenport, Iowa; WHB, Kansas City; WEY, Wichita, Kansas; WCK, St. Louis.

WEY is longest distance from here—1,400 miles.

I am using the straight regenerative-circuit with .001 mfd. condenser on ground lead. Aerial is 100 feet long with a 50-foot lead-in.

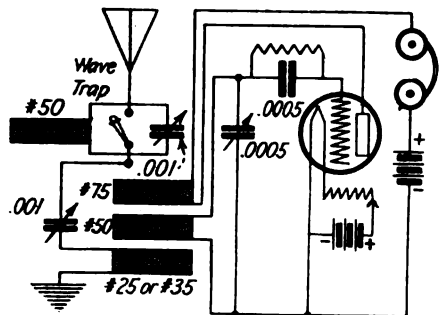
Using two steps of audio-amplification, WMAQ, Chicago, on Christmas Eve, was heard very distinctly on a loud-speaker, which, by the way, is only a Baldwin phone with Lily horn attached.

Uses a Wave-Trap

From W. D. Ready, 4286 Holmes Street, Kansas City, Mo.

I HAVE accomplished no great distances, but this list of stations I have heard since December 1, and most of them consistently, with a honeycomb regenerative set and two stages of amplification:

WBAP, WSB, WPO, WAAE, KYW, WCX, KSD, WJAX, WAAJ, WDAB, WFAA, WGM, WDAJ, WLAG, WAAF, KFAF, WBL, WDAP, WDAW, WNAV, WJAR, WAAP, 9-YQ, 19-DKO, WPA, WHAS, WNAD, WPAC, WJAZ, WOC.



Schematic design of hook-up by Mr. Ready. Its principal feature is the No. 50 coil and .001 condenser used as a "wave-trap" to eliminate any station not wanted.

WWJ, WOAI, WAAC, KYI, WOS, WJAT, WMH, WMAB, KDKA, WDAO, 9-ZAY, WKY, WFAS, WGY, WEA, KOP, 9-ZAF, WIAO, WGAO, WMAP, WIAC, WGF, WLK, WJAP, WFAV.

All of these came in sufficiently strong to be heard all over the first floor of my home. There are very few of these I have not heard several times.

I am also using an apparatus called the wave-trap, used to eliminate stations I do not care to hear—a hook-up without amplification.

Disconnected Aerial and Ground

From Clarence Milano, Englewood, N. J.

I AM pleased to tell about my set, which I constructed a few months ago. It consists of a triple-gear De Forest type

with a 2-variable condenser, series-parallel switch and 2 stages of amplification. Having obtained good results, I disconnected my aerial and ground and am still copying WJZ, WOR, WEA, and others. I know code—Morse and Continental—and have copied POZ, MPD, MUU, and up to 18,000 meters, using 1,000 and 1,200 duo-lateral for the high-wave stations. I also copied WHN without an aerial.

Another Challenge for Mr. Lindstrom

From Mike Podhorn (Old Timer), Box 89, Wood River, Ill.

IN RADIO WORLD, No. 37, dated December 9, 1922, I noticed that Arthur Lindstrom (Baraboo, Wisconsin) heard from coast to coast and from border to border with his equipment of a one-step amplifier with 45 volts on plate, using Cunningham tubes and a Thordarson transformer. His record of receiving long distance takes the prize. I have quite an expensive set and, although I heard dots and dash from half of the states in the Union, I have not heard any music from any western station. If Mr. Lindstrom's record is correct and true I would advise him to obtain a patent on his set and put it on the market. I believe it would reap him quite a fortune. I for one would like to obtain a diagram of his set as I would like to put one up and try my hand at long-distance receiving. I have been in the game nearly three years; and, although I do not claim to know it from A to Z, what I do know is a great help to me in putting up radio sets for my friends. Come on, radio bugs, and let's hear what you have to say in regard to Mr. Lindstrom's record of long-distance receiving! Best 73s.

Consistent Long-Range Work

From G. W. Goode, Thornton, Washington

I HAVE a home-made regenerative set with two stages of audio-frequency. Have heard WGY, WEA, WIP, KDKA, WSB and WGM—each three or more times during the last two weeks—also numerous stations in the Mississippi Valley.

There are three sets in this town, all alike, that have accomplished this. The others have received some eastern stations that I have not.

We get Fort Worth, St. Louis, Kansas City, Davenport, Minneapolis and Winnipeg—some of them every night.

If any one can show a set that will give more consistent long-range work than this tell us about it.

Seattle Sends In One

From E. L. Gerry, 3644 Denmore, Seattle, Washington

I HAVE a long-distance receiving record to report. On December 11, 1922, at 11 p. m., I heard 6-XB, the Mercantile Trust Company, San Francisco, California, music and speech QSA. My set consists of one U-V 201 tube, single circuit, honeycomb coils, 40-volt plate, 3½-volt filament potential, ground connection, no aerial, series and parallel primary-condensers.

Simple Set Works Well

From Thomas F. Cortese, 319 West Liberty Street, Louisville, Kentucky.

HAVING read other records send in, I will send mine. On an aerial 4 feet above a tin roof, and 100 feet long, with a 15-foot lead-in and 20 feet high, I have received the following stations: KDYX,

(Continued on page 27)

MAGNAVOX Pioneers

in the Radio field

IT was in 1913 that the Magnavox electro-dynamic receiver made its first public demonstration, when telephone communication was held between Denver and New York—a revolutionary advance.

The rise of radio broadcasting found Magnavox apparatus already perfected and in successful use.



R-2 Magnavox Radio with 18-inch horn



THIS instrument is intended for those who wish the utmost in amplifying power: for large audiences, dance halls, etc., but requires only .6 of an ampere for the field.

Price, \$85.00

R-3 Magnavox Radio with 14-inch horn

SAME in principle and construction throughout as Type R-2. Is ideal for use in homes, offices, amateur stations, etc.

Requires one ampere field current from your filament battery.

Price, \$45.00



Magnavox Power Amplifier—Model C

CAN be used with any "B" Battery voltage which the power tube may require for best amplification.

AC-2-C, 2-Stage \$80.00
AC-3-C, 3-Stage \$110.00

The facilities and experience back of each piece of equipment bearing the Magnavox trade mark are unrivaled anywhere in the world.

Magnavox products may be had of good dealers everywhere.

Write to us for illustrated booklet

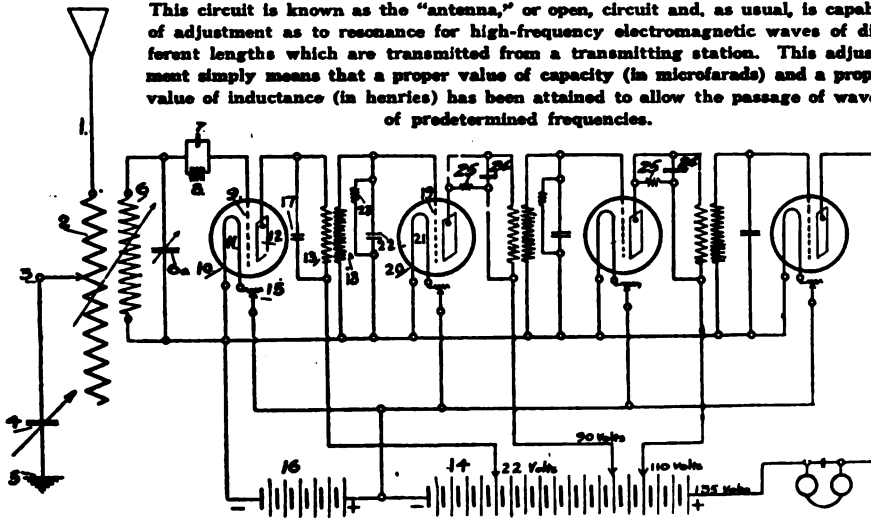
The Magnavox Company

Oakland, California

New York Office: 370 Seventh Ave.

Latest Radio Patents

This circuit is known as the "antenna," or open, circuit and, as usual, is capable of adjustment as to resonance for high-frequency electromagnetic waves of different lengths which are transmitted from a transmitting station. This adjustment simply means that a proper value of capacity (in microfarads) and a proper value of inductance (in henries) has been attained to allow the passage of waves of predetermined frequencies.



Another Static Killer

No. 1,439,485. Patented December 19, 1922. Patentee: Henry M. Williamson, Chicago

IN his specifications Mr. Williamson claims an apparatus having an audio-frequency amplifier, or a cascade of such amplifiers, employing a method for isolating

and excluding static interference from any source. It is also claimed that it will prevent oscillations in a thermionic amplifier. It is also claimed that it will provide a means, located between the detector and the receiver, which will completely filter out static.

* * *

New System of Modulating

No. 1,439,134. Patented December 19, 1922. Patentee: Leon J. Sivian, East Orange, N. J.

MR. SIVIAN'S is an invention to provide a high-impedance control-element associated with the oscillatory circuit of an electronic oscillator in order to prevent variations in the frequency of the oscillations produced; also to produce an arrangement whereby the electromotive force impressed on the input circuit of a thermionic device used as an oscillator is directly under the control of a transmitting device.

A large class of thermionic oscillators contain an electron-discharge device having

three elements—a cathode, an anode, and a grid, or other impedance-controlling element—associated with an oscillatory circuit in such a manner that a portion of the oscillatory circuit supplies a variable electromotive force to the input, or grid-cathode circuit, of the electron-discharge device, and the cathode-anode, or space-current circuit, of the discharge device in turn impresses a variable electromotive force on the oscillatory circuit. It is quite common to connect the input circuit of the electron-discharge device, or tube, to the terminals of a condenser in the oscillatory circuit, or across part or all of an inductance in the oscillatory circuit. Moreover, the oscillatory circuit may be closed or open, as in the case of an ordinary-tuned antenna—the antenna conductors and earth acting together as a capacity element. The electromotive force impressed by the oscillatory circuit on the input circuit of the tube is that which normally exists between the points in the oscillatory circuit to which the grid and cathode are connected.

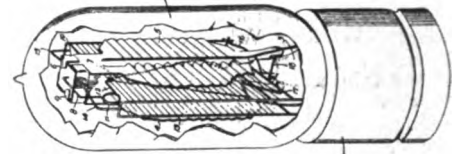
According to Mr. Sivian's invention a variable coupling is employed between the oscillatory circuit and the input circuit of the electron-discharge device. A high-impedance shunt-path is connected to the two points in the oscillatory circuit, to which the input circuit-elements are ordinarily connected, and the input circuit elements are connected to two points in this impedance shunt-path. The relative values of the portion of the impedance between the points of connection of the input circuit and the portion outside of these points can be varied by control elements, varying the fraction of the electromotive force.

A New Vacuum Tube

No. 1,438,989. Patented December 19, 1922. Patentee: Lawrence B. Spengeman, Jersey City, N. J.

THE object of Mr. Spengeman's invention is to provide a filament support which, in addition to supporting the filament, will apply sufficient tension to prevent vibration, and will also maintain the proper space relation of the filament with any other parts of the lamp which may be positioned therein. It is particularly applicable to vacuum tubes in which a plurality of electrodes are used, such as a filament, a plate,

and a grid, the space relations between which must be maintained constant in order that the proper operation of the device will result. The invention comprises an insulating block positioned near the upper end of



The large free curve of the supporting wire affords greater resiliency and more ready adjustments.

the lamp, from which extends a spring wire in a curve to a point beneath the block where the spring is connected to the filament. Between the point of the block from which the spring wire extends and the point of connection with the filament the spring wire is given one or more turns in the form of a pigtail twist to produce elasticity.

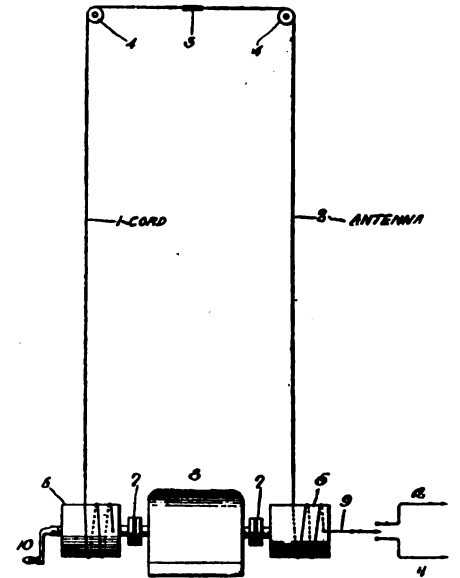
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To Avoid Large Inductance

No. 1,438,296. Patented December 12, 1922. Patentee: William E. Beakes, New Orleans, Louisiana

IT is well known that in order to receive signals of a given wave length the antenna of the receiving station must be tuned so that its natural wave-length corresponds more or less closely with the wave length of the incoming signals, and likewise, since the wave length of the outgoing signals at a transmitting station depends on the natural period of the antenna, the antenna is made adjustable in such a manner as to vary its natural period in accordance with the wave length to be transmitted.

Heretofore it has been common practice to tune the antenna so as to give it a desired



Diagrammatic design, illustrating Mr. Beakes' invention.

natural period; or wave length, by varying the factors of inductance or capacity. The object of Mr. Beakes' invention is to avoid the necessity of using a large inductance, or capacity, in the antenna for the purpose of adjusting it to desired wave lengths, and, thereby, to increase the efficiency of the antenna both when the apparatus is used in a transmitting or receiving system. The adjustment of the antenna to a given length is effected in part or in whole by increasing, or decreasing, its operative length, or the length of its conducting parts. By this means the radioist is enabled to do away with the use of large inductance, or capacity, in the antenna circuit. By adjusting the antenna to the desired wave length in this manner, Mr. Beakes claims, a much stronger signal is received or transmitted than would be the case if the adjustment were provided for by including in the system the usual large amount of inductance and capacity.

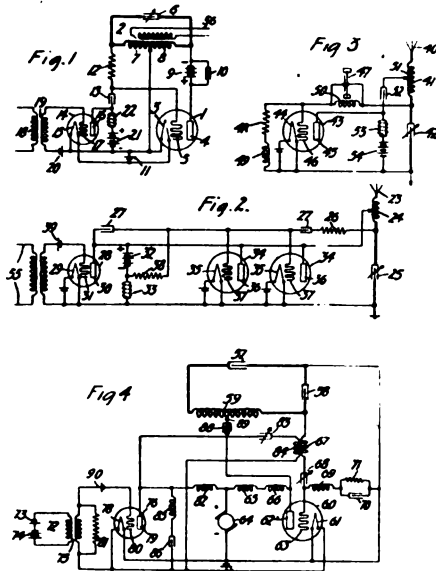


Figure 1 illustrates diagrammatically signaling system in which an oscillator produces oscillations of an amplitude determined by the value of thermionic impedance, and supplies oscillating energy to a transmission circuit. Figure 2 illustrates a modification of the oscillator arrangement of Figure 1 applied to a radio system. Figure 3 illustrates a modification of the circuits of Figure 2, in which the thermionic control impedance is replaced by a condenser transmitter. Figure 4 illustrates another modification in which the thermionic control impedance is indirectly introduced into the control circuit.

Secrecy in Radiotelephony Seems Assured

Combination of Radio and Land Telephone Is New Wonder. Experiment Made on High-Tension Wires Carrying 70,000 Volts Proves Successful

BALTIMORE—The successful transmission of voice over electric power lines carrying 70,000 volts by means of carrier current, a new development of radio, is announced here by the General Electric Company.

The tests were made over the high-tension lines connecting the Highlandtown substation of the Pennsylvania Water and Power Company here, with its hydroelectric plant at Holtwood on the Susquehanna River, a distance of forty miles. Conversations were carried on under every possible condition that might occur on a power transmission line, such as short circuits, grounding and broken wires.

The apparatus by which the transmission of voice is made is similar to a radio outfit, having vacuum tubes, batteries and other appliances. Instead of radiating waves through spaces in all directions as from a broadcasting station the voice waves are kept concentrated about the electric power lines, thus insuring privacy and direction of signals.

Quality of Speech Much Better Than By Land Phones

For power companies the carrying current system has many advantages over the land telephone, for so long as there is a single transmission line in operation communication can be carried on. Ordinary telephone wires, which are many times smaller than the high-power electric lines, are generally the first to suffer during a storm, whereas transmission lines are seldom affected by even the most violent storms.

In the tests made here the quality of speech was much better than that obtained by a land telephone over the same route. The conversation was free from hum and other noises which are usually experienced when a telephone line parallels a high-power electric system.

Carrier current, in addition to insuring privacy in communication, has other advantages over radio. Static, fading of signals, and interference from other stations are entirely eliminated. Government broadcasting licenses are not required, and it does not require a licensed radio operator.

A small switch connected with an ordinary telephone instrument does all the work. By moving this switch upward a bell is rung at the other end of the line. The switch then automatically returns to neutral or listening position, and conversation begins. The apparatus is in operation only when a conversation is in progress, the telephone hook holding the receiver acting as a switch for the set.

Equipment Consists of Detector and Two Amplifier Tubes

When the receiver is raised a small motor generator is started, supplying 1,000 volts direct current. This is put through two 50-watt vacuum tubes and converted into high frequency alternating current of 15,000

cycles. This voltage carries the voice signals from the telephone into a wire 1,000 feet long, leading from the station and parallel to the transmission lines.

Traveling at the speed of light, or 186,000 miles per second, the voice is received at the other end much the same as radio broadcast signals. The equipment consists of a detector and two amplifier tubes. Tubing is not necessary as the wave-length and other characteristics are always the same. Since carrier current travels on a wave-length of 15,000 meters it is removed from any possibility of interference from radio broadcasting stations.

A Real Task

IT is apparent that the task of the radio broadcasting director is to find music and speech of a character that will bring real information and pleasure to the greatest number who listen in. But when the program you get doesn't quite meet with your approval always remember the many problems that the poor director has to overcome. Next to running a grand opera the running of a broadcasting station is the best test of the mental stamina of humankind.

When a man tells his wife, who is holding supper for him, that he wants to "listen-in" just one more minute he is usually picking a minute half an hour away.

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8"x24"	1.25
12"x24"	1.75

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Agents wanted.

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PATENTS

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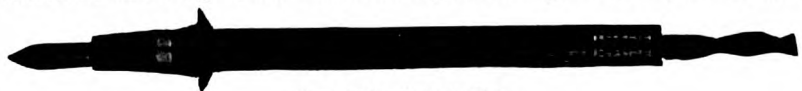
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New York City.

New York, December 29th, 1922.

Gentlemen:—In starting our business as a retail distributor of radio goods, the writer had placed some advertisements in RADIO WORLD, while connected with another company, and was so impressed with your pulling power as an advertising medium that the suggestion was made that we advertise only in RADIO WORLD.

Our plan has been, as you know, to take a column one week, giving an itemized list of our offerings with prices, and on the following week to take but three- or four-inch space, mentioning but one or possibly two special items.

Although our store has not a particularly good location, our advertising has not only proved highly profitable but has resulted in sufficient mail order business alone to give us a handsome profit from our advertising in RADIO WORLD. Therefore, we take pleasure in telling you that we have found RADIO WORLD to be a most profitable advertising medium.

Very truly yours,
RADIO DISTRIBUTING & AUTO SUPPLY CO.
B. K. OWEN.

Heard at the Radio Counter A Conversation between Customer and Radio Clerk

Part X

HELLO, O. M. I Did you get to the American Radio Exposition, last week?"

"I most surely did. I wouldn't have missed it for a new storage battery!"

"Say, speaking of storage batteries, is there any advantage in the storage B batteries I saw advertised there?"

"Well, I should say so. Have you ever had a perfectly good message lost just because there was a terrible lot of tube noises that sounded like static?"

"That very thing occurred to me only the other night. I was listening in to WOX. Suddenly there was a terrible noise. I blamed it on static; but I thought, later, that this time of the year is kind of late for Old Man Static to be so noticeable."

"Well, if you had analyzed the trouble, you would have found, probably, that due to chemical action, there was a heavy battle of electrons in your B-battery circuit. Now, if you had used a storage battery of the same voltage, you wouldn't have lost that concert."

"That sounds interesting. Do you happen to have any in stock?"

"We just received a fresh stock, this morning, all ready for use. All you have to do is pour in the electrolyte and connect it up. You will need a rectifier, also, if you have alternating current at your house."

"Doesn't it cost a lot to charge such a high-voltage battery?"

"Certainly not! You can charge your battery about every other month or so at a cost of about from three to five cents."

"I feel that I had better purchase one of those batteries."

"Here it is, O. M. The electrolyte is in a separate bottle. Do you want the rectifier also?"

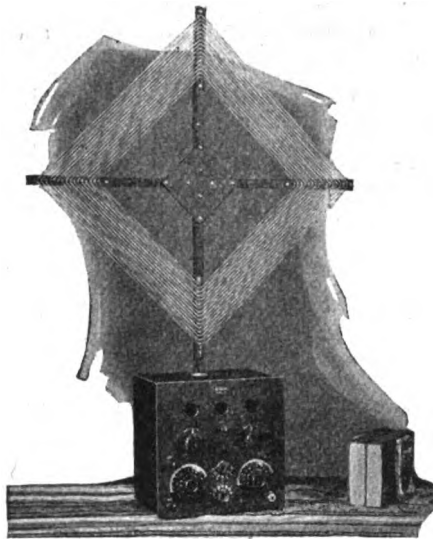
"Surely."

(To be continued)

New De Forest Reflex Set

THE new D-7 Reflex Set of the De Forest Radio Telephone and Telegraph Co. is shown in the accompanying illustration. This set, we are told by one of their eastern distributors, Radio Stores Corp., was recently perfected. It permits long distance reception on an inside loop through the agency of three steps of radio-frequency and two steps of audio-frequency, on only three tubes, and fills a want in circles where such a circuit is needed, but where the old type of circuit, using six tubes, is impossible on account of upkeep and cost.

The signals are rectified (detected) through the agency of a jar-proof crystal detector, which is one of the features of the set. Although primar-



Photograph of the new De Forest Reflex set showing the collapsible loop. Signals are rectified by a jar-proof crystal detector.

ily developed for loop reception, it can just as easily be used with antenna and ground. This is accomplished by having the loop on a jack. Thus when the loop is plugged in through the agency of a double-circuit jack, the antenna and coupler is disconnected and the loop is tuned with the condenser which tunes the secondary circuit when the set is used with the antenna.

The loop is collapsible, and the entire set may be put in operation at any time and place by simply connecting the necessary batteries and inserting into the loop. The fact that it is freely operated on either loop or aerial make it possible to use it in a district where there are many phone and spark stations, because of the fact that it tunes very sharply.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

FIRST UNIVERSAL EXPOSITION OF INVENTIONS AND PATENTS, Grand Central Palace, New York City, February 17 to 22, inclusive, 1923.

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Linquet Electric Co., Jamestown, N. Y., has increased its capital stock from \$15,000 to \$75,000. Commonwealth Mica Corporation, Wilmington, Del., mining, \$1,000,000. (Colonial Charter Co.) United Radio Publicity Corporation, \$500,000; Herald G. Wilson, Frank C. Mooney, Camden, N. J.; Charles C. Mooney, Philadelphia. (Corporation Guarantee & Trust Co.)

New Loud-Speaker

ONE of the best indications that radio is becoming more and more popularized is the fact that more and more loud-speakers are being put on the market. The entire family now wants to listen in. The Atlantic & Pacific Radio Company, of New York, has just recently brought out a loud-speaker made of a special alloy of their own. The company also claims that the instrument owes its unusual qualities of clarity and tone to the peculiar acoustic properties of its design.

Radio Now a National Problem

SECRETARY HOOVER declares the tremendous growth of radio in recent months has made it a national problem. He estimates there are now 21,065 sending stations in this country, the major portion of them—16,898—being amateur. In addition there are 2,762 on ships. Of broadcasting stations there are 576 of Class A and 25 of Class B.

Interference, he says, is largely in the broadcasting stations that send out news despatches and entertainments of various character. While the total of these is around 569, it is variously estimated that the receiving stations number 1,500,000 to 2,500,000.

The interference, he states, runs largely in "the 600 to 1,600 wave-length field, which is reserved for the army and navy." This reserve of wave-lengths should be open to the public, Mr. Hoover added.

Club Notes

THE Mt. Pleasant Radio Club is located at 3215 East 118th street, Cleveland, Ohio. The officers are: E. Sherring, president; D. Bluffstein, secretary; H. Abrams, treasurer.

The Marconi Radio Club is in active operation at 125 North 6th street, Monmouth, Illinois. Lloyd Sandy, president; Charles Bisher, vice-president; Lawrence McVey, secretary-treasurer. Meetings are held at high school every Wednesday night at 7 o'clock.

DEALERS

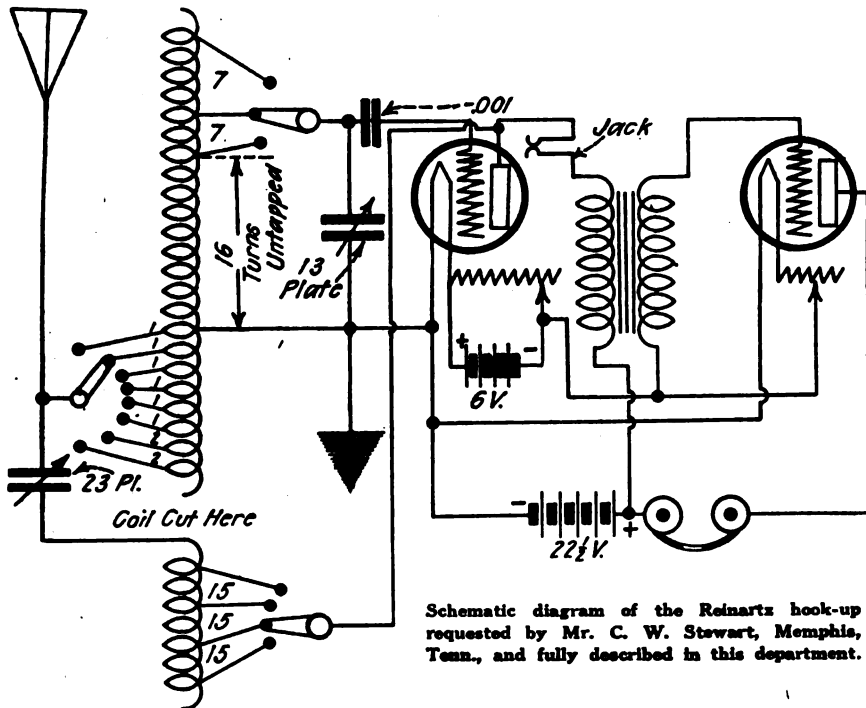
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Answers to Readers



Schematic diagram of the Reinartz hook-up requested by Mr. C. W. Stewart, Memphis, Tenn., and fully described in this department.

IS it possible to use the 1½-volt dry-cell tube in the hook-up published in RADIO WORLD, No. 30, dated October 21, by Harold Day in his article, "One-Tube Regenerator Hook-Up for Loud-Signals"? I have a crystal set, but wish to construct a more powerful receiver.—W. G. Miller, Ballston Spa, New York.

Yes. This tube may be used in this circuit with very good results.

Advise me if there is a circuit using radio-frequency in a regenerative set, but used before the tuner. By that I mean using it between the aerial and the tuner instead of between the tuner and detector.—James E. MacDonald, Boston.

We know of no such circuit. We do not understand why you desire to use such a circuit as no advantage can be attained.

I contemplate building a radio set and would like a little information regarding a set capable of receiving over 500 miles. Just what parts are necessary to build such a set? How many tubes may I use with such a set?—William O. Philips, "Sun," West Virginia.

We refer you to the sets described in this number. All of these sets are fully described, and have been tested and found O. K. The number of tubes used depends on how many stages of amplification you wish to utilize. If you are using only audio-frequency it is not advisable to use more than two or three stages at the most as the tube noises in sets using more than that completely overbalance the advantages.

Publish a diagram of a set using 3 tubes similar to those being used to give 2 stages of radio-frequency, detector and 2 stages of audio-frequency.—Walter D. Kampton, Santa Barbara, California.

We understand that you want a hook-up using 3 tubes in place of the usual tube-circuit using 5 or 6. See the article on page 4 of this issue of RADIO WORLD by Frederick J. Rumford.

Publish the original hook-up of the Reinartz circuit, also constructional data on the inductance itself.—C. W. Stewart, Memphis, Tennessee.

The diagram you request accompanies your answer herewith.

The tuner consists of a spider-web inductance of 85 turns of No. 26 S. C. C. wire. The spider web has 9 spokes, and the core of the coil is 2½ inches in diameter. The complete coil, when wound, is 5 inches in diameter. Wind 45 turns on the form and then cut the wire. This is the plate winding and should be tapped at 15, 30, and 45, as shown in the diagram. Then start the antenna winding directly on top of the first and tap at the 2nd, 4th, 5th, 6th, 7th, 8th, and 9th turns and bring out the 10th tap for the ground and condenser tap. Then the winding is continued and taps are taken off for the grid coil at the 26th, 33rd and 40 turns. This coil, if carefully wound, and not shallacked will work very efficiently from 150 to 370 meters, which is sufficient for most all the work you want to cover. This tuner was designed primarily to cover C-W work on short waves, but will work on phone.

1. Publish the panel layout for a 3-circuit regenerative receiver with detector and two stages of audio-frequency amplification.

2. Does a U-V201 function as well as a detector as a U-V200 if properly hooked up?

3. Are variable condensers absolutely necessary in such a circuit?—Kenneth H. H. Jones, London Mills, Ill.

1. A suitable panel layout is published in this issue of RADIO WORLD. See the article by Mr. Cranby Meyers.

2. A U-V201 will not work properly as a detector. It is primarily a hard tube, and is intended for amplification. You had better use a regular U-V200 and save yourself trouble.

3. Due to the fact that you use variometers, variable condensers are not absolutely necessary in this circuit. It has been found to function better in long-distance work with

the least necessary capacity. It is better to tune your set with inductance than capacity.

1. Is it possible to use the Western Electric V-T1 and V-T2 in a receiving set, using the V-T1 for detector and the V-T2 for amplifiers?

2. Will they give as good results on a three-honeycomb-coil unit as the regular tubes?

3. Can they be used for radio-frequency amplification? My radio-frequency embodies two variometers and a variocoupler.

4. Will a 6-volt A battery operate these tubes efficiently?—Ernest Chartier, Montreal.

1. Yes. These tubes function extremely well as detector and amplifiers.

2. Yes. They will give as good results as the regular tubes. Besides, the V-T1 are not critical and operate on low-plate voltages. Sometimes it is not necessary to supply more than sixteen volts for their efficient operation as detectors.

3 and 4. They may be used for radio-frequency amplification and may be operated on the regular 6-volt storage battery. The filament of these tubes being oxide-coated, they will not light up bright. They generally operate at their best when the filament is just a deep cherry-red. Do not make the mistake of trying to burn these bulbs too high.

1. Is it possible to use the W-D11 1½-volt tube, using 40 to 45 volts on the plate, as a detector or amplifier in the regenerative set described in RADIO WORLD No. 29, dated October 14?

2. Will they also work with the circuit I am enclosing?

3. Is any rheostat O. K. for their proper filament adjustment?—R. L. Hilton, Waterville, Me.

1 and 2. The W-D11 is a good amplifier and detector and will work admirably in any circuit. It is not a very efficient radio-frequency amplifier, but, in both circuits you mention, will work efficiently. It is only necessary to put 22½ volts on the plate of the detector, but the amplifier needs 45.

3. While any rheostat will do, we advise the vernier type for fine adjustment in tuning in the DX boys.

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- 1 Rheostat
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- 1 W. D. 11 Tube
- 1 Grid Leak Condenser
- 1 "B" Battery, 25½ volts
- 1 "A" Battery, dry cell
- 1 Variocoupler
- 1 "23" Plate Condenser
- Wire for Hook Up Free
- 1 Panel, 7½x10½
- Complete.....

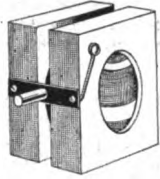
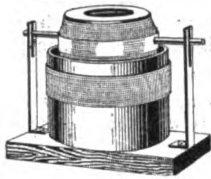
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OVER four hundred attended the first general meeting of the Radio Trade Association, composed of manufacturers, jobbers and dealers in the industry, at the Grand Central Palace, during the American Radio Exposition Week.

The Radio Trade Association is national in scope and looks toward the development of the radio industry through the standardization of radio products, the control of

broadcasting to eliminate interference, and the education of the public to the immense opportunities for education and amusement provided by the new art and science.

That contributions to churches are on the increase because of radio was the assertion made by Major J. Andrew White. Major White gave as an instance the experience of St. Thomas's Church on Fifth avenue, from which an entire Sunday service was recently broadcasted for a thousand miles.

Before this church broadcasted any of its services, Major White said, the collection plate usually brought in but little returns because the church is a rich one and does not rely for support on the passing of the plate. But after the recent broadcasting contributions flowed in by mail from radio distance of the church.

Among the other speakers at the meeting of the Radio Trade Association were Paul Godley, internationally known amateur, and Dr. Lee de Forest, a pioneer in the development of radio. Mr. Godley asserted that the instrument that would ultimately meet with the favor of radio fans would be one somewhat more complex than the one in average use today.

Dr. de Forest spoke on the radio industry in the country. "The farmer is the foundation of civilization," he said, "and agriculture is still the largest single industry in the country. People in the cities still look upon country people, however, as not having progressed in the last twenty-five years." He said that they did not realize that slowly a transformation has taken place on the countryside, brought about by greater facilities in communication. "No one art or industry," he added, "will do more to complete the evolution of the country than the receiving set."

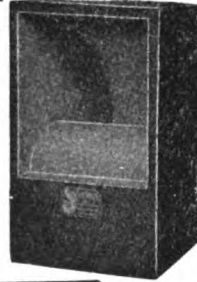
Henry M. Shaw, manufacturer of Newark, New Jersey, elected president of the association, presided. In opening the meeting Mr. Shaw said that, in his experience of forty years as a manufacturer, he had witnessed the beginnings of the electrical and automobile businesses. He did not, therefore, worry at the present "growing pains" of the radio industry, for it seemed that every young industry had to grow through certain periods corresponding to the measles and the mumps of childhood.

The meeting was an enthusiastic one. Laurence A. Nixon, secretary, was kept busy registering new members.



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At Your Service!

There appeared in RADIO WORLD, dated April 1, 15, and 22, the following articles:

April 1—A 500-Mile Radiophone Employing a 5-Watt Tube, by Frank A. Hahnel. "Toll Me, Please, How Will This Set Receive?" by E. L. Bragdon. Short Cuts in Receiver-Circuit Design, by O. C. Roos. Making a Short-Wave Regenerator, by Fred. Chas. Ehler.

April 15—First Principles of Electricity as Applied to Radio, by John P. Miles. Your Storage Battery, by E. L. Bragdon. What Makes Radio Possible, by Edward Linwood. Ground Connection as Vital as Antenna, by Fred. Chas. Ehler.

April 22—Valuable Pointers on Aerial Construction, by Edward Linwood. What Is Meant by Tuning, by E. L. Bragdon. Radio-Frequency Amplification and Regeneration, by Frank Armstrong. Honey-Comb Coils and Condensers, by Edward Linwood. Charging the Storage Battery, by E. L. Bragdon. How to Construct the Variocoupler, by Frederick I. Rumford.

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Talks Through Steel Walls

Description of the invention of Mr. Bernays Johnson Shown in the Photographs on Our Front Cover.

ON the front cover of this issue of RADIO WORLD may be seen photographs of one of the most startling recent improvements in radiotelephony. This apparatus, which its inventor, Mr. Bernays Johnson, demonstrated at the American Radio Exposition, will allow the person operating it to throw his voice into the air without the use of the necessary bulbs and transmitters. In his demonstration, Mr. Johnson demonstrated that his invention is directional to a remarkable degree, so much so, in fact, that he claims he can direct his voice to within five degrees on either side of a station and tune it out. The large photograph shows the transmitting apparatus which used neither bulbs nor arcs to produce the necessary wave-trains. The chief operating principles of the invention are a secret as yet; but the inventor claims that a 6-volt battery is all that is necessary to produce efficient operation.

The receiver comprises a loop of wire similar to the one on the transmitter, as shown in the smaller photograph, and a small square box with two binding posts. The contents of the box are a secret. They comprise the main points of the invention, which is one that may revolutionize entirely the reception of radio signals.

Mr. Johnson's invention has worked successfully in distance of over fifty miles, using railroad rails as carriers of the waves, and with no actual connection between the receiving station and the transmitter.

In order to make a thorough test this invention was placed over two hundred feet in the interior of a coal mine. The man on the surface had no trouble "picking up" and talking to the man in the mine below. Another test was as follows: Mr. Johnson and his apparatus were locked in a large steel vault, the walls of which are two feet thick and solid all the way through. Mr. Johnson and the mystified spectators outside the vault conversed in ordinary tones and heard one another as clearly as if they were in a haunted graveyard at midnight.

Have You a Little CQ'r in Your Neighborhood?

EDITOR, RADIO WORLD—I suppose that everyone owning a radio set capable of receiving C-W signals has heard this pest and wondered what particular bit of the devil had cut loose. He is the chap who repeats "CQ, CQ, CQ," about fifty times and then signs his call as many times. Before anybody can answer him, he has started all over again.

He don't seem to realize that while he is wasting all that precious juice the fellows who may be hearing him have tired of waiting for him to sign off and tune around for some one else to talk to.

I have 'one of those pests in my neighborhood. He is so clear that, when he starts, I get his carrier wave all over my primary and he knocks out everything else that is on. The other night, I called him on the telephone and asked him why he called "CQ" so many times when the government distinctly says that you are to call three times, sign, and wait for five minutes; then, at the end of that time, repeat. He said that he didn't think he was going out very strong so he wanted to make sure that the fellows wouldn't miss him. I told him that if he didn't stop his stunt, everybody in the neighborhood would wish he was some place where he would not be missed.

Buck up, fellows! Call 3, then sign! You'll get there quicker, because we'll pay more attention to you if you're businesslike!—Frank Maier, New York, N. Y.

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Torpedo	1.25	.75
Flat	1.25	.75

POTENTIOMETERS

Amsco	1.25	.75
RCA, for "A" Battery.....	2.00	1.50

RHEOSTATS

Amsco	1.25	.75
Bradleystat	1.85	1.50
Cutler-Hammer Co.	1.00	.75
Fada Type	1.00	.75
Plunger	1.20	.75

SOCKETS

Bakelite	1.50	.75
China60	.35
F. E.	1.00	.75
Moulded	1.25	.75
W. D. 11.....	1.00	.75

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Brandes, Superior 2000-Ohm.....	8.00	6.95
Federal, 2200-Ohm.....	8.00	5.50
Turney, 3070-Ohm.....	6.50	5.75
Stromberg-Carlson, 2000-Ohm.....	10.00	8.95
Dr. Seibt	12.00	6.90

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1-ft. lengths30	.20
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Acme Type A-2S	5.00	3.95
Murad Radio Frequency.....	6.00	4.95
Thordarson	4.50	3.95
UV-712, RCA, Amplifying	7.00	5.45
UV-1714, RCA, Amplifying	6.50	4.95

CONDENSERS

Morehouse Tested .0025-.0005-.001.....	.40	.30
Morehouse Tested .002.....	.30	.25
Morehouse Tested .006.....	.60	.50

SOLDER

Solderall, easy to use, tube 2-oz.....	.25	.19
--	-----	-----

VARIABLE CONDENSERS

3 Plate	1.25	.95
A. B. C. 23 Plate.....	3.00	2.00
A. B. C. 43 Plate.....	4.00	2.50

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Glass Enclosed, dust proof.....	1.75	.95
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Composition, 3 in.90	.55
Composition, 3 in.50	.30
2 in., for Rheostat75	.50
4 in., with knob, 180 Degrees.....	1.75	.95

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Tubular enclosed in glass 1/4, 3/4, 1, 2, 3, 4, and 5 Megohm.....	.65	.50
---	-----	-----

JACKS

Federal, double	1.00	.75
Federal, single .....	.85	.60
Firth Type, single .....	.85	.60
Firth Type, double.....	1.00	.70

PANELS

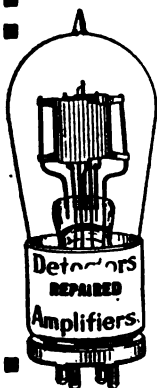
Hard Rubber, navy specifications, none better.		
7x10	1.75	1.25
7x18	3.15	1.80
12x18	4.20	2.50

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A Real Loud Speaker at a Reasonable Price

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\$4.95
Postage Prepaid

Dealers and Jobbers write for proposition

Note: The A & P Loud Speaker owes its quality to the Special Alloy used and to the peculiar Acoustic Properties of its design.

Atlantic & Pacific Radio Co.
131 W. 37th St. New York
We also have a complete line of standard parts at reduced prices.

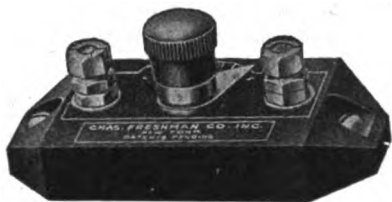
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Clarifies Signals, Lowers Filament
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Unbroken range—zero to 5 Megohms;
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Regulating Wireless Telegraphy

THROUGHOUT the country, with its radio sharps in the remotest settlement, from the small urchin to the oldest inhabitant, there is great interest in the Kellogg-White Federal Radio Control Bill, says *The Times*, New York. The original act of August 13, 1912, is regarded as obsolete. It was the work of legislators who could not perceive even dimly the rapid growth of the giant which they were asked to hold in leading strings. In November Justice Wendell P. Stafford, of the District of Columbia Supreme Court, directed Secretary Hoover, of the Department of Commerce, to issue a license to the Intercity Radio Company of New York. It was operating a high-powered station that put many important wireless plants out of commission when it was working. Among the complainants in the case were the United States Navy, the Coast Guard and Customs Service, the Post Office Department and the Radio Corporation of America. Judge Stafford had to issue the mandamus asked for because the act of 1912 did not give the Secretary of Commerce discretionary power to refuse a license to the Intercity Radio Company. Judge William G. Lamb, solicitor for the department, said of the statute that it tied the hands of the Federal Government:

We are unable to control the situation. Not only will the administration of the Government be hindered, but ships at sea which may have occasion to send an S O S call must wait their turn if the Intercity plant is working when a disaster occurs.

The wave-length of this wireless station

was 3,900 meters. "We find," said Judge Lamb, "that it is both physically and mechanically impossible to devise or arrange a wave-length at which this plant can operate without interfering with others." Radio regulation moves slowly. The Kellogg-White bill was introduced in the Senate as long ago as June. It may be pleaded for Congress that wireless telegraphy is comprehensible only to the experts, and that they are not in accord about its restriction. Secretary Hoover told the Merchant Marine Committee of the House recently that control must be established over "the bedlam filling the air from 21,000 radio transmitting stations." It is the regulators who will be in bedlam if something practicable is not soon done to harness and guide the monster.

By the terms of the bill the Commerce Department is to have charge of all radio communication, licensing operators, assigning wave-lengths, passing on apparatus. Day and night the air is full of band music, concert singing, vaudeville dialogues, speeches about everything that interests the American people; sermons, crop and weather reports, prizefighting by rounds, football battles by plays, not to speak of the business of the army and navy and post office. There is discord even between the departments. Secretary Hoover, for instance, would have the Navy Department attend strictly to its professional concerns and not stray into fields of entertainment to keep the service cheerful. It has been said that under the provisions of the bill Secretary Hoover would have power "to break up the 'Big Four' or any other civilian radio combination." Broadcasting stations are to be limited in number. The attempt cannot be made to control the myriad of receiving stations. The cost would be prohibitive even if regulation were possible. Fees, however, might be imposed, and few could escape them. The Kellogg-White bill will call for a great deal of discussion before it is put on passage. At the best it will be tentative legislation.

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| \$5.00 Federal J. Set, complete with phones | 12.50 | \$25.00 General Electric 2-Stage Amplifier..... | 69.00 |

- TUBES**
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| Tubes—U. V. 200..... | \$4.00 | Navy V. T. 2..... | \$7.50 |
| U. V. 201..... | 5.00 | W. D. 11..... | 5.00 |
| Navy V. T. 1..... | 5.50 | U. V. 202..... | 7.00 |

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| Baldwin Type C..... | Radio Corp..... | Federal..... | 5.25 |
| \$10.00 | Remer..... | Paragon..... | 4.00 |
| Baldwin, single..... | Star..... | Rayser Coil..... | 3.00 |
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| Helzer, Cabot..... | | Thermon..... | 2.75 |
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| Murdock 3000 ohm..... | Radio Corp..... | U. V. 1716..... | \$7.00 |
| 4.50 | Paragon..... | U. V. 1714..... | 5.50 |
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| 6.00 | Amoco..... | Baldwin..... | 2.25 |
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| Federal 3000 ohm..... | Magnavox..... | 4-in. Telt..... | \$1.00 |
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| Western Electric..... | Diagraph..... | 3-in. Station..... | .50 |
| 7.50 | Autovox..... | 3-in. Pathe..... | .50 |
| French Brunott, 4000 ohm..... | Western Electric..... | SOCKETS | |
| 7.75 | Baldwin Clariphono..... | Paragon..... | \$0.60 |
| | | Turkey..... | .30 |
| VARIABLE CONDENSERS | VARIOMETERS | DeForest..... | .60 |
| .0015 Balanced DeForest..... | Pathe..... | Triple..... | 1.50 |
| \$5.00 | Emco..... | W. D. 11..... | .60 |
| .0005 Balanced DeForest..... | Baldwin..... | JACKS and PLUGS | |
| 4.50 | Emco..... | Federal..... | \$0.75 |
| .001 Balanced DeForest..... | Atwater-Kent..... | Sun Grip..... | .90 |
| 4.75 | | Firth, single..... | .35 |
| 23 Plate Moulded Ends..... | TRANSFORMERS | Firth, double..... | .50 |
| 1.25 | U. V. 712..... | | |
| 23 Plate Plain..... | Amco..... | | |
| 1.00 | 3.75 | | |
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| Baldwin..... | | | |
| \$4.50 | | | |
| All Wave, 150 to 3000
Meters..... | | | |
| 7.50 | | | |
| Atwater-Kent..... | | | |
| 6.00 | | | |
| Emco..... | | | |
| 4.75 | | | |
| Tosca..... | | | |
| 3.50 | | | |
| BATTERY CHARGERS | | | |
| Westinghouse 2 Amp..... | | | |
| \$15.00 | | | |
| Westinghouse (large) 6 Amp..... | | | |
| 22.00 | | | |

Space will not permit us to list all our special values, therefore we will gladly quote special prices on any Radio parts or sets you may want.
 Reliable merchandise first, then price. We will refund, at any time, for Radio material purchased from us which is not up to standard and as represented.
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The Motion Was Carried

AT a meeting of a certain radio club in a large city in the east, there was a discussion on the relative merits of the superheterodyne as compared with straight regenerative radio-frequency. It started off all right, the Big Boy of the club talking in flowery language about "superimposed" and things of that sort. Suddenly a small voice spoke up and said, "Say, you can talk all right, but I noticed that when I was up to your house, that you couldn't get that bunch of junk of yours to even work. Suppose you talk from experience, don't you?"

The B. B. turned and, giving the youngster a mean look, said, "Mr. Secretary, I propose that when a speaker has the floor any member interrupting him be fined a month's dues."

When order was finally restored, the youngster had the platform. "Say, fellows, I move that hereafter, when anyone gets up here and starts talking about Mr. Armstrong's pet circuit, that he bring the results of his experiments along and demonstrate them!"

"Second the motion!" yelled a half dozen voices.

The motion was carried.

Margie—And he had radio eyes!
 Sue—What do you mean—radio eyes?
 Margie—Oh, just eyes with a broad cast!
 —Crosley, *Radio Weekly*.

London report says that wireless photographs have proved successful, which is more than can be said of many of them you sit for in a studio.—Roy K. Moulton, in *The Mail*, New York.

With the DX Nite Owls

(Continued from page 19)

Honolulu; KDYR, Pasadena; WHAS, Louisville; WLAP, Louisville; WDAK, Frankfort; WEAN, Providence; WGY, Schenectady; WSB, Atlanta; WBAP, Fort Worth; PWX, Havana; WOC, Davenport; KSD, St. Louis; KFBV, Colorado Springs; WCAC, Phoenix; CFCA, KDYO, and others too numerous to mention. I use one step of radio-frequency and detector only.

* * *

Set Cost Just \$101

From George Franz, 286 South Clarkson St., Denver, Colorado.

I HAVE written you before about my set, but recently I added two steps of radio-frequency. I am sending you the stations which I have received, most of them with my old set; but they now come in much stronger and more clearly. I still have no connections soldered; I did not have in my other set. My set, complete with storage battery, B batteries, phones, and the five tubes, cost me \$101. This, I think, is very reasonable considering what the sets sell for at a retail store. I am using Radiotron Tubes.

Following is a list of the stations I have received with this set, everyone coming in very loud and clear: WOC, WBAP, WHB, KZN, KWH, WBL, KHJ, KFI, KFBB, KFAA, WOI, WDAF, CFAC, CJSC, CJCG, CJCD, 6XB, CSCN, KSD, KDKA.

Testing out the set the other evening, I found that I could unhook the aerial and ground and still hear local stations very clearly. Testing it out further, I disconnected the tuner from the rest and using no ground or aerial I still heard local stations. Attaching the aerial to the input on the radio-frequency and using no tuner, I heard the local stations very loud and clear.

* * *

A Vario-Coupler Record

From Lambert Jones, P. O. Box 164, Benton, Ill.

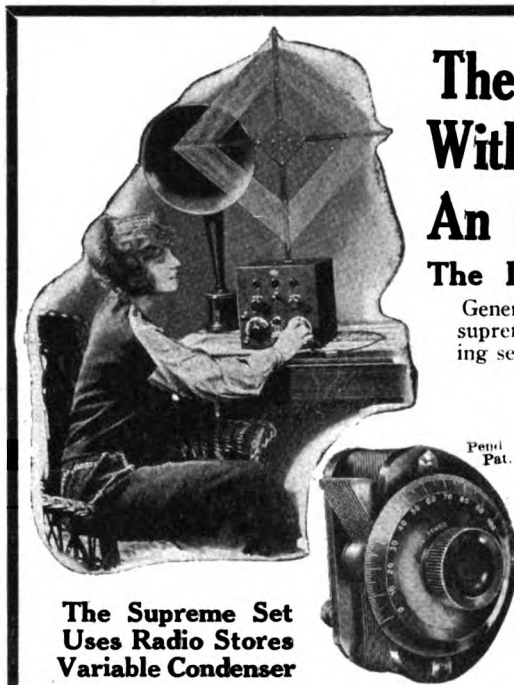
I AM sending my receiving record of the last two months. My receiver is a vario-coupler with detector only. The aerial is 30 feet high and 200 feet long. I haven't as yet seen any vario-coupler records. The following stations come in very clear and strong: KHJ, Los Angeles; PWX, Havana; CJCG, Winnipeg, Canada; 5-ZA, Roswell, New Mexico; WMAS, Southampton, Massachusetts; WBZ, Springfield, Massachusetts; DN4, KLZ and KFAF, Denver; WFAA, Dallas; WPA, Fort Worth; WOAI, San Antonio; WEAY, Houston; WHAM, Rochester; WEAJ, New York City; WGR, Buffalo; WGY, Schenectady; WAAC, New Orleans; KSDS, 75 miles from Denver. WHB, Kansas City, Missouri, comes in so loud that often music may be heard all over the room.

* * *

Can Eliminate Static

From C. G. Frank, Oriental Hotel, Galveston, Texas.

I READ RADIO WORLD as fast as you get it down here. My set is a single-tube hook-up that will bring in WWJ, KSD, WOC, WSB, WGM, WBAP, and all the central-time stations. I am no radio engineer, just a radio bug. There are ten sets like mine in Galveston, all getting the best of results, and sometimes when the weather is cold. I can get WEAY over fifty miles away without any aerial or ground. I get the Sweeney School (Kansas City, Missouri) on a loop. When static is bad, I change and put the ground wire on the antenna side of the set and the antenna on the ground side. This is not a joke, as I believe th ground waves bring them in louder and decrease the static. I don't use any



The Supreme Set Uses Radio Stores Variable Condenser

also acknowledged supreme in its class,

DeForest, after competitive tests, chose the Radio Stores Variable condenser, in accordance with their policy to use nothing but the very best.

It has the following features:
 Concealed Counterweight Under Dial.
 Brass Studs Through Aluminum Plates, and Die Cast.
 Shaft Held in True Center Through Brass Bushings.
 No Insulating Material Tapped—Metal Inserts Throughout.
 Precision Workmanship—Best Engineering Design.

LIST

- 23 Plate .0005 mfd., Capacity Ratio \$4.25
- 28 to 1
- 43 Plate .001 mfd., Capacity Ratio \$4.75
- 46 to 1

Complete with Knob, Dial and Counterweight. Packed in Individual Carton.

The Radio Stores Torpedo Plug, \$1.25

is a truly worthy companion to the Dictograph and DeForest products. It makes a perfect connection with both jack and cord tips. It is unbreakable and is especially desirable for the following reasons:

All Conductive Parts of Heavy Machined Brass. Insulated Throughout. Screw Binding Post Terminals. Separate Anchor for Tail of Cord. Designed to Insure Rigidity, Durability, Strength and Lightness. Packed in Individual Carton.

222 West 34th St. New York City

The Set Without An Equal

The DeForest Reflex

Generally acknowledged the supreme achievement in radio receiving sets. It combines three steps of radio and two of audio on only three tubes, and can be used either with inside loop aerial or outside antenna; has single knob control; is super-sensitive, with unusual range. Operating in New York it has received Louisville, Chicago, Atlanta, Pittsburgh, Boston, Detroit and Havana.

The set is only 10x10x8 inches. Complete with loop. "A" Battery (Eveready 90 Amp. Hr. storage). 2 "B" Batteries (Eveready 90 volts), Dictograph Headset, Dictograph Loud Speaker, 2 Radio Stores Torpedo Plugs.

All Complete \$175.00

Dictograph Loud Speaker



The Dictograph Loud Speaker combined with the DeForest Reflex provides the utmost in Radio reception.

The Dictograph Products Company has been known for many years as one of the world's foremost designers and constructors of Acoustic appliances. Thus the Dictograph Loud Speaker, the newest addition to their famous line, is the product of their many years of experience.

Dull gold horn
 Black Japanned stand
 and 5 foot silk cord..... \$20
 Loud and clear in tone—No distortion or howling.



UNBREAKABLE!
 Patent Pending

Message to Dealers

Just drop us a card to get your name on our mailing list, to receive advance information on money-making opportunities and new inventions. We are manufacturers and also distributors for DeForest and Dictograph products. Large stocks for immediate deliveries.

amplification on this set as it kills the signals.

I can produce witnesses as to how this set works. My distance record is 2,000 miles air-line, but there is one State I cannot get—California. I am just three squares from the Gulf of Mexico, and have a one-wire aerial 100 feet long with a ground for a water pipe.

The apparatus I use is one 23-plate condenser, one 3-plate vernier, one vario-coupler, G.-E. detector No. 200, pencil-mark grid leak, Fixed Phone condenser and a Ford battery for my A battery.

* * *

Good One-Tube Record

From Melbourne Renken, Box 113, Cole Camp, Missouri

I HAVE seen letters in RADIO WORLD from many radio fans with their long-distance receiving records. I am using only one

tube and a home-made regenerative set and have received over a hundred stations. I have received as high as thirty in one night.

Some of my "distance" is PWX, Havana; KWH and KHJ, Los Angeles; CRCR, Regina, Canada; CFCD, Toronto, Canada; CJCG, Winnipeg, Canada. MJZ, WGY, WOR, WFFD, KDKA, WGR, eastern stations; WWJ, WWI, WSB, WDAJ, Atlanta; WAAC, New Orleans; KZN, Salt Lake City; WFAA and WDAO, Dallas; WCM, Austin; WBAP and WPA, Fort Worth; WLG, KFAF, KDZO, Denver; WDAP, WGAL, WMAQ, KYN, Chicago; WOC, WRL, WJAP, WLAG and WLAJ.

I think that this is pretty good on one tube—don't you?

When the girls get to sending their kisses by radio they mustn't be too particular who tunes in on them.—Kansas City Star

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Money back Guarantee



Retail Price \$21.00
Includes Loud Speaker

Trutone has been pronounced the best on the market by experts. It has a clear, true tone. Every radio fan should try Trutone and compare it with others. If YOU don't find Trutone the best, your money will be refunded. It is sold on a ten-day trial money-back guarantee. If not carried by your dealer write us.

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SPECIAL OFFER

SEND **\$3.60**

Cash or Money Order Only, and we will mail you postpaid a pair of 2,500-ohm phones with a **MONEY-BACK GUARANTEE** that they are as good in workmanship and material and as loud and clear as any \$6.00-\$8.00 phone made.

SYKES MFG. COMPANY
15 SPRINGFIELD AVENUE
NEWARK, N. J.

Radio World, 52 issues, \$6.00.
Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

Radio Slang Worries Professor

PAGE the orthodox grammarian! There is danger that even the modern slang of conversation will be revolutionized and given added stimulus toward lower depths of abbreviated phraseology, says "The Globe," New York, if radio messages become common means of communication, according to students and professors of Ohio State University. Professor Charles A. Wright, of the department of electrical engineering at the university, raises the question, if amateur radio operators increase in numbers, will their abbreviations slip into common usage and thus become a part of the American vocabulary?

As an example of what might be thrown at a person during informal conversation with one of these fellows cards received at Robinson Laboratory broadcasting station on the campus are submitted as evidence. One from San Juan, Porto Rico, reads: "U wr wkg 2 EL. Am I rite? Would like to hr fm u. Congratulations OM." By way of interpretation the following may be noted: OM means "old man"; wkg, "working"; wr, "were"; U, "you"; hr, "hear"; rite, "right."

Another card from an operator in Fort Worth, Texas, says: "Ur C. W. steady. Called u but N. D. Hv u ever hrd me?"

QSA is the international abbreviation for "loud." ND means "nothing doing." Otherwise the message is very convincing to the average reader, is it not?

A Radio Serenade

SWEETHEART, alas, I cannot sing. My voice to song is not adjusted. I sound—comparison to bring— Like buzz-saw biting nail that's rusted, If 'tis like anything.

But thanks be to the radio (To Friday's program I refer you). A proxy serenade I'll throw Upon the evening air to stir you, While I with passion glow.

Hook up your wave-lengths, pet, to hear From KPX at eight precisely. The barytone who'll thrill your ear Will summarize my feelings nicely. The Bedouin Love Song, dear.

And then, you'll note, I give a choice (Beneath your ledge in spirit straying), There's GKV with Heart, Rejoice, Or APJ with Let's Be Maying. My views, if not my voice.

One word of caution let me say. Do not, I pray thee, feel offended If Weather Forecast for Today Should interrupt my song extended; It sometimes works that way.

And there's another thing, my dear; It can't be helped, and more's the pity— The static in the atmosphere With shrieks may mar the sweetest ditty. Believe not all you hear.

Drink to Me Only with Thine Eyes (Quartet; YZ) will end my rapture; Four proxy swains as one will rise And sing for me, thy love to capture. Sweetheart, some enterprise!

—ARTHUR H. FOLWELL,
in *The Ladies' Home Journal*.

His Definition of Radio

AN engineer gives as a definition of radio "a system of communication whereby intelligence is transmitted with the speed of light in all directions, for any desired distance, without the aid of any artificial medium, by the propagation and detection of electrical disturbances in space."

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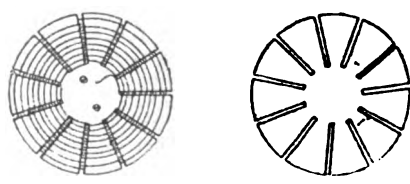
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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

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EXCHANGE JOLLY, INTERESTING LETTERS through our club. Stamp appreciated. Betty Lee, Inc., 4254 Broadway, New York City.

BACK NO. RADIO WORLD WANTED—The publisher wants copies of Radio World of April 22. Mail us copies and current issues will be sent you in return. RADIO WORLD, 1493 Broadway, New York City.

Broadcast Bill's Radiolays

By William E. Douglass

HEZEKIAH SINGLETREE'S a "Wire-less Bug" fer fair; he sez that he kin pick up stuff frum almost everywhere. No matter where I meet him, he will hand me out a line about how good his set is—sez it's just as good as mine. Now he made his with balin' wire an' cans frum "Father's Oats"; of course they ain't no more alike than pigs an' billy goats. But that don't stop him

them stations in, no matter, far er near. So puttin' on the earmuffs I tried hard to tune 'em in, an' once I heard a feller playin' on the violin. I told Hez what I'd heard but he sed, "That's my daughter Claire a practicin' her lesson, that ain't music frum the air." I tried again but all I got wuz squeals an' that there static; I sez, "If this here set wuz mine, I'd store it in the attic." When I took off the headset I could see that Hez wuz sore or sorter puzzled like at least, I couldn't see what for, 'cause I wuz only kiddin' him, but I found out today, when I wuz down to get the mail, why he had looked that way. Now folks I'll bet you couldn't guess what it wuz all about, but Hez an' me are friends again, we've straightened it all out. It seems that it wuz this way, while I set there by the set with rubber earmuffs clamped on tight a tryin' to get some far off distant station, north er south er on the coast, most any place so Hez could say that he'd made good his boast, he'd asked me if I'd like to have some of the "cup that cheers." "some real old stuff" aged in the wood, that he had kept fer years. With earmuffs on I didn't hear a single word he'd said an' fer some unknown reason I must of shook my head. But it's like Doctor Coué sez (correct right to the letter)

"For day by day in every way its getting better and better."

Copyright, 1922, Westinghouse Electric & Manufacturing Company.

Crystal Detector Not Recent Invention

MANY authorities now state that old patents, magazines, and other scientific literature show that the crystal devices claimed to have been "patented" were described in these magazines and patents many years before the present holders' "patents" were applied for. There is a great volume of this literature, it is said, in French, German and Dutch languages, as well as in English, clearly explaining the crystal detector, no one ever having bothered to file patent applications on them until comparatively recent times.

No Free List

To many anxious inquirers: **RADIO WORLD** has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.



"New, Folks, I'll Bet You Couldn't Guess What It Wuz All About."

talkin' cause he'll argue all day long, beginnin' after breakfast 'long 'bout noon he's goin' strong. To please him I went over to his house the other night (I'd rather stayed at home where I could hear the concert right). But nothin' else would do because he wanted me to hear how he could bring

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Remember the beginner is looking for them.

We intend to print in this paper, each week, pictured information and description of value to radio amateurs. If you have found a newer or better way of doing anything, don't keep the secret but tell it to your thousands of brother fans.

Send in a photograph of your set with or without accompanying diagrams and measurement. State whether you figure in the picture yourself, or not, and without any expense whatsoever to you we will make an engraving and publish it. Be sure to write your name and address plainly on photograph.

Send in your picture at once, or if you have not made a set or done anything else in making radio material, tell the boy next door all about this offer.

Address Technical Editor

RADIO WORLD, 1493 Broadway, New York City, N. Y.

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A 500-Mile Radiophone Employing a 5-Watt Tube, by Frank A. Hahnel.
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Short Cuts in Receiver-Circuit Design, by O. C. Roos.
Making a Short-Wave Regenerator, by Fred. Chas. Ehlert.
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Do You Know Your Receiving Equipment, by James D. Gordon.
Why a Crystal is Called a Rectifier, by Walter Emmett.
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Storage Batteries for Radio, by Fred. Chas. Ehlert.
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Your Storage Battery, by E. L. Bragdon.
What Makes Radio Possible, by Edward Linwood.
Ground Connection as Vital as Antenna, by Fred. Chas. Ehlert.
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Valuable Pointers on Aerial Construction, by Edward Linwood.
What is Meant by Tuning, by E. L. Bragdon.
Radio-Frequency Amplification and Regeneration, by Frank Armstrong.
Honey-Comb Coils and Condensers, by Edward Linwood.
Charging the Storage Battery, by E. L. Bragdon.
How to Construct the Variocoupler, by Frederick J. Rumford.
- MAY 6.**
The Advantages of Radio Frequency, by Harold S. Potter.
How to Construct, Protect and Operate a Storage Battery, by George W. May.
The Beginner's Catechism, by Edward Linwood.
Tuning and What is Meant by It, by Fred. Chas. Ehlert.
New Frequency Amplifier Brings Faintest Waves in Strong, by G. W. May.
- MAY 13.**
My Practical V. T. Detector and Two Stage Amplifier, by Frederick J. Rumford.
The Principles of Radiotelegraphy, by Walter J. Howell.
The Reason for the Loop Aerial, by George W. May.
Tuning and What is Meant by It, by E. L. Bragdon.
The Beginner's Catechism, by Edward Linwood.
- MAY 20.**
The Design of an Amateur Receiving Set, by C. White.
The B Battery and the Plate Current, by George W. May.
Radio Terms at a Glance, by Fred. Chas. Ehlert.
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Fire Undewriters' Rules, by Fred. Chas. Ehlert.
- MAY 27.**
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Why the Condenser Doesn't Condense, by E. L. Bragdon.
Making Signals Louder with Two-Stage Amplifier, by George W. May.
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The Cost of a Single-Circuit Receiver, by Howell W. Miller.
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Tested Invention of Major Armstrong Amplifies Set 100,000 Times, by John Kent.
Repairing Cracks in Hard-Rubber Storage Battery Jars, by W. S. Standford.
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Big Impression Gained at the American Radio Exposition

AN observer at the recent American Radio Exposition, the first of any national importance, must have been greatly impressed by the absence of great changes in radio receiving sets. As has been predicted by leaders in the industry, the sets for 1923 will be only slightly changed from those of the past year. Refinements rather than startling innovations will be the order of the day.

If there is any one item that shows the advance of radio it is the increasing use of radio-frequency units. This is but a natural outcome of the desire on the part of owners for sets that will cover distance.

Of freak sets but few were to be seen. One exhibitor showed a complete set in the pedestal and globe of a floor lamp, but otherwise than this the manufacturers have settled down to the more commonplace outfits.

Few crystal sets were observed. Those that were comprised permanent detectors which do not depend on the fussy manipulation of a hairlike wire.

Loud-speakers have been improved, but no radical changes in design could be observed. Rumors are circulated of laboratory tests on remarkable speakers, but evidently the developmental work had not progressed to a point where the mechanism could be exhibited.

To Rebroadcast American Radio in Canada

AN experiment which may change the broadcasting plans of the country will soon be tried in the station of a large Montreal daily. To technical men, the new plan is known as retransmission, and although it has been tried many times in an experimental way, this will be the first time that it has been given a practical test in rendering public service.

The radio broadcasting station of a Montreal daily paper will be used to rebroadcast entertainment of the New York stations. The New York programmes will be picked up in Montreal with a sensitive receiver and highly amplified. The output of the receiver will then be fed into the broadcasting equipment and the very entertainment that is being sent forth from the New York stations will be enjoyed by the "listeners-in" in Montreal at practically the same instant.

High hopes are held out for the success of the experiment since it will mean a great deal to broadcasting if practical. Working on this principle it will be possible to operate two or three big central broadcasting stations with the smaller stations in the outlying districts used only for retransmission. In this way, two or three stations could blanket the entire United States and the money that is now being spent on the entertainment for several hundred broadcasting stations could be concentrated on a few.

Attention, Newsdealers

You should keep a good supply of back numbers of RADIO WORLD on hand all the time. It has been the experience of many dealers that a purchaser of RADIO WORLD for the first time will almost immediately want the back numbers, some of which are already out of print and some of which are difficult to get. THE PUBLISHER WILL FURNISH BACK NUMBERS TO DEALERS DIRECT OR THROUGH THE AMERICAN NEWS CO. AND ITS BRANCHES. Dealers should hold their unsold copies for a reasonable length of time. RADIO WORLD of October 28 contained a full page of contents of back numbers to that date. 15 cents per copy; any seven numbers for \$1.00. RADIO WORLD, 1493 Broadway, New York.

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RADIO WORLD
 No. 43, dated Jan. 20

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5 RADIO-WIRE TABLES, BY FREDERICK J. RUMFORD, E.E., R.E.

These tables, showing the number of feet in a pound and fractions of a pound, were published in RADIO WORLD as follows: No. 1—Enameled Magnet Wire, RADIO WORLD, No. 84, dated Nov. 18. No. 2—Single Cotton-Covered Wire, RADIO WORLD, No. 35, dated Nov. 25. No. 3—Double Cotton-Covered Wire, RADIO WORLD, No. 36, dated Dec. 2. No. 4—Single Silk-Covered Wire, RADIO WORLD, No. 85, dated Dec. 16. No. 5—Double Silk-Covered Wire, RADIO WORLD, No. 40, dated Dec. 30. Sent to any address postpaid at 15 cents a copy, or the complete set of 5 copies for 75 cents. Or start your subscription with any number. Order now. Every amateur builder should have these tables constantly at hand. The supply of back numbers is limited.

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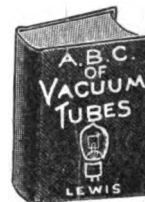


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WEEKLY

Makes Remarkable DX Record without Amplification

ONE of the most remarkable records made by a simple crystal radio-receiving set has been recorded by William Keating, 1516 Second Avenue, South, Minneapolis, who, without any amplification, hears St. Louis, Louisville, Davenport, Iowa, and Detroit. The average crystal set rarely receives over a radius of thirty miles.

Mr. Keating's apparatus is simple. His hook-up is similar to that used by most radio fans, with the exception of a specially wound tuning-coil with a double coil of wire primary and secondary. Two circuits are used, the phone condenser being connected in series with the secondary winding. His aerial is 50 feet high and 75 feet long.

In addition to his remarkable long-distance record, Mr. Keating can bring in local stations with a loud-speaker. This, heretofore, has been considered impossible with a crystal set without use of amplification. Another feat of Mr. Keating's is the use of his thumbnail in place of the catwhisker on his detector, which brings in the music strong in the headphones.

Mr. Keating has contributed a letter to this issue of RADIO WORLD, fully describing his set. See "With the DX Nite Owls," page 18.

(Photo C. International)



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"Farads" or "Microfarads"

Interesting Point in Radio Measurements Raised
 by Radio World Reader.

EDITOR RADIO WORLD — Looking
 through a number of recent maga-
 zines containing articles of interest to
 Radio enthusiasts, I noticed frequent refer-
 ence—both in articles and advertise-
 ments—to the capacity of condensers.
 The various condensers were described
 as having capacities of .001 m.f.d., .0005
 m.f.d., .00025 m.f.d., and so on.

It appears to me that such statements
 are incorrect in that the decimal value
 of capacity is rated as "farad," not as
 "microfarads."

A farad, according to my understand-
 ing of the subject, is that capacity of a
 conductor (a condenser for instance)
 whereby one coulomb of electricity is
 "stored" with a reactance of one volt.

Now, the farad, being too large a unit
 for practical use, a term denoting a mil-
 lionth part of a farad was evolved, i.e.: a
 micro-farad. In other words, one micro-
 farad is 1,000,000th of a farad and is
 written decimally .000001 farad.

Therefore the above quoted condenser
 capacities should be written as 1,000 m.f.d.,
 or .001 farad; 500 m.f.d., or .0005 farad;
 250 m.f.d., or .00025 farad.

If, however, the value .00025 m.f.d., is
 correct, then the capacity of that con-
 denser is only 250 millionths of a million
 of a farad which seems rather "smallish,"
 to my notion.

In analogy, take the quantity of water
 denoted by the term "one gallon." The
 quantity, "one gallon," is rather incon-
 venient, therefore a smaller unit is taken
 for everyday use, i.e.: "Quart." A quart
 is 1/4th of a gallon. If a certain jar has a
 capacity of two quarts of water, we say
 it holds "two quarts" or, written decimally,
 .5 gallon, but not .5 quarts.—F. A. God-
 frey, Entiat, Washington.

Mr. Godfrey is right; but he has caused
 us to do a little more thinking than usual.
 Consulting "Practical Wireless Tele-
 graphy," by Elmer E. Bucher, we found
 the following quotation relating to con-
 denser capacity, (page 81, section 85)
 under the heading, "Condensers."

"Thus the jars in Fig. 91 have the com-
 bined capacities of .002, .003, .004 or alto-
 gether .009 microfarads."

We quote Mr. Bucher to show that
 while Mr. Godfrey is correct in stating
 that a microfarad is 1/1,000,000 of a farad,
 condensers are rated as .009 microfarads
 or 9/1,000 of a microfarad, which is
 9/1,000,000,000 (nine-thousand millionths)
 of a farad.—The Editor.

Radio Books Reviewed

"Tracked by Wireless," by William Le
 Quex. Moffatt, Yard & Company.

WILLIAM LE QUEX, whose stories
 of mystery and the exploits of de-
 tectives have delighted fiction lovers for
 many years, will suffer no loss of reputa-
 tion through his latest novel, "Tracked by
 Wireless." A leading member of the In-
 stitute of Radio Engineers, Mr. Quex is com-
 petent to present in novel form an interest-
 ing narrative with radio as its basic element.
 The plot of "Tracked by Wireless" is in-
 terwoven with mystery, and it is mystery of
 the sort that grips the reader to the end.
 An attractive love theme is cleverly intro-
 duced.

Written in Radio

A LETTER received by RADIO WORLD
 illustrates how completely the Eng-
 lish language is being transcribed to meet
 the radio amateur's need for abbrevia-
 tions. It runs as follows:

"Red yr magazine and mst sa tht it is
 O. K. U hv sm fine hook-ups. lk yr pic-
 tures vy mch. 73 OM CUL hvnt mch
 tm."



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RADIO WORLD

No. 44, Dated January 27, 1923

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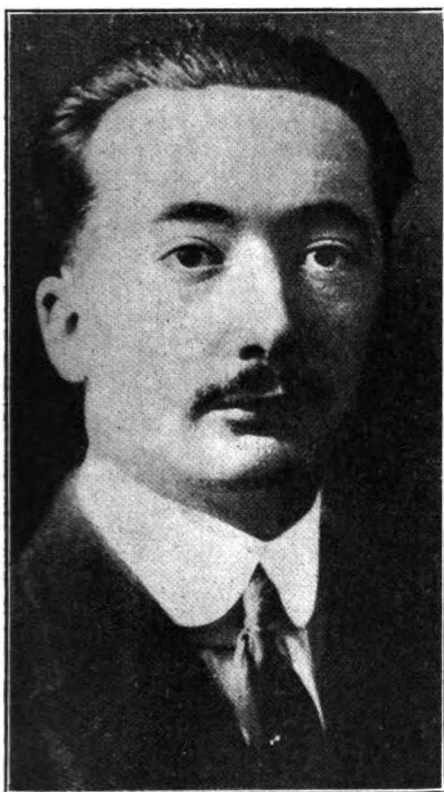
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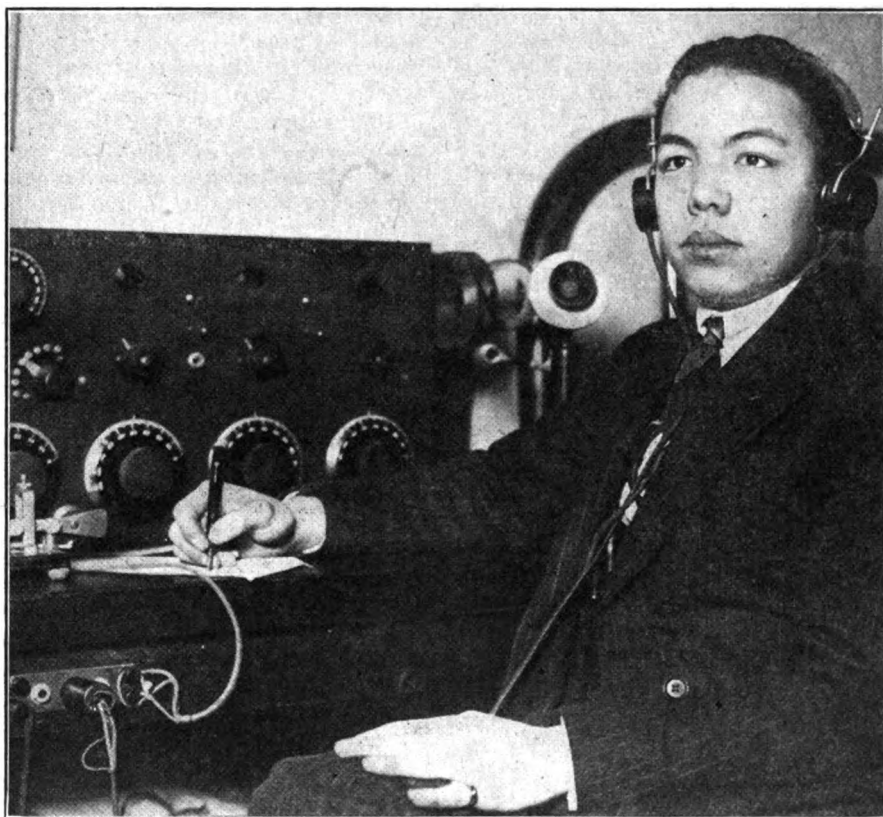
First in France and First in America to Pick Up Transatlantic Radio

By Peter Gray



(C. International)

(At left) Leon de Loy, member of the French Radio League, the only Frenchman to pick up the transatlantic messages of the American Radio League. (At right) Howard Chinn, of Brooklyn, New York, the first American to pick up a message from France.



(Wide World Photo)

ONE of the first American amateurs to receive signals from a French amateur is Howard Chinn, a student of electrical engineering at the Polytechnic Institute, Brooklyn, New York, who spends most of his time between studies transmitting and receiving radio messages. While listening, he recognized the signature of the night wireless operator at Nice, France. The message being in French he could not translate. The picture shows the typical installation that may be expected in the modern radio amateur's "radio shack." Take notice of the "bug key" on the left-hand side of the table. It takes some "fist" to manipulate such a key correctly, otherwise the signals generally sound like a cat scratching around the inside of an empty barrel. Mr. Chinn built his own receiving set, and the fact that he has

received messages from France testifies to the efficiency of his workmanship. By studying the photograph closely, it will be seen that he is using two steps of amplification.

It is a very noticeable fact that amateurs who derive the most satisfaction from their apparatus build their own. Notice also that while the regenerative set takes the most important place on the table, Honeycomb coils are used for long-wave work. The method that Mr. Chinn used of plugging in his telephones is indeed a very novel and notable feature. By plugging the phones in below the table, the cords are kept off the table, and are therefore not in the way when tuning or writing.

The owner of the set is but seventeen years old, and has been interested in radio only four years; but even at that he is the owner of a very fine

station, and is a member of the A. R. R. L., as may be seen by the button in his lapel. This organization has done more to put amateur radio on a really business basis than any other organization of its kind, and it was through the efforts of this organization that international amateur work was projected and made possible. Things of this sort are commonplace now, whereas ten years ago the amateur who transmitted fifty miles and could be heard distinctly enough to be read through static and other disturbances was supposed to be doing wonders. How times have changed since then! Now if an amateur can't receive at least 1,500 to 2,500 miles his set is "no good." In the matter of transmitting, if he doesn't cover at least 500 miles on C-W, why he isn't "doing anything." Digitized by Google

DX Work with a W-D 11

Complete Instructions and Full Size Working Diagrams for the Construction of a Set Using the Famous and Popular W-D 11 Tube

By Ortherus Gordon

For the originality shown in the construction of this set, the writer is indebted to Mr. Kresten T. Sorensen, of Waukegan, Illinois, who first built a set according to these specifications.

For the pleasure and privilege of dissecting the set upon its arrival through the mails and for demonstrating its DX possibilities, the writer is indebted to Miss Abby Sorensen, of Fall River, Massachusetts.

A RADIO receiving-set owned and operated by a girl amateur, Miss Abby Sorensen, of Fall River, Massachusetts, is so modest in its construction yet so efficient in its operation that the details are given here for the benefit of other amateurs. The outfit makes use of the now famous Westinghouse W-D 11 vacuum tube. Built by a pioneer radio amateur and presented to Miss Sorensen as his donation to National Radio Week, the receiving outfit embodies his idea of what should be what in a set of this kind. It is essentially a set for the radio novice, but, at the same time, it is so constructed that it is capable of surprising DX reception. A study of the plans and hook-up will uncover a few original and, perhaps, valuable ideas.

The circuit used is the simple Armstrong regenerative, using the secondary coil of the vario-coupler as a feed-back inductance. The vario-coupler used is an original design, details of which will be explained under its proper heading later, and besides being a departure from the usual in construction, this vario-coupler also operates differently. Ordinarily we think of

the primary winding of a loosely coupled tuner as being stationary. We also feel that it should be wound with multiple taps, so that the antenna inductance can be varied over a wide range of wave-lengths.

This vario-coupler, however, is an exact reversal of ordinary procedure. The rotor, or that which is known as the secondary of the coupler, is used as the antenna inductance while the stator is used as the feed-back inductance. Both inductances have a permanent number of turns, which has been increased and decreased by experimentation until the proper number has been found. Here, again, we find a reversal. The antenna inductance has 50 turns, while the feed-back or "tickler" has 75.

The result of this reversal is surprising. The set actually goes out and brings 'em in, and is as sharp and as "fussy" as outfits three times its size and reputation. While being tested in Waukegan, Michigan, this same set brought in KHJ, Los Angeles, and WBZ, Springfield, Massachusetts, with all stations in between. In Fall River, the set has brought in Chicago opera with no trouble at all, and is actually as sensitive as neighboring stations with one stage of amplification—that is to say, the signals are as loud as from any one point.

It is also a quiet set, easy to operate, and the reception of music is clear and without distortion. The antenna cir-

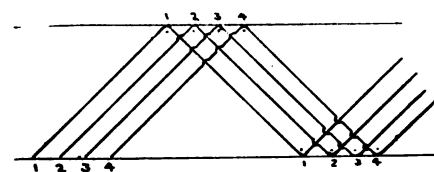


Figure 3. When finished the honeycomb winding resembles lattice work. The windings are fully explained in the accompanying article.

cuit is tuned by a 43-plate variable condenser, while the vario-coupler does the tuning for the remainder of the set.

The instruments comprised are the vario-coupler, a variable condenser, grid-leak condenser, Westinghouse W-D 11 tube, a special tube socket (Na-ald) and a vernier rheostat to vary the filament current. They are panel mounted and enclosed in a neat cabinet.

The Panel

In designing the panel, plenty of room is given the various instruments. There is nothing more annoying than an overcrowded panel or a cabinet which is so full of gear that a fellow can't get his hand down between them to tighten or change a connection. Figure 1 gives the panel layout, showing the holes to be drilled in heavy lines and the dials, binding posts and cabinet outline in dotted lines.

The material used is hard rubber $\frac{1}{8}$ of an inch thick, and the size needed is 6 inches by 10 $\frac{1}{2}$ inches. Bakelite, formica, or any other good composition could have been used, but wood was barred on account of its poor insulating qualities. The terminal markings were scratched on with a sharp instrument and then filled in with white ink. The cabinet is made so that the lid comes off.

The Vario-Coupler

The vario-coupler consists of a stationary winding of 75 turns and a movable winding of 50 turns. Identical
(Continued on page 6)

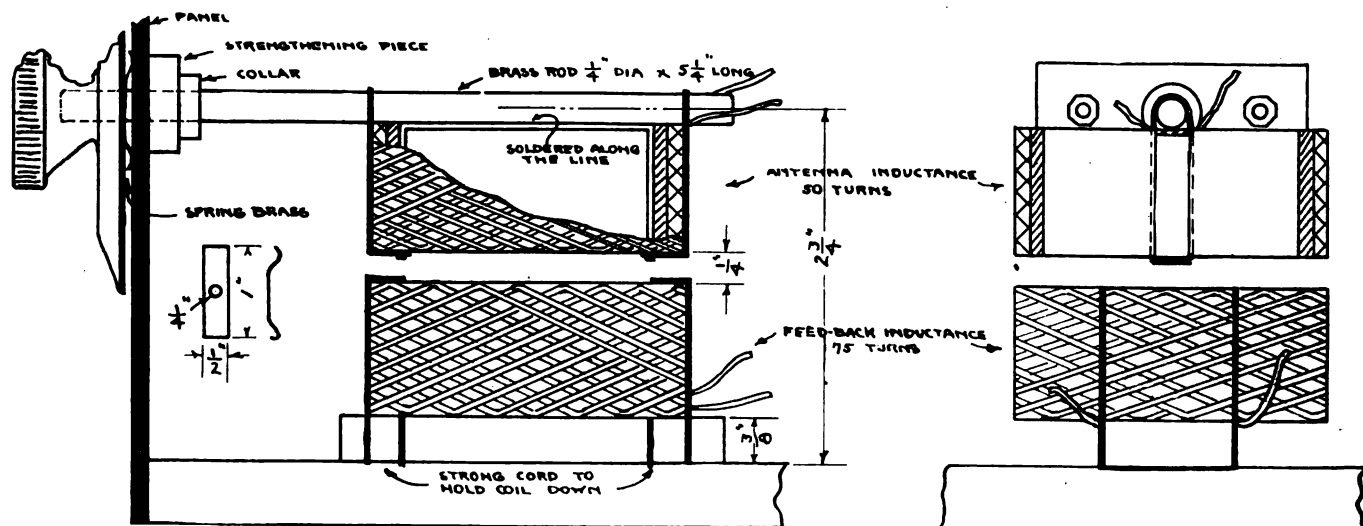
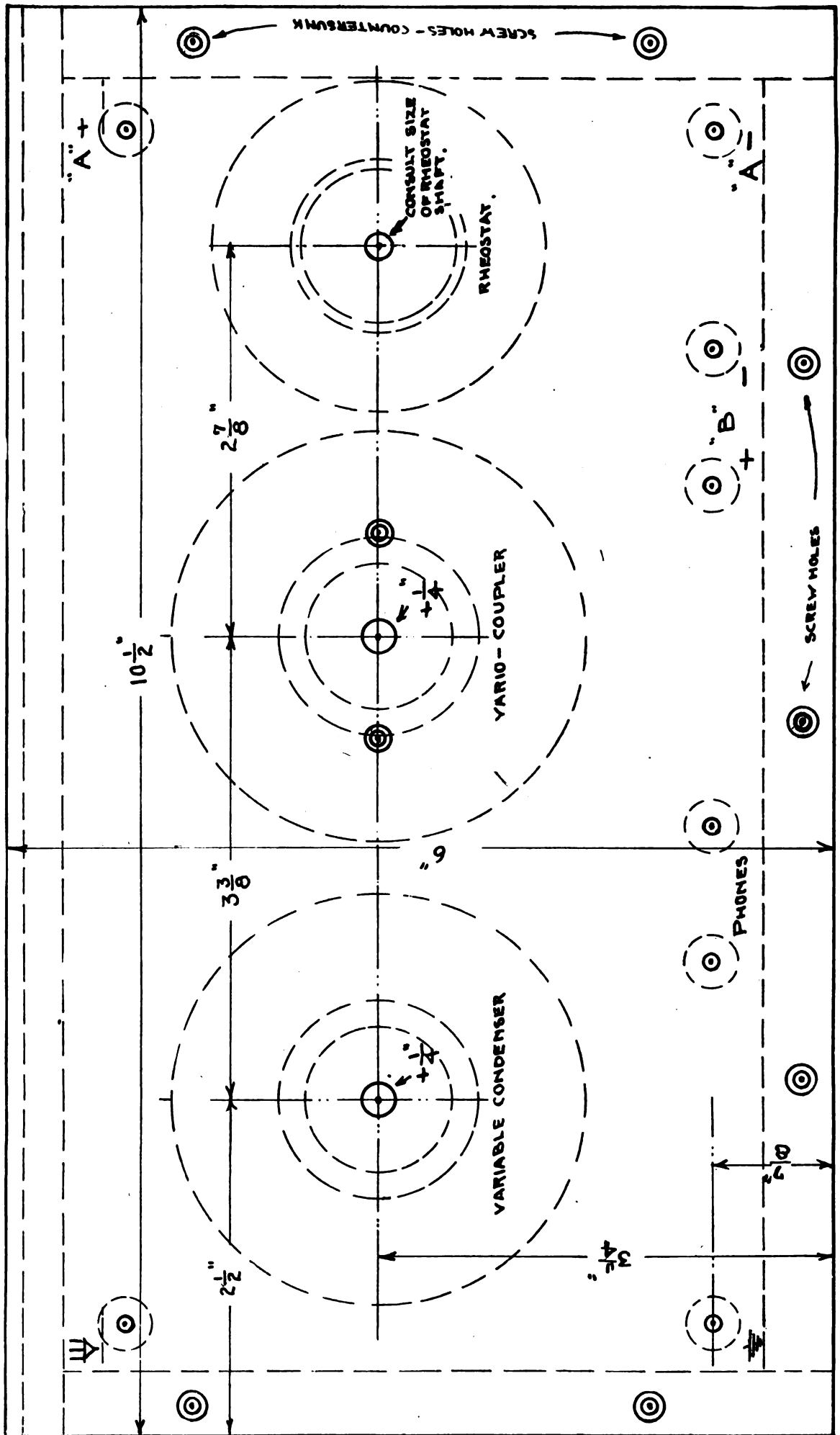


Figure 2. Details of the vario-coupler used with set fully described in the accompanying article. The honeycomb coils are placed one over the other and the upper one is made to rotate to vary the inductance.

Here Is Exact Size Diagram of Panel for W-D 11 Set

Use! This without Alterations

Figure 1. The diagram of the roomy panel for the W-D 11 set is reproduced here with all dimensions given in full size for laying out and drilling for binding posts, screws, and dial shafts. From this it may be seen that all that is necessary is to lay this illustration over your panel and mark the places for drilling the holes. The walls of the cabinet are half an inch thick all around, as the dotted lines indicate. This, of course, means a cabinet with half an inch molding on the inside. Owing to the fact that there are so many different types of variable condensers on the market, no holes are planned except the hole for the shaft. In any case, all that is necessary is to lay a light piece of cardboard over the condenser, and make marks with a pencil over the correct holes in the condenser, and then place it on the panel and drill the same as for other holes. This panel was carefully planned, both for appearance and easy accessibility of the instruments when hooking up. Because there are only two controls and no taps, it should prove an easy matter to lay out and drill a panel according to the above plan. Three-inch dials are used on the variable condenser and coupler, and a small two-inch dial on the rheostat.



(Continued from page 4)

pieces of the same two-inch tube are used for both primary and secondary and both are wound in honeycomb style, making them very compact. The stationary coil is placed flat on the base of the cabinet as shown in Figure 2, being raised to a desired height by a piece of wood $\frac{3}{8}$ of an inch thick. The movable coil is mounted on a $\frac{1}{4}$ -inch brass rod as shown, employing the aid of a brass double-angle and a few

is made just beyond the previous angle, and so on until the total number of turns are made. Each succeeding turn "binds" the turn which has preceded it, so that the pins can be taken out and moved around the edge of the tube as the winding progresses. The complete effect is like lattice work. See Figure 3. The last turn must be held in place by a drop or so of tallow or sealing wax, applied at the angles. Then the whole coil is soaked with

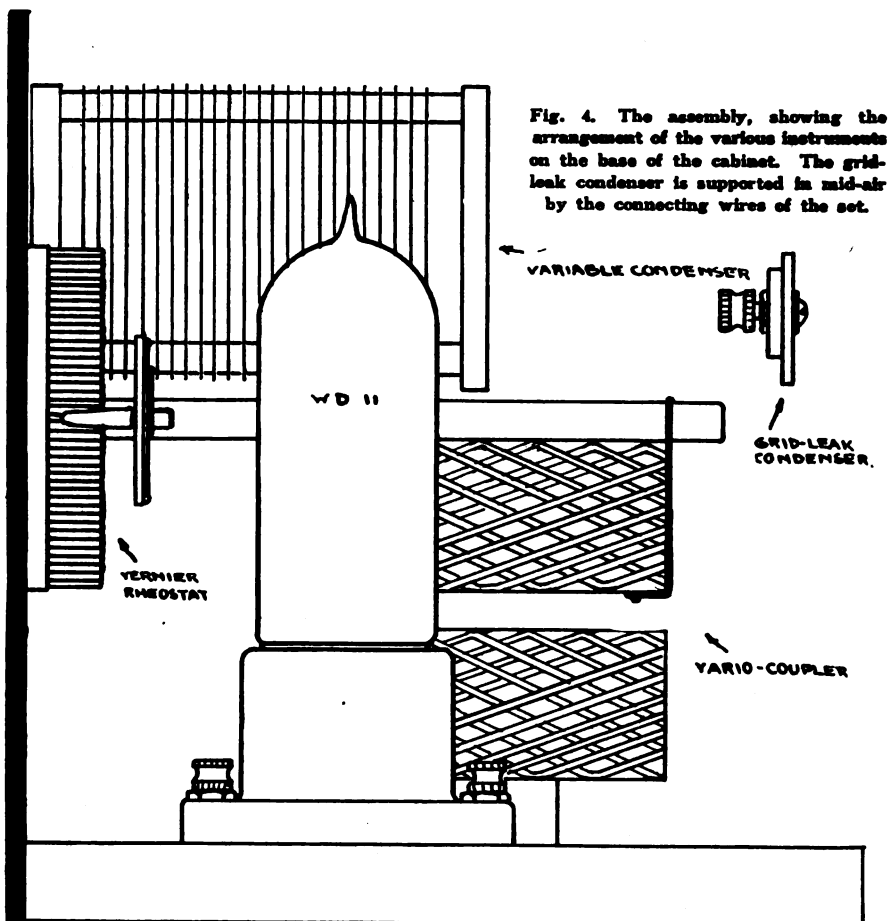
way of making the cat take a squint at the queen.

The Condensers and Grid-Leak

The tuning element in the antenna circuit is a 43-plate variable condenser. It is placed in series with the antenna as shown in the hook-up. See Figure 4. The grid condenser has a capacity of .00025 mfd., while the grid-leak has a resistance of about one megohm. This capacity and resistance is about right for a W-D 11 tube. The grid-leak resistance in this set is a few pencil marks on a piece of cardboard, but later this device will be replaced by a variable grid-leak. No phone condenser is used.

The Rheostat

In providing this receiving set with a filament control, buy the most sensitive rheostat you can find. The W-D 11 operates on a filament voltage of approximately one volt, although the full voltage from a No. 6 dry cell, $1\frac{1}{2}$ volts, will do no harm. Usually, however, it operates best when the filament is maintained at a cherry red and not a bright red glow. The tube is very critical and demands just the proper voltage, no more and no less. When it gets just enough, the reception of signals is truly remarkable—the music is clear, undistorted, and minus the scratches and undertone whistles so frequently the rule in vacuum tube reception. When too much voltage is



pieces of strong twine or fish-line. The clearance between the top of the stationary coil and the bottom of the movable coil should be about $\frac{1}{4}$ of an inch.

Many amateurs are shy of honeycomb windings thinking they are hard to wind. In reality, they are not so much work as the ordinary side-by-side winding with its tap-making troubles. In the case of this vario-coupler, take the two-inch tube and cut off two short pieces, each one inch in length. Shellac and dry these as usual, and then take up one for winding. Using No. 22 D.C.C. start any place along one edge of the tube and wind diagonally across it to a point on the other edge half way around the tube. At this point, stick a pin in place to hold the wire. Then make an angle and complete the turn, ending just an eighth of an inch beyond the starting place. Stick in another pin and call this one turn.

The second turn is made the same as the first excepting that the angle

shellac or paraffin until it is set and hard.

In mounting the movable coil of 50 turns on the panel, it is necessary to give the $\frac{1}{4}$ -inch brass-rod bearing surface. This is done by a strengthening piece of fiber or wood bolted, or screwed, to the panel. A shoulder—soldered on to the brass rod—fits against this strengthening piece and is held there by a small piece of spring brass placed between the dial and the outside face of the panel. This arrangement is ideal and works to perfection. However, other ways may suggest themselves to ingenious amateurs. There is always more than one

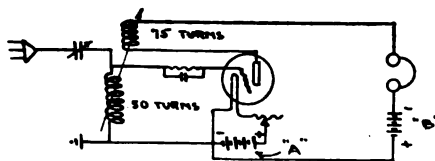


Fig. 5. Hook-up with the W-D 11 set

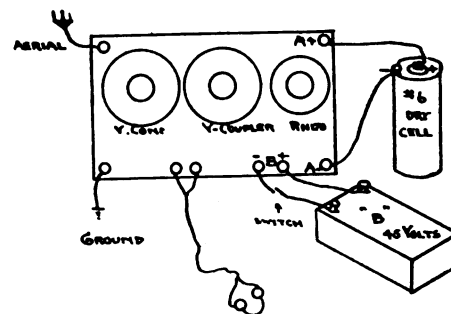


Fig. 6. Diagram showing how to connect the aerial, ground, batteries and phones to the six binding posts on the cabinet face.

supplied the W-D 11 filament, reception gets noisy and distorted. With these facts gained by actual operation of this set, a vernier rheostat is strongly recommended. The most delicate on the market will prove none too sensitive for the W-D 11 tube.

The Assembly.

The arrangement of instruments on the panel and on the base of the cabinet is indicated by Figures 1 and 5. There are eight binding posts on the panel, and Figure 6 shows what they are used for. The A battery is a No. 6 dry cell. The terminals on such batteries are not usually marked plus or minus, but the central binding post is the positive, while the binding post on the edge is the negative terminal.

The B battery is ordinarily rated at

National Radio Center to Check Crime

By Washington R. Service

WASHINGTON, D. C.—Henry M. Daugherty, Attorney General of the United States, plans a National Bureau of Identification and Information in Washington. Radio will be utilized to its fullest extent. It will be the means of broadcasting data on criminals and their activities to the whole country, according to William J. Burns, chief of the Bureau of Investigation. A National Gallery of Rogues and Crime is the idea of the Attorney General. It is believed that this will be something unique in criminal investigation, as it will cover the whole country and be immediately available.

"In these days of fire and accident prevention," said Mr. Burns, "we have come to crime prevention. We plan to have eventually on file here the photograph, finger prints, description and history of every known criminal in America, as well as data on his methods of operation."

When legislation authorizes it, and the system gets into operation with State, county, and municipal police departments co-operating, Mr. Burns believes that the first practical step toward the prevention of crime and the apprehension of criminals will have been established. If a local police de-

partment radios to Washington the details of a crime, with a description and name of the suspect, or asks for data on a man in the rogues' gallery, it would be disconcerting for the fugitive from justice to know that, a few minutes later, his whole history would be broadcast over the United States. He would be watched for at every possible point of departure within an hour after the commission of the crime. Mr. Burns believes this would restrain, to a great extent, the activity of criminals.

Rogues Archives in Preparation

Already one police association has voted to turn over its criminal historical data to the Washington National headquarters, where the government records will soon be moved from Leavenworth, Kansas, as a nucleus of the criminal archives to be kept by the new division.

A national bureau of identification will be of immense value to the country, Mr. Burns said, explaining that criminal psychology was such that when he is known he is practically out of the game. "Turn the light on him, and he is destroyed," Mr. Burns put it. "Catch him without his knowing how it is accomplished," he said, "he becomes uneasy and, thereafter, is slow

to take a chance." Sir Basil Thomson, formerly head of Scotland Yard, who was a recent visitor to Washington, is interested in the department's scheme, Mr. Burns said. Sir Basil is also a firm believer in the value of radio in general police work.

Greatest Scientific Achievement in World

"I believe radio is the greatest scientific achievement in the history of the world," declared the chief of the Government's criminal investigation bureau. Within two years, Mr. Burns predicts, every home, institution, and establishment, will be equipped with radio receiving sets capable of receiving messages from all over the country and even abroad. In New York, he added, the police broadcast warnings from headquarters when a crime is committed and the criminal is at large.

Warner Wears Winner's Hat



Mr. Kenneth B. Warner, secretary of the American Radio Relay League, wearing the Amateur Radio Top Hat won from Mr. M. W. Burnham, of England. A wager was made, last fall, that the American amateurs would not be first to reach England "by spark." The bet was a top hat, as illustrated. The Englishman lost, and the photograph indicates how thoroughly he paid up. The hat is fittingly inscribed with the terms of the wager on the front and, on the back, the results of the test. It is now England's turn to show what her amateurs can do in transatlantic work.

(Continued from preceding page)

22½ volts for detection and 45 or more for amplification, that is to say, with W-D 11 tubes. But with this vario-coupler and hook-up, it has been found that 45 volts work best on the plate circuit. Amateurs building this set according to specifications and then neglecting to provide the extra voltage for the plate will be disappointed with the results. The 45 volts necessary may be secured by building up a number of small flashlight batteries or by connecting two 22½-volt batteries together.

Operation

With the aerial, ground, batteries, and phones connected as in Figure 6, the W-D 11 set is ready for reception. Adjust the headphones and turn the rheostat until a sandy noise like the beginning of a phonograph record warns you that regeneration has set in. Then turn the dials until a shrill whistle is heard. Carefully adjust the variable condenser and the vario-coupler dials until this whistle disappears and in its place is a distorted and swollen something that sounds as though it might be a voice, a song or an orchestra, as the case may be.

Now cut down the filament voltage with the rheostat and you will notice

that as the proper voltage is neared, the music clears itself out, and the attendant noises disappear. When this happens, closer adjustment of the other two dials will complete the tuning to perfection.

Owing to the variable quality of a dry cell, it frequently happens that the voltage increases or decreases without warning, so that the rheostat adjustment is never the same twice. It varies considerably for the same station under similar conditions.

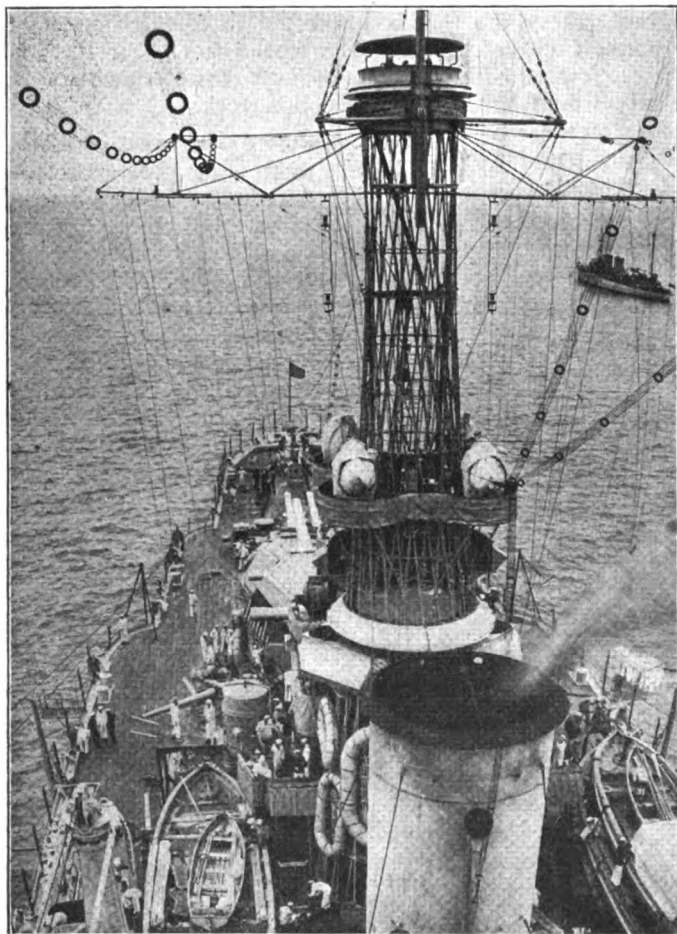
A warning is given about the filament voltage. *Do not use more than 1½ volts.* The filament is easily burned out when excess current is used; but is a "long-lifer" with proper care.

Do not connect the plate battery by mistake to the A battery terminals. Such a mistake will cost you the price of a W-D 11 tube—and they are not being given away. Do not use two dry-cells for the filament unless you are certain that their maximum combined voltage does not exceed 1½ volts.

When finished with the set, be sure that the rheostat is turned off, and the B battery switch thrown out. Otherwise perfectly good batteries will go to waste.

How Radio Is Handled in the Atlantic Fleet of Uncle Sam's Navy

By Robert A. Bachmann, Commander, M. C. U. S. N.



(U. S. Navy Official Photo.)

Aerials of the United States Battleship "New Mexico," one of the newest and most powerful oil-burning ships.

THE idea to visit a battleship had been with us for some time. So much had been printed about radio that our curiosity was aroused and we wanted to see for ourselves what equipment a modern fighting machine carried.

A news paragraph revealed the fact that the U. S. S. "Maryland," the latest and largest ship of Uncle Sam's ships, flagship of Admiral Hilary P. Jones, of the United States Fleet, had just arrived at New York and would dock at the Navy Yard so we made the trip to Brooklyn and located the "Maryland" moored alongside a wharf.

"Can you tell us," we asked Lieutenant-Commander Craven, fleet radio officer, "something about radio activities in the fleet?"

"Perhaps I should begin by showing you our equipment," said Commander Craven. For instance, we have visual signaling by means of flags, light flashes, and search lights; messages by boat and aircraft; sound telegraphy through air and water; carrier pigeons; and, above all, we have radio. All these methods are coordinated, and all have their uses as well as their restrictions; but radio is the principal means of communication in the fleet.

"Ashore each Naval District has its radio stations under the control of the district communication officer and crews of men. The Bureau of Engineering at Washington maintains the equipment used in naval communications through

the navy yards of the various districts. The chief of the Bureau of Engineering is responsible for all the radio installation and radio material. The personnel which mans these stations is trained under the supervision of the chief of the Bureau of Navigation.

"Afloat, all the radio activities are administered directly by the admiral of the fleet through the Fleet Radio Officer, who, in turn, has the supervision, in a general way, of the radio equipment and the work of the radio officers on the various ships that make up the fleet.

"A man-of-war not equipped with radio can not be employed efficiently in modern warfare. In fact, radio is the most interesting branch of the entire naval service. The present wonderful developments of modern electrical science enable us to maintain communication at long distances between ships, from ship to shore, across oceans, with aircraft, with submerged submarines, and between airplanes in the clouds and submerged submarines in the water."

It was easy to see that the young officer was becoming warmed up to his subject. "Let me give you a little of the history of radio in the Navy," he continued. "The Navy Department first began seriously to investigate the general subject of the transmission of signals by electrical waves in the year 1899.

"Four officers were detailed from the Navy Department to observe and report on the working of this system. Following the report of this board, the department placed two ships and a torpedo boat at the disposal of Mr. Marconi for further experiments with a shore station established at the Highland Lights, near the entrance to New York Harbor. This station was the first shore station erected in the United States, and the first ships equipped with radio were the cruiser 'New York,' the battleship 'Massachusetts,' and the torpedo boat 'Porter.' From the favorable reports received from the officers observing these experiments, the advancement of this science progressed by leaps and bounds, many ships and several stations being equipped with different types of radio apparatus and expansion grew tremendously.

"The office of the superintendent of Naval Radio Service was established by the Navy Department General Order No. 240, of November 9, 1912, at Arlington, Virginia.

"The Bureau of Engineering organized a special division in the bureau to handle radio material problems, research laboratory work being carried on by this section. Many improvements and inventions were made and many projects are still being handled by the radio division of the Bureau of Engineering.

"In August, 1916, the office of Superintendent of Naval Radio Service was changed to the office of director of Naval Communications. The rapid advancement of radio still continues and, at this date, practically every type of ship is equipped with radio apparatus."

"Has the advancement of radio stations ashore been as rapid as aboard ship?" we asked.

"Progress in radio ashore and afloat has gone on simultaneously," replied Commander Craven, "and both our coasts are, to-day, dotted with radio stations, there being thirty stations on the Atlantic and Gulf Coasts; twenty-one stations on the Pacific Coast and Alaska; and eleven stations on the Great Lakes. This does not include fifty radio-compass stations scattered over the world—there being five stations in the Canal Zone; eight stations in Cuba, Haiti, Porto Rico, and the Virgin Islands; two in the Hawaiian

(Continued from preceding page)

Islands; two in the Philippines, and one in China, making a total of eighty shore stations.

"These stations and vessels are organized so that they form lines of communication between the various naval units, especially between the Navy Department and the fleets; between the unit commanders in the Navy and the fleets; and between the Navy Department and our outlying possessions. In this system there are high-power 'trunk lines' by which messages are sent to centers whence they can be disseminated by means of intermediate power lines of communication to their destination.

"Without these lines of radio communication the Navy Department would be unable to communicate with the fleets and bases, and the rapid exchange of orders and information so necessary in modern naval warfare would be impossible. Now, let's go up on deck," he concluded.

We ascended a small iron ladder to the open air above. Commander Craven continued:

"The squirrel-cage type of antenna has been found to give the best results aboard ship. As you can see, they extend from the signal yard on each side of the masts, between the masts, and then down to the decks forward and aft. At a distance they look like long spider webs. The main, auxiliary, telephone and the emergency sets each have a separate antenna. The emergency set is operated from storage batteries and does not depend on the ship's power circuit for its operation in time of battle. In addition to the many permanent sets on board, there are field sets—portable sets with telescopic masts and hand-operated generators, having a sufficient range to keep a landing force in touch with the ship while operating ashore or to keep a small boat in communication with its battleship.

"The main radio set is powerful enough for a ship to be in communication with the Navy Department through one of the many large radio stations along our coasts."

"Is it permissible to visit your main radio station?" we interrupted.

"Yes, indeed. Follow me."

The perilous descent down four flights of iron stairs—"ladders" they are termed in the Navy—began and, presently, we found ourselves in a sound-proof room. Here we were amazed at the size of the radio installation. There were big rows of switch boards all neatly polished and ship-shape; there were "banks" or receivers of the most modern type. Operators were typewriting incoming messages just as telegraph operators do in big establishments on shore. We saw one big transmitter and several smaller ones.

"This large room," Commander Craven said, "contains the heart of the fleet's communication system. In here is all the product of modern electrical science which enables the admiral of the fleet to communicate instantaneously with any battleship, cruiser, destroyer, submarine, or aircraft, and to receive information of the enemy. In fact, this room contains the only means available to the admiral for coordinating all the United States naval forces in an action against the enemy.

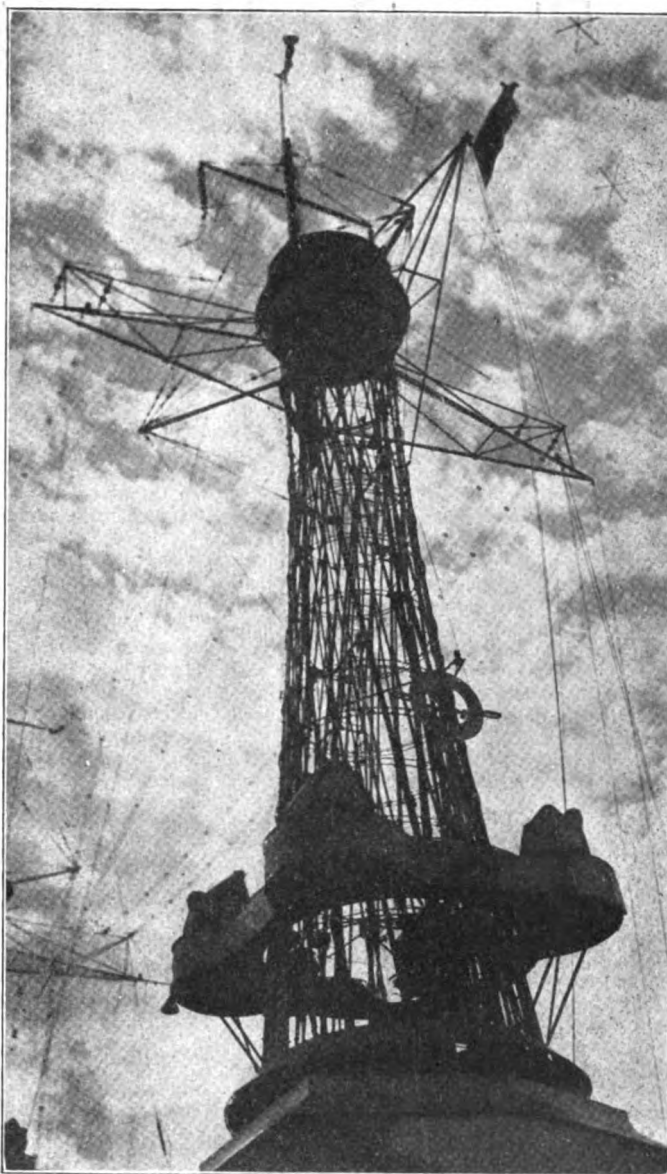
"That set over there is used for communicating at distances over one thousand miles; these smaller sets are for simultaneous communication at shorter distances. We use that one in the corner"—he indicated a set with six big lights—"is for talking to aircraft. It is a radiotelephone.

"These receivers are of the most modern type and we can receive eight messages simultaneously on this ship. When we took the Secretary of State to Brazil, we handled all his important messages direct from the United States twelve hundred miles south of the equator.

"We also have a radio compass on board which helps us to fix our position at sea as well as to locate the enemy."

At the risk of being considered completely uninformed, we confessed that locating an enemy by means of radio is a procedure not quite clear to our nonseagoing brains.

"It's like this," went on Commander Craven obligingly enough, "during the World War, all the Allied shore sta-



(U. S. Navy Official Photo.)

Mainmast of a modern American dreadnaught showing the massive radio equipment.

tions used to listen to enemy submarines sending in their daily reports through the air. Each station had a receiving apparatus by means of which the direction of the incoming waves was accurately determined. By cross checking up between two or more stations, the position of the 'sub' was easy to fix. As soon as the position was learned, it was charted and thus from day to day. Each enemy sub was plotted and its course put down in black and white."

"Just one more thing we want to know. What chance has a young man for advancement who enlists as a radioman in the Navy?"

"You can no longer enlist as a radioman," we were told, "but a primary course of training at a Naval Training Station is necessary. The recruit enlists in the seaman branch and, after being sent aboard ship, submits a request to his commanding officer for a course of instruction in radio. Every opportunity is given an ambitious young man to fit himself for rating and advancement in the radio branch of the Navy. Numerous books and special courses are at his command if he will only accept them. On board battleships and many smaller vessels, classes are organized for men desiring to learn radio. As soon as the student has acquired some proficiency, he is assigned to duty at a shore station or in the radio room aboard ship. For those men who wish to acquire greater proficiency, there are schools of instruction at the Norfolk Navy Yard and at the Great Lakes Training Station."

The Radio Primer

*For Thousands of Beginners Who
Are Coming into Radio Circles*

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

WHAT is the purpose of a rheostat? The rheostat controls the amount of current flowing through the filament. Therefore, it controls the brilliancy.

Why is it better to use separate rheostats for each tube than one to control all of them?

When you use one rheostat to control all the tubes, all are supplied with the same amount of current. As detector tubes generally function better on less than the amplifiers, if you use separate rheostats you will be able to obtain closer and better adjustment of the detector than if you had used only single control.

What part does the filament in a vacuum tube take?

When a filament enclosed in a highly exhausted or gas-filled space is heated to incandescence, it has been found to give out infinitesimal particles called electrons. It was discovered that these electrons are negative; therefore, if a plate is introduced into this highly vacuumized space and a positive charge put on it, the negative electrons given off by the filament will flow from the filament to the plate so long as there is a positive charge on the plate. That is the reason why it is always necessary to connect the positive (+) pole of the high voltage (B) battery to the plate of the vacuum tube.

Why are telephones necessary?

Present-day head telephones are sensitive to very minute electric-currents, and because of the fact that there has been found no apparatus that will as readily adapt itself to the very small currents, they are necessary to make audible the sounds.

What advantage is gained by using a pair of high-resistance telephones?

As the sensitivity of head phones lies in the number of ampere turns on the magnet spools, a pair of phones with 2,000 turns of copper wire will necessarily be more sensitive than a pair of phones with only 700 turns wound on them. As the more wire wound on the spools necessarily puts more resistance in them, it is realized that phones with 2,000 turns the ohmic resistance will be higher than those with only 700 turns. The sensitivity of phones does not depend on the resistance, but on the number of turns of wire wound on the magnet spools.

What is the sign of a weakening B battery?

When you start to use the set, the signals will be strong and clear but will gradually fade away. There is also a scratching noise when this happens.

What is the sign of the A battery weakening?

The indication is visual. By that we

mean that the filament either does not light up as bright as usual, or, after having been turned on, it gradually dims.

What is meant by the "life" of a battery?

By the life of a battery, we mean its useful period. The length of time in which we can draw current from it.

Why has a 22½-volt B battery a longer life than an A battery?

Because a B battery is called upon only to furnish about approximately 1/1000 of an ampere, it lasts longer than the A battery, which generally has to furnish 1 ampere—1,000 times as much. The current flows only from the B battery when signals are audible, while the filament is heated by the A battery while the set is in use.

Is there any advantage gained by using a storage B-battery?

While both dry and storage B-batteries function exactly the same in a receiving set, the advantage lies with the storage battery because it is more constant and convenient. It may be recharged and, therefore, its useful life is many times that of the dry battery which has to be thrown away when its current is exhausted.

What is a B Battery?

A B battery consists of a number of small cells connected in series so as to furnish a sufficient amount of high voltage to operate a tube.

Why is it necessary to use 45 to 60 volts on the plate of an amplifying tube, while a detector generally functions best on 22½ volts?

Amplifying tubes are generally termed "hard;" that is, they are highly vacuumized and it takes more voltage to bridge the gap between the filament and plate. Detector (soft) tubes are of a lower vacuum and are mostly gas filled. Therefore, it takes less voltage to "bridge" the gap between the elements.

Class of Radio Students, in London, Starting Out for Field Tests



Nearly every London school has its class in radio now. The students work both indoors and outdoors.

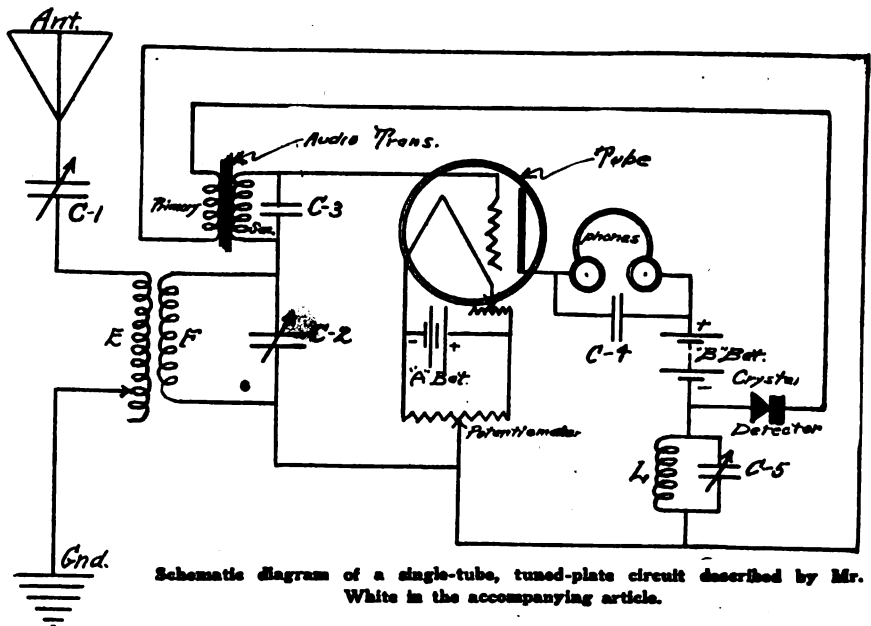
Reflex Circuit with Crystal Detector

By C. White, Consulting Engineer

If you are an experienced amateur looking for a circuit that will bring in broadcast music with clarity and volume, and yet cost no more to operate than a simple regenerative outfit, you can do no better than with the reflex circuit. In a reflex circuit, the vacuum tube is made to play a double function hence the circuit is more critical in its constants than an ordinary type of tuning circuit. But I know that any experienced radio-fan may easily master such a circuit if only he will have the patience necessary when experimenting with radio apparatus. The constants of the circuit are solely dependent on the characteristics of the particular tube that is used and, also, to some extent on the inherent properties of the audio-frequency amplifying transformer. I have personally tried out quite a few reflex circuits but the one described in this article is the most simple and efficient for amateur operation. Do not consider the idea a new one. French radiomen experimented with reflex outfits long before the popularity of the regenerative receiver. Only recently American amateurs began to take to the reflex, and I must confess that the zeal that is now displayed over its development will certainly bring many interesting and valuable radio facts to light.

The type of reflex illustrated in Figure 1 is the type commonly known as the single-tube tuned-plate circuit. A crystal detector of the ordinary style is used as the rectifying, or detecting, unit. Those who, perhaps, loathe the use of a crystal on account of the many adverse comments regarding it are, indeed, foolish. The crystal detector is not only noiseless in operation but is known to incorporate a healthy and natural sound to the received music which is altogether lost when a soft tube is used. The crystal costs nothing to operate and, besides, it is quite easy to find the sensitive spot when radio-frequency amplification is employed. A potentiometer having a resistance of 250 ohms is recommended where a sensitive tube is used.

The unit E-F is an ordinary variocoupler. E is the stator and F is the rotor. The constants of the circuit consist of the inductance unit, L, and the various condensers. The inductance, L, may be made up easily at home by winding about 50 turns of No. 22 D. C. C. on a 3-inch tube. The condenser, C-1, is a 23-plate variable. C-2 is also a 23-plate variable. C-3 is a very large capacity mica-condenser.



Schematic diagram of a single-tube, tuned-plate circuit described by Mr. White in the accompanying article.

The experimenter should try out a few sizes from .25mfd., down to .025mfd., if possible; but anything above .025 mfd., will function satisfactorily, so do not fear that .025 is the largest that may be obtained. The condenser, C-4, is .001mfd., phone bypass mica-condenser. C-5 is another 23-plate variable. If the coil, L, is wound with sufficient inductance, it will be possible to substitute a 11- or 13-plate condenser for the 23-plate.

The first time this circuit is tuned, the amateur will experience a little difficulty owing to the fact that he is working completely in the dark in relation to the correct setting for the

condenser, C-5, but after a little time he will find the correct place and, thereafter, for a given wave-length, no further adjustment will be necessary so far as C-5 is concerned. The main tuning is accomplished by C-1, E-F, and C-2. The condenser, C-5, should be set to about 1-3 mesh, and the main tuning should be accomplished in the main tuning-circuit. After the signal has been tuned in, then C-5 may be adjusted to give the maximum response in the phones. The potentiometer may also be adjusted until the best quality of reception has been effected. Of course, after the first adjustment, the operation on subsequent times is just as easy as the simple regenerative-circuit.

B-Battery Variable

IS there any decided advantage in having a B battery variable in 1½-volt steps?" is a question often asked.

Each tube, of course, has its own internal characteristics. In detectors they generally use one of the gas-filled type. This is called a soft tube, and it is impossible to get the same amount of gas and vacuum in two tubes absolutely identical. Therefore, whenever a soft (gas-filled) tube is used the plate current should be variable because these tubes are critical in their operation. In the hard tubes (not gas-filled, but exhausted to an extremely high degree) this is not necessary as they are more stable.

* * *

Wouldn't it be great if you could get as much for your set when you want to sell it as you think it is worth?

The volume and range of this outfit is fully equal to the best regenerative circuit-tuner. Its quality of tone is far above any type of receiver that uses a tube detector. While it is a little more difficult to set into initial operation, I think that the man who successfully conquers this circuit will be fully rewarded with results. The circuit is not new, as I have said, but it is very practicable. Sets employing as many as eight stages have been successfully built and operated. If you are a radio fan who enjoys trying out the ordinary type of circuit, you will find none better for this purpose than the single-tube reflex. I believe that the reflex circuit is the coming type of radio-phone receiver because it not only brings in distance but does it without distorting the music, like many other types of regenerative and superregenerative circuits, as it is completely noiseless in operation.

Progress on Radio Legislation Indicates Early Passage of White Bill

House Committee Expects to Adjust Military and Commercial Differences

WASHINGTON, D. C.—The Radio Bill will be reported on the floor of the House by the Merchant Marine Committee, and early action is hoped for by Congressman White, of Maine, father of the bill. Following a public hearing, at which only a few changes in the wording were seriously considered, the sub-committee on radio, headed by Congressman White, drafted amendments and hopes for early agreement.

One misunderstanding arose as to the interpretation of the section of the bill relating to the licensing by the Department of Commerce of all operators who handle commercial traffic. Many of the Naval ship and shore stations and some of the Army's transports and stations in Alaska now transmit commercial messages in public interest, when there are no other means of forwarding them by radio or wire. A strict interpretation of the bill would require that Army or Naval operators who handled such messages be licensed by the Department of Commerce, and Secretary Hoover stated at the hearing that the Navy should not have privileges denied other users of wireless. He agreed, however, that he and Secretary Denby would confer on the matter.

As a result of an executive session, Chairman White waited on Secretary Denby and Secretary Hoover with a plan of compromise on the licensing of naval and military operators and the control of Army and Navy stations. Progress was reported and an agreement between the Department heads is expected soon.

Licensing Military Operators Would Be Handicap

Both Army and Naval officials point out that if their operators were forced to take the commercial examinations, it would handicap their work, necessitate considerable travel and split authority over them. It would also complicate grades in the services, as today the Navy has several classes of operators, the Army only two, while there are three grades of commercial licenses.

On the other hand, the Department of Commerce has neither the funds nor the personnel to examine and license all the operators of both military services, many of whom are scattered all over the world; they want only a compliance with regulations and fair competition

By Carl H. Butman

in commercial work. Signal Corps officials would regret the necessity of having to handle commercial work, explaining that they do so only when no other means of communication is available.

This is the case in the Navy, too. This department is most anxious to get

rid of its commercial work, although it is glad to aid in transmitting messages from out-of-the-way places. Recently, eight Navy stations were closed, but on request two were reopened. If Navy men have to be licensed as commercial operators, Secretary Denby says he will refuse all future commercial traffic, but he is sanguine as to an agreement when the facts are laid on the table.

Navy and Commerce Expected to Agree

An amicable adjustment, therefore, is anticipated through the compromise plan of the House sub-committee. Although the details of the scheme were not revealed, it is believed that an exception to the general rule authorizing the licensing of commercial operators is suggested for Army and Navy stations so that emergency messages filed at places where there are no commercial stations can be handled by government operators. It is possible that the President may be named as the arbitrator in cases of departmental disagreements regarding radio control.

Commenting on the situation, Secretary Hoover said that the point of disagreement with the Navy was not a wide one. He seemed willing to compromise in the interest of the public. The bill as drafted, he explains, was intended to control only those radio-transmitting stations carrying on a regular commercial or broadcasting service and to license their operators. Generally, it appears that considerable agitation has been raised over a very small point, but since it is practically the only one brought out in the recent hearing, close observers are hopeful of the bill's speedy passage.

Unanimity on Bill Necessary

Members of the House Committee feel that it will be impossible to pass the measure this session unless there is unanimity of agreement, but this now appears probable. If Mr. White has succeeded in placating the Secretaries of the Navy and Commerce, it is expected that the whole committee will report the bill to the House toward the end of the week. Nothing else seems to stand in the way of this bill intended to clear up the radio atmosphere, eliminate interference, reallocate wavelengths and make for considerable progress in this means of communication. The amateurs and the commercial interests offered no objections of moment, presenting few suggestions.

Hears by Radio While Walking Fields

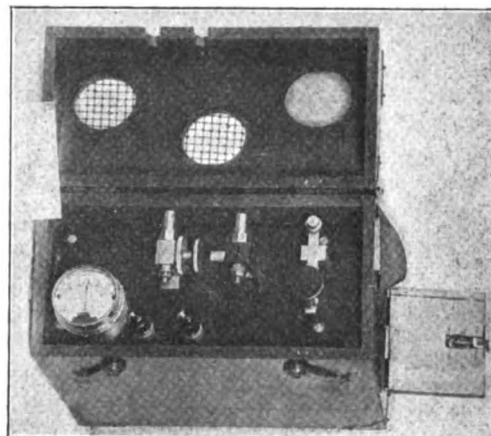
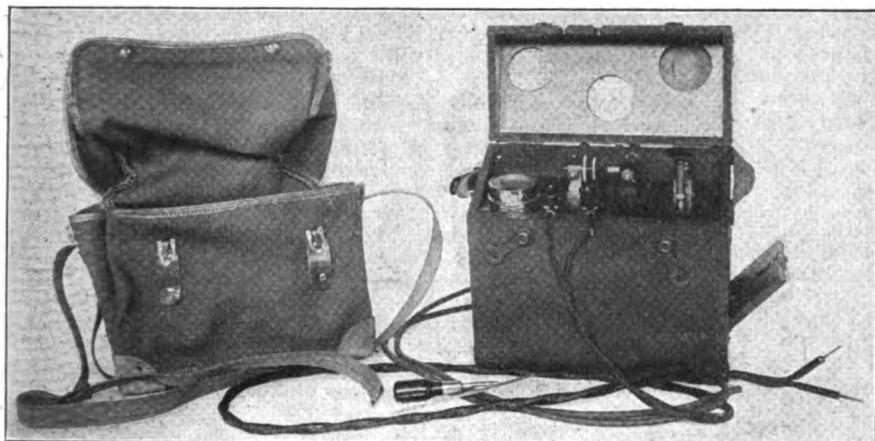


Brent Daniel and his radio valise.

BRENT DANIEL, of Washington, D. C., walking through the fields and listening to a concert from a distant station! His set is encased entirely in an ordinary cowhide suitcase. It consists of a loop aerial wound in the cover of the suitcase, two steps of radio frequency, detector, and three steps of audio-frequency amplification. All the controls are visible through the little door in the side of the case. Mr. Daniel has done some wonderful radio work with this set. Because it is portable and because dry-cell tubes are used, signals may be received in any place whatsoever.

Spark-Coil Transmitting Set Designed for Uncle Sam

By Harold Day



Portable spark-coil transmitting set designed by radio experts in the Signal Corps of the United States Army. (At left) Complete transmitter with carrying case. (At right) Top view of transmitter showing in detail gap, key and ammeter.

THERE is always a great deal of interest in any radio apparatus used by the United States government. The photographs accompanying this article illustrate a portable spark-transmitter recently perfected for short-distance work. As may be seen, the entire apparatus is self-contained and takes up a space 5 by 7 inches. The ammeter, which permits the operator to see just how much he is radiating, is an interesting attachment. This little set has the oscillation transformer inside the box. Because of the fact

that the key is high, the entire set may be operated without the cover being removed. This is accomplished by placing a rubber sheet directly over the key in the cover. The instruments may then be viewed through the glass ports and checked up. This was done in view of the fact that the set may be operated in any weather. Being entirely self-contained, and operated by a special storage battery inside the cabinet itself, it only necessitates the attaching of the antenna and ground, and the cover is snapped closed. Then

the operator presses the key through the rubber. Another feature—one of vast importance—is the small size of the outfit. The entire set may be carried as an adjunct to the regular pack. It weighs only 32 pounds. It has a reliable range, with a regular field antenna from 30 to 75 miles under favorable conditions. The experts who turn out apparatus for the government may be relied on to produce something worth the close scrutiny of all fans and amateurs and because of which they use the world's accepted standards.

Smallest Tube Radio Set in Hospital Service



(C. International News Reel)

Could Dr. Coue do more for this man? If mind is to prove the master of material things, then radio is indelible proof of the efficacy of the theory. Recovering from a most serious operation, Mr. R. Edwin Joyce is bedridden for an indefinite period; but through the ministrations of radio, he is able to recover his strength more rapidly—because his mind is kept in touch with world's best entertainment and information.

PRESENTED with the smallest tube receiving set ever built, by his associates on the Federal Board for Vocational Training of War Veterans, in Washington, R. Edwin Joyce is photographed listening to a concert broadcast from St. Louis. Mr. Joyce was taken to a hospital in Washington where an operation made it necessary that he remain in bed for an indefinite period. To while away the weary hours and keep his mind active, his friends presented him with a small set—one that wouldn't require a large cabinet. This miniature tube-set is the invention of Barney J. Foy, in charge of the electrical training courses at the Washington Bureau for Disabled War Veterans. Tests prove that it has a remarkable receiving-range notwithstanding that it belongs to the army of pygmy radio-sets. The complete set, batteries and all, may be held easily in one hand. As will be seen in the photograph, the inductance is the familiar honeycomb type and the 1½-volt tube is used. The fact that it is small necessitates, of course, that it be of the single-circuit type; but it has recently been found that this type of receiver is remarkable in its selectiveness and is easier to manipulate than the multicontrol type. The use to which this set is being put is another phase of the wonderful work that radio is performing in keeping the minds of those who are sick and ailing off their ills. Another instance of radio's heroic service!

RADIOGRAMS

The Latest Important Radio News, from the World Over, Briefly Told for the Growing Army of Radio Fans

THE fact that 316 American amateurs succeeded in crossing the ocean came as a surprise, since 318 was the total number of stations which qualified for the final tests of the Amateur Radio Relay League. Last year only thirty-three stations "got across." During the last tests, one Canadian amateur station was heard in Europe; this year, signals from two stations were reported. One amateur station in Porto Rico, operated by L. Rexach, and one West Coast station, operated by F. E. Newkirk, were also heard by British and French operators for the first time.

With the opening of the Mackenzie River to navigation, next June, there will be sensitive radio receiving sets installed at Hudson Bay posts all the way down the river to Stefansson's "Friendly Arctic," in the delta of the river, 2,000 miles north of Edmonton and 200 miles north of the Arctic Circle. These will enable the fur traders to keep in touch with the fur market.

A new radio station, the largest in the motion picture industry, is in process of erection at the Warner Brothers' West Coast studios, Los Angeles. The station will be established at an approximate expenditure of \$50,000. In order to link up the entire country, the Warner Brothers will erect two other stations, in Chicago and New York, respectively.

Dancing in Bermuda ballrooms to music by radio from New York, Pittsburgh, and other cities in the United States is a novelty this season. Several of the cottagers have either installed or are about to install powerful receiving outfits; some of the larger hotels will probably have them in operation and there is talk of making radio an adjunct to the service at the clubhouses of Bermuda's two eighteen-hole golf links, the Mid-Ocean course at Tuckertown and the Riddell's Bay course, across the harbor from Hamilton.

Additional weather forecasts and warnings are now broadcast from NAT, the Naval Radio Station at New Orleans. These broadcasts, on a wave of 1,832 meters, are for the district included in Louisiana, Arkansas, Oklahoma, and Texas, and comprise weather forecasts, river conditions, and a summary of the conditions over the United States. The schedule calls for a broadcast at 10:30 a. m., and 10:00 p. m., at 75th meridian time.

Who has first right to ether, the radio receiver or the radio sender? This is the problem raised in a suit filed by Edward McWilliams of Dwight, Illinois, in the Circuit Court at Pontiac. The suit is against Wiley Bergman, another radio fan of Dwight, who has a sending apparatus. Mr. McWilliams has only a receiving set, and when Mr. Bergman is sending, it is claimed that his service, as well as that of twenty other radio fans in Dwight, is interrupted. Mr. McWilliams wants the court to determine whether one person has a right to send radio messages disabling the pleasure of countless other persons while they are receiving programs from all parts of the country, which fact, Mr. McWilliams declares, Mr. Bergman refuses to recognize.

The new studio of KDKA is located at the main entrance of the East Pittsburgh works, one mile from the actual broadcasting station. This station is situated on the roof of a nine-story building further up the valley, and will be connected with the studio by direct telephone. The studio will be operated by remote control which has been perfected to a high degree by Westinghouse radio engineers. Remote control of the broadcasting station means that the studio operator will turn the broadcasting apparatus on and off from the studio when the actual program starts and this feature will eliminate any delay between numbers on the program.

Great Britain is rapidly establishing its radio broadcasting system. Three stations are now operating and it is hoped that three more will be broadcasting before the end of this year. Present plans call for eight stations throughout the British Isles, each with sufficient power to entertain listeners in the United States as well as in England.

Commercial radio communication between the United States and China has been established. A station at Hillsboro, Oregon, working on 8,400 meters, is being heard regularly at Shang-

hai, where the company has erected an experimental station. R. P. Schwerin, president of the Federal Telegraph Company, with a party of engineers, is in China completing arrangements to erect stations that will work with this company.

The city council of Chicago is considering a proposed radio ordinance. A study of the contemplated regulations is being made by a subcommittee of the council committee on gas, oil, and electric light. The proposed measure stipulates an inspection fee of \$3 for antenna of receiving outfits and a fee of \$5 for the antenna of transmitting apparatus. Specifications as to the kind of equipment and methods of installation are outlined, chiefly for the guidance of the inspectors. The ordinance has stirred up radio interest. Many are opposed to any legislation, declaring that such regulatory measures would stifle the industry. Others of the radiophone public approve the inspection of antennae, but object to the size of the fee on the ground that an inspection apparatus can be made in a very few minutes and that a fee of 50 cents would be sufficient.

A new vacuum tube for radio use which uses but one-fourth the filament current of the present type radiotrons, has been perfected by the General Electric Company. This can be used either as a detector or an amplifier and is interchangeable in all receiving sets now using radiotrons U-V 200 or U-V 201 tubes. According to W. C. White, who developed this tube, U-V 201-A guarantees quieter operation, with no tube noises, and assures greater amplification due to greater filament and plate area. Greater electron omission amounting to about five times that of the present type tubes is given off.

From December 1 to 31, 1922, 1,760 reports were received at Station PWX, Havana, expressing appreciation for the concerts broadcast from that station. According to the letters received, 66 cities in Massachusetts, 37 cities in Connecticut, 125 cities in Ohio and 53 cities in Indiana heard the Cuban concerts.

WJZ has a new transmitter. Though the old one was generally regarded as one of the finest in the country, recent developments by the Westinghouse engineers rendered it obsolete, so that it has been removed and a new one, up-to-date in every respect, has been installed in its place. This new transmitter is rated at double the power of its predecessor, or 1,000 watts, and is greatly superior in the details of its transmitting, modulating and generating system. It is about three times more effective than the old transmitter. While listeners with electron-tube receivers all over the country have been quick to notice the change, it has been especially pleasing to local owners of either crystal detectors or loud speakers, who are now able to get satisfactory results from their instruments.

One of the latest feats in radio is the reception of a concert played at station WDAF, Kansas City, Missouri, in London and Hawaii simultaneously. The music was played at 11:45 p. m. in Kansas City. It was 7:35 p. m. in Hawaii and 5:35 a. m. in London. The radio waves from the Missouri station were strong enough to be recorded on a dictaphone record in London.

A radio message spoken in New York can be caught in Portland, Ore., in one-sixty-second of a second.

Now they will broadcast the proceedings of Congress by radio, which will be particularly entertaining on the numerous days when Congress fails to proceed.

An Important Article on
THE FILTER CIRCUIT
 with ILLUSTRATIVE HOOK-UP
 By Frederick J. Rumford, E.E., R.E.
 In RADIO WORLD
 Next Week. No. 44. Dated January 27

Radio and the Woman

What the Great Game of Radio Brings to a Woman Who Has a Set in Her Home

By Crystal D. Tector

LAST week, the minister visited our house and was asking just why we hadn't been seen in church for so long a time. Friend Husband took him into our "Radio Room" (We used to call it a parlor) and the minister's face lit up like a beaming sun.

"Ah! I had begun to think that you were forgetting all about church, but I now see that you are in good hands," he said. "We are going to take up the matter of broadcasting our sermons at the next meeting of vestrymen. I hope you won't have to listen in to New York City for sermons then."

Friend Husband thinks that is a fine idea, because the minister is one of those long-winded preachers who never knows when to stop, and on the radio we can switch him off whenever we think we have heard enough.

* * *

I THINK it is absolutely absurd the way some people spread stories. I am just mad, mad, mad clear through. I made a remark, jokingly, the other evening, to a friend of mine, that Friend Husband thought as much of the radio set as he does about me. My friend mentioned it to some one else; and by the time the story got the rounds and came back to me, it was something like this: "Oh, my dear, I am so sorry for you. I heard that your husband is so taken up with radio that you are going to leave him!"

Why, you could have knocked me over with a feather. Why don't people stop talking if they can't get things straight? Talk about a broadcasting station. Some people I know are the best little broadcasters that ever were. They even beat WJZ for speed and distance. They also have a lot of distortion, too.

* * *

A LETTER from a young woman radio fan in Tacoma, Washington, was received the other day. Part of it was as follows: "As it was to be a birthday radio-party and our

parlor is kind of small, we found that we couldn't get everybody in comfortably. My brother solved the problem. He ran wires from the power amplifier of his set into the parlor of the flat next door—the neighbor kindly consenting to let us have the use of it for the evening. It was then a simple matter for us to keep the crowd happy with music from the station, and it really was quite novel having the same set working in two different flats at the same time." Well, I think our western cousins have shown us a little trick that is worth trying—that is, if one has pleasant neighbors.

* * *

SEVERAL girl friends and myself went out the other day with the intention of doing quite a little shopping. I came home with a package of hairpins and a box of delicious bonbons. The reason that we didn't buy more was the fact that while walking through 42nd Street, we passed a theatre that advertised "Televue." The photographs in the lobby were so striking that we simply had to go in. It is really wonderful. You peer into two little holes in an apparatus that looks something like a distorted opera-glass. The pictures are so lifelike, that you actually think that the people on the screen are real. They almost reach out and touch you. Outside of radio, I think that is the most wonderful thing I have seen in the past few years.

* * *

I HAVE noticed in the past month or so that all the little boys in my neighborhood come to my door, after school, and ask me if I have any errands that they can do for me. I have been wondering just why, because heretofore they have made themselves so scarce when I needed one of them. Friend Husband has discovered the reason. It seems that after they run errands they always hung around the radio room for quite some time. One little tow-headed rascal even boasted of it, I heard. "Sure, we run errands for her in turns and then we can sit in the parlor and listen to the radio! She don't care."

Exercising by Radio to Keep the Office Force Fit



(C. Kadel & Herbert)

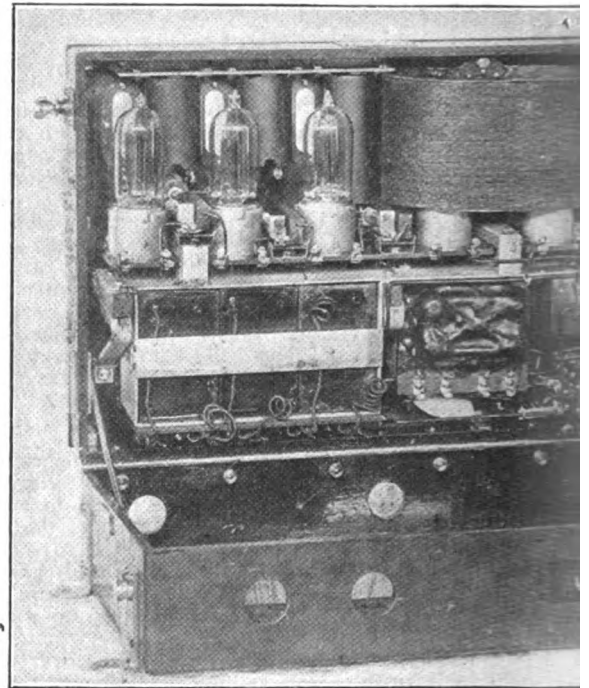
A New York Corporation has installed a complete radio equipment for the benefit of its employees. A physical-culture class has been started and the employees do their setting-up exercises with the aid of the radiophone. The photograph shows the office force exercising to the snappy music

Photographers Ke as Radio Progi

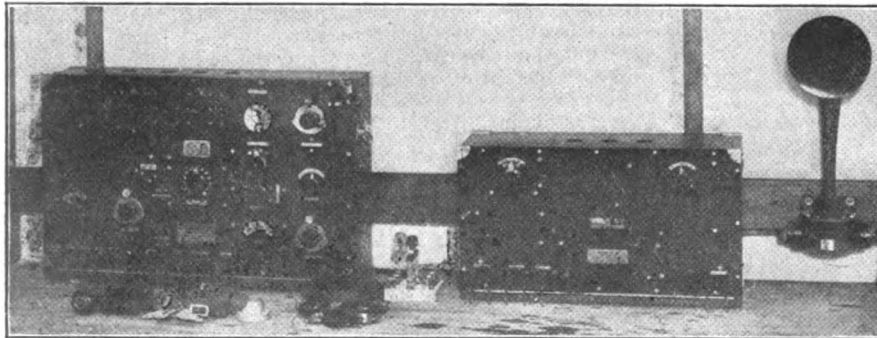


(C. Underwood & Underwood, N. Y.)
(Above) How radio finds its way into the woods with the Boy Scouts. Dick Gordon (left), son of the camp director, and Ralph Mahan are receiving a radio message through their portable set at Camp Kanohwahke, in Interstate Park, the huge reserve that covers the adjoining corners of New York, New Jersey, and Pennsylvania, where some 600 boys enjoyed a holiday week of real winter sport—even to the pure joy of being “snowed in” by a violent snow storm—under the direction of the Boy Scout Foundation of New York.

(Below) Complete receiving and phone equipment used on United States submarine chasers during the World War. This apparatus, although designed over four years ago, is still up to date. There has been very little change in telephone circuits during the past few years. On the right is the combined receiver and transmitter used for intership communication. Owing to the fact that the transmitted wave is always tuned with the receiving circuits, it is a simple matter for communication to be established. The cabinet on the right contains the power tubes used in the transmitting set. Similar sets were recently released by the Government as ships on which they were installed are out of commission. A New York department store bought them up, and it did not take amateurs long to realize the kind of apparatus being offered. The result: that the supply did not last very long.



(Above) Interior view of the transmitting set described in the text at the left. Note the fact that six tubes are used, two of which are of the octal type. The large oval inductance-coil which acts as a shield as well as being a part of the set, one that amateur builders should note, is the second tube on the right-hand side. It is directly under the second tube on the right-hand side. Its wave lengths and plate voltages are simultaneously controlled, of course, are furnished by motor generators not shown in the picture. Owing to the fact that it is reasonably low compared with the voltage of a motor generator, it is easier and more convenient to use.



(Below at left) The Tower at Round Hills, Massachusetts, owned by Edward H. R. Green, son of the late Hetty Green, who has invested heavily in its development. On his estate is a large laboratory, where he is working on broadcasting ideas as soon as anything new in radio is discovered. Colonel Green's first roof of the cupola is equipped with gigantic loud-speakers.



(Photograms, N. Y.)

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Up Us Up to the Moment esses Week by Week



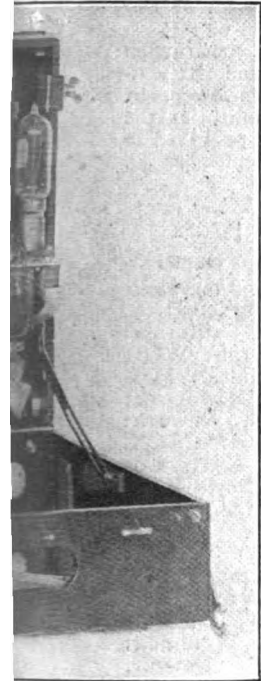
(Above) A corner of the radio room aboard a battleship. The photograph shows the long-wave receiver on the extreme right, and the separate tube-control cabinet. This apparatus is now obsolete, having been replaced with the more modern tube sets. However, it is used to train operators for warships. One of the most noticeable improvements that have been made in these sets is the fact that the tubes are now mounted on the inside of the cabinet. This guards against breakage. Another important fact: Instead of having connections on the front of the cabinet, these are all made at the rear. This makes a neater looking set. Because they are out of the way and cannot be fooled with, there is less chance of damaging the apparatus due to connections being loosened and, therefore, short circuited.



(C. Kadel & Herbert)

(Above) The Grand Old Man of American Law and Railroad, Chauncey M. Depew, nearing his eighty-ninth birthday, recently addressed, for the first time, a vast invisible audience by radio. Mr. Depew, photographed talking into the microphone, told the world how to keep young. His advice is, "Banish worry; forget the past; live in the future."

(Below) The very latest radio development for railroads is radio in sleeping cars. Heretofore it has been confined to baggage cars and day coaches, but to-day—as the photograph below, taken on a Delaware, Lackawanna & Western Pullman, shows—it may be heard in the "sleepers." No outside antenna is used. A loop and straight wire running through the top of the car acts as its antenna. Railroads have even taken up transmitting. The fast train running from Atlanta, Georgia, to Washington, D. C., is broadcaster WEAJ.

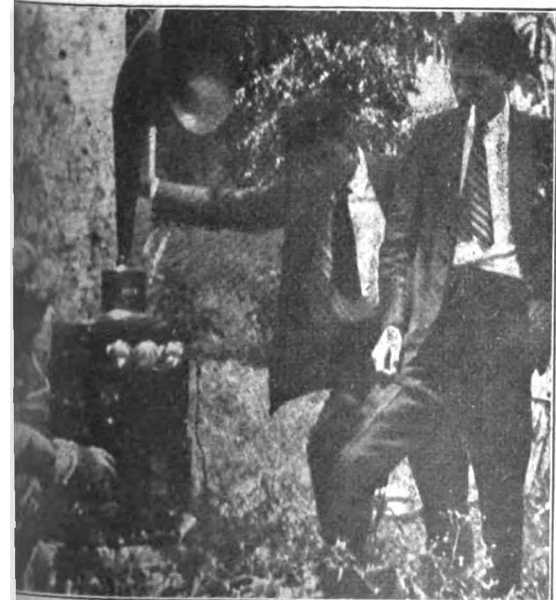


(Caption and photograph show the inside of the substance. A notable feature is a circuit-switch located by means of this switch that is used. The plate voltages, of the circuit. The batteries shown are the voltage generated by the small block batteries shown.

In the country estate of Col. ... interested in radio and ... he has built a ... station is complete, and ... immediately gets it. The ... as the photograph will show.

Captions by John Kent

L. L. Taylor, Jr., who recently established the broadcasting ... for the Cuban Telephone Company of Havana, Cuba, ... tests fifty miles from Havana on the road to Matanzas; ... incidentally, introducing radio to the natives.



(Wood & Underwood, N. Y.)



(C. Kadel & Herbert)

With the DX Nite Owls

1,500 Miles with This Circuit

From Emerson S. Sherow, Millbrook, New York.
Member Radio League of America and
the Poughkeepsie Radio Association

THIS is my hook-up with which I had the results given in RADIO WORLD No. 36, dated December 2. The vario-coupler I have is a Simplex. The first set of taps are on each turn, while the second set are on every ten turns. The variometers (V) are also Simplex. The variable condenser may be placed either in the aerial or ground circuit, but will give best results as shown in the hook-up. This is a Crosley condenser, as are the rheostats (R) and the amplifying transformers (AT).

The jacks (J) are single circuit, while the jack (JI) is a double-circuit. The A battery is a 100 ampere-hour, 6-volt Cooper. The B battery may be any voltage from 24 to 100. I use 45 volts but can get good results using 24 volts.

My aerial is a four-wire inverted-L and runs north and south, both parallel to and at right angles to a high-voltage electric line. It is about 40 feet long and 35 feet high. The lead-in is nearly 25 feet long. There is not one soldered connection in the set, the wires being just wrapped around to make connections. The panel is of hard wood but there is no trouble from this source.

My list of stations is 63, including several amateurs. These stations are situated in eighteen different States, District of Columbia, Canada and Cuba. Some of the farthest are WHB, WHAC, WMAM, WHA, WOC, PWX, WFAA, WLAB, WPK, WBAP, WLAG, KSD. This includes only my longest-distances using the detector and one step. I use only the two steps with a loud-speaker.

One of my records is receiving without using any aerial connections—just the ground to the bathtub. With 24 volts on the plate, and detector tube not lit to extreme brilliancy, I have heard the following very clear and can duplicate any time: WOC, WGY, WJZ, WBZ, WEA, WNAC, WSB, WGM, WGR, KYW, WDAP, WHA, KSD, WQAA, CKCE, CFCA, CKAC, WOH, WLK, WWI, WWJ, WCX, KOP, WMAF, WPK, WOR, WIP, WFAF, WFAB, WHAS, WHAZ, WGI, WLW, WHK, WJAX, NOF, KDKA and several others nearby.

My best distance is Havana, Cuba, 1,500 miles. As I hear a new station nearly every night, I am liable to break this record at any time. My best night for receiving new ones was on December 19, when I heard four within five minutes. On the night of January 4, in about ten minutes of listening, I heard twelve stations, all in about 50 degrees on the condenser dial. This set is very easy of ad-

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups of the various "DX Nite Owls" sending in records, with a view of publishing them.

Send hook-ups of your sets provided they contain anything unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

justment and there is no trouble to secure any desired station so long as he is on the air.

Anyone desiring any further information about this set may write me. I will be glad to help other radio fans so far as I am able.

* * *

With a Radio World Hook-up

From A. E. Jesalita, East Gettysburg,
Long Island, N. Y.

IN RADIO WORLD No. 35, dated November 25, 1922, you published a hook-up for DX work, by George W. May. Believe me, you can reach a good ways with the detector alone. With the hook-up I have had WOC, WDAP, WWJ, PWX, WGM, KDKA, WHAS, and many nearby stations.

* * *

Your Chance Is Good!

From Myrtle Wood, Star Route, Rhineland,
Wisconsin

HOW'S chances to get in with the DX nite owls? I have a record which consider very good for just one tube. I have heard 63 different stations, the farthest being KHJ, Los Angeles; KZN, Salt Lake City; KFAF, Denver; WFAA, Dallas; WBAP, Fort Worth; WSB, Atlanta; WCAC, Pittsburgh; KDKA, East Pittsburgh; WGY, Schenectady; WJZ, Newark; WOR, Newark; WGAM, Orangeburg, South Carolina; WHAS, Louisville. My outfit consists of a loose-coupler, variometer, one W-D 11 dry-cell tube and grid leak. My aerial is a single wire 165 feet long and 60 feet high. How's this for one tube?

* * *

Another 1-Tube Record

From L. H. Hassenflug, Ordway, South Dakota

I AM a steady reader and booster of RADIO WORLD. Noticing the DX records accomplished with one-tube sets, I will enclose mine which may not be as good as some, but will come up to many. I have heard in the last month the following: WLAG, Minneapolis; WOC, Davenport; WDAP, Chicago; WOH, Indianapolis; WLW, Cincinnati; WSZ, Toledo; KDKA, Pittsburgh; DAV, College Park, Georgia; WBAP, Fort Worth; FAA and SZAY, Dallas; WLA, Tulsa, Oklahoma; WKAK,

Okewak, Oklahoma; WOS, Jefferson City, Missouri; WHAS, Louisville; KSD, St. Louis; WDAF and WHB, Kansas City; KLZ and KFAF, Denver; WCX and WWJ, Detroit, and a number of others totaling 42 stations heard in the month of December, 1922.

I am using a set of my own construction and winding of all coils, by hand. It consists of a variable condenser, vario-coupler, plate and grid variometers. I am using the hook-up by Fred. Chas. Ehlert, published in RADIO WORLD, No. 27, dated September 30, but just using a detector.

* * *

One Night's List

From Lyano Hull, Eureka, Kansas (9EFV)

I HAVE heard on a detector and one stage of amplification the following: WDAL, Jacksonville; KLP, Los Altos, California; WSL, Utica; KDKA, Pittsburgh; WGL, Philadelphia; WGI, Medford Hillside, Massachusetts; WRW, Tarrytown, New York; WBAY, New York; WJZ, Newark; KFC, Seattle; PWX, Havana; CFCX, Montreal; CFCA, Toronto; KJH, Los Angeles; WKAQ, San Juan, Porto Rico; KJJ, Sunnyvale; CJGG, Winnipeg; KOB, New Mexico.

One night's list was WEY, Wichita; CFCF, Montreal; CFCA, Toronto; WHAS, Louisville; WOC, Davenport; WBAP, Fort Worth; WSB, Atlanta; KYW, Chicago; WAAW, Omaha; CJCG, Winnipeg; WGY, Schenectady; WCX, Detroit; WLAG, Minneapolis; KIZ, Denver; WGM, Atlanta; WHB, Kansas City. In all I have heard about 120 stations.

* * *

Invites Investigation of Set

From Bill Keating, 1516 Second Avenue, South
Minneapolis, Minn.

NOT long ago, I wrote you concerning the remarkable long-distance record of my crystal set—simple with no amplification. I have done even better, getting KDKA, East Pittsburgh, and listening to them for a full half-hour until local interference prevented. This was on December 23, 7:30 to 8:00, C. T. On the night of December 29, I picked up WFAA, Dallas, Texas, and heard them very clear and distinct. In addition, I get the stations regularly that I mentioned in my first letter.

The total list is as follows: WOC, Davenport; WCAL, Northfield, Minnesota; WHAS, Louisville; WWI, WCX, and KOP, Detroit; KSD, St. Louis; WDAF, and WHB, Kansas City; KYW, and WDAP, Chicago; WSB, Atlanta; KLZ, Denver; KDKA, East Pittsburgh; WFAA, Dallas.

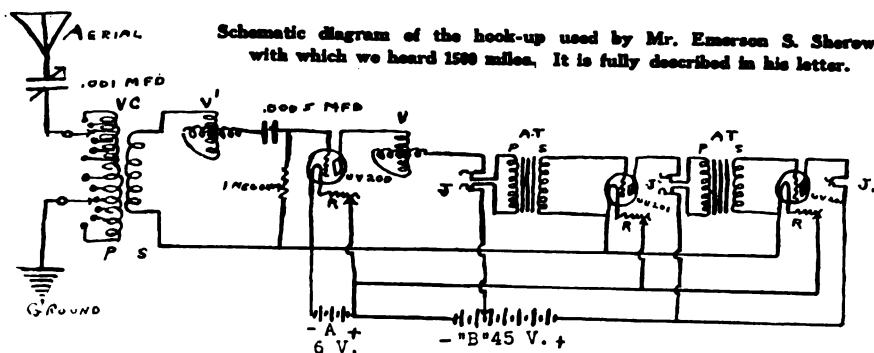
Local results are excellent, as everyone who has seen my set will testify. I use a Dictograph loud-speaker.

However, there are many who discredit my long-distance reception and explain it as reradiation. I can disprove this theory. First, why don't other owners of crystal sets get the same results?

I am aware that there are a few who get short distances of fifty miles, and, perhaps, a few who get the same results as I do. Many of them live much closer to tube sets than I do.

Second, I have picked up these stations fifty times over a period of six weeks at different hours of the night. Wouldn't it be carrying the coincidence pretty far to say that the "owner of a nearby tube set" was tuned in to the same station, at the same time, every night during this period?

Third, the fact that I get these stations so consistently—I get them practically every time I try, and when they are "on" and there is no local interference. A few nights ago, when WLAG, a local station, signed



With the DX Nite Owls

(Continued from preceding page)

off, without any further adjustment I immediately heard WCX, Detroit. These results are not due to a super-crystal, as I have used several.

What, then, is the explanation? I have an excellent pair of sensitive phones, a good aerial (2-wire, 75 feet long and 50 feet high) and good crystals. But many other fellows have the same apparatus. The explanation must lie in the peculiar construction of my set—in the coil. Beyond this I am unable to tell, but I am positive the stations mentioned are actually brought within the receiving range of my set, that the set is not a "freak," that it could be duplicated.

It seems to me that there is a splendid opportunity for investigation and experimentation with this set. I am not capable of such work, but would be glad to have anyone who is look this set over.

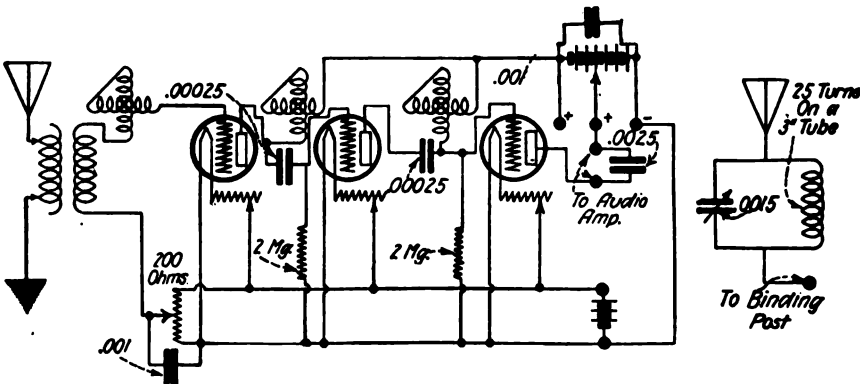
Following is a list of the stations I have received, not counting locals: WJAX, Cleveland; KDKA, Pittsburgh; WGY, Schenectady; 2XL, Schenectady; WJZ, Newark; WDAP, Chicago; WCAE, Pittsburgh; WEAJ, New York; WDAE, Tampa; WMAF, South Dartmouth; WCX, Detroit; WSB, Atlanta; WGM, Atlanta; KOB, State College, New Mexico; WQAA, Pearsburg, Pennsylvania; WMAQ, Chicago; WHB, Kansas City; WCAT, Rapids City, South Dakota.

With One Bulb

From Mayne Damon, 117 Walnut St., Leominster, Mass.

THE following stations came in loud and clear:

WGI, WNAC, WCN, WWJ, KYW, WHAS, WSB, KDKA, WOAP, WGY, WJZ, WBZ, NOF, WIP, WOR, WEAJ,



Schematic diagram of the new radio-frequency amplification described by Mr. K. M. Jones in his letter. The set also makes use of a wave-trap in the antenna circuit. The diagram at the right illustrates the wave-trap. When properly tuned it permits Mr. Jones to work through 200-watt local stations.

New Radio-frequency Amplification

From K. M. Jones, 1646 Richmond Ave., Columbus, O.

I HAVE read with much interest the DX records in RADIO WORLD and would like to enter mine. The work was done on an antenna, on top of the house, 75 feet long, supported by a 45-foot pole at one end and a 12-foot pole at the other.

The circuit is a Grebe C-R-3, two-vario-meter, set adapted to a two-step radio-frequency with three steps and a Magnavox. Baldwin and Western Electric phones are used. The circuit is enclosed. Following is the list of my most distant stations:

KHJ, Los Angeles; KGW, Portland, Oregon; KWH, Los Angeles; KLS, KFAF, DXN4, Denver; WBAP, WVPA, Fort Worth; WFA9, WRR, Dallas; WCM, Austin; WOA1, San Antonio; WEAY, Houston; PUX, Havana; CJCG, Winnipeg; CFCA, Toronto; CKAC, Montreal.

One hundred and twenty-one stations in 34 States have been copied.

Set Cost Only \$7

From Charles A. Benjamin, Boudnot St., Philadelphia

CONSIDERING the fact that my set, without the phones and batteries, cost less than \$7, I sincerely think I can match some of the one-tube records you publish. I use a white-pine panel not varnished, a vario-coupler and a 23-plate condenser. The wiring is composed of scraps of wire picked up around the bench—five different kinds, some insulated and some plain. Fol-

WWZ, WOO, WCAE, WJAX, ZXI, WCR, WOC, KSB, KOP, CFCN, WFL, WWT. I have a Westinghouse R-C set with one stage of audio and radio. The above stations were heard with one bulb. As I am only twelve years old, I have to go to bed early and can't listen for PWX. My aerial is a single wire 40 feet high and 100 feet long.

Home-Set Does Well

From Leon Fry, Box 64, Empire, California

I AM sending my receiving record. I am using a home-made set, which I built. It consists of a bank-wound vario-coupler, 23-plate variable condenser, and a detector tube: KSD, St. Louis; WHB, Kansas City; PWX, Havana, Cuba; WLAG, Minneapolis; WAAP, Wichita; WOI, Ames, Iowa; WCX, Detroit; KYW, Chicago; WWJ, Detroit; WJX, New York; WOC, Davenport, Iowa; WDAF, Kansas City; WBAP, Fort Worth; WSB, Atlanta; CKCB, Winnipeg, Canada; CHCQ, Alberta, Canada. I have caught many other closer stations, several of which are in Canada.

Play the Radio Game, Too

From J. R. Suttie, Mexia, Texas

TO the DX Nite Owls—Dear Friends: I have just finished reading RADIO WORLD No. 40, dated December 30, 1922, and thought I would drop you a line to let you know that "Oil" is not the only game we play down here and that several radio sets have been installed lately. It may be of interest to you to know that with my set

(Continued on page 26)



THE relaxation, the gaiety and the stimulus which all the world is seeking, Magnavox Radio will bring to your own hearth and home.

With the Magnavox Radio, every incoming signal registered by the receiving set is reproduced to the utmost degree of sensitivity and power. This superiority has given Magnavox the distinctive title of the Reproducer Supreme.



R-2 Magnavox Radio with 18-inch horn: this instrument is intended for those who wish the utmost in amplifying power; for large audiences, dance halls, etc. . . . \$85.00

R-3 Magnavox Radio with 14-inch horn: the ideal instrument for use in homes, offices, amateur stations, etc. . . . \$45.00

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Radio. 2 Stage . \$80.00
3 Stage . 110.00

When you purchase a Magnavox product you possess an instrument of the highest quality and service.

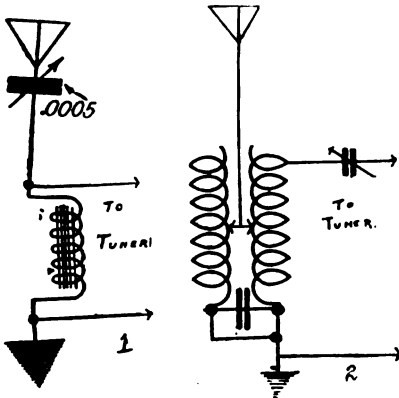
Magnavox products can be had of good dealers everywhere. Write us for copy of new illustrated booklet.

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Oakland, California
N. Y. Office: 370 Seventh Ave.

MAGNAVOX
Radio
The Reproducer Supreme

Answers to Readers

I LIVE about four hundred feet from the telephone office. They use an interrupter to ring the bells direct from the 110-volt line. The noise from this makes tuning impossible. Suggest a way to eliminate this.—R. V. Randrew, Perryville, Ohio.



Two hook-ups requested by Mr. R. V. Randrew, Perryville, Ohio.

We are publishing herewith two hook-ups showing how to eliminate the induction hum. In No. 2, the coils are 40 turns of No. 22 wire wound on a suitable core. The same coil can be used in No. 1. We suggest that in No. 2 you use a .00025 condenser between the two coils.

1. I am constructing a dry cell set similar to the Aeriola Sr., with a two-stage dry cell amplifier. Would you advise a two-stage radio-frequency, a one-stage radio and a one-stage audio-frequency, or two stages of audio-frequency amplification in such a set?
2. Are the rheostats and transformers offered for use with the regular 6-volt tubes suitable for use with the 1½-volt tubes?
3. Where can I get the best hook-up for use with such a set? The nearest broadcasting station is 400 miles.—M. B. Shickley, Gillette, Wyoming.

1. As the 1½-volt tubes do not function well as radio-frequency amplifiers, we would suggest detector and two-stage audio-frequency amplification.
 2. The apparatus in question is all right for use with the 1½-volt tubes; but we suggest that the rheostat of the detector tube be a vernier.
 3. Study the hook-up published in this issue, with all other details, by Ortherus Gordon. It is a very fine hook-up and has given excellent results, as he claims. It is a little different than the others and will probably mean a little extra work in winding the coils, but the results will pay you many times for your trouble.

Would a gravity battery of 6 cells, each cell 6 by 8 inches and taking 3 pounds of blue vitriol, charge a storage battery for use in radio work, or would more cells be required? The storage battery in question is 6 volts. This question was prompted by an article in RADIO WORLD No. 25, dated September 16.—F. A. Hicks, Leon, N. Y.

It will require at least seven cells of a gravity battery to charge a 6-volt storage battery at a very low rate. It would be better to use 8 cells with a resistance in series in order to obtain better control of the charging current. It appears that the average size gravity cell will deliver 1-3 of an ampere. Assuming that the radio set is to be used 3 hours a day, the time left available for charging would be 21 hours, and if the maximum current from the charging battery is 1-3 of an ampere, the amount of current in ampere hours available for

charging would be 1-3 of 21, or 7 ampere hours. Since the amount of current in ampere hours put back into the storage battery should exceed by about 20 per cent the amount taken out, it is apparent that 5.08 ampere hours can be taken from the storage battery over a period of 3 hours, or 1.09 (nearly 2 amperes) continuously for 3 hours. In other words, we should approximate that 2 audion tubes can be used for slightly less than 3 hours a day taking current from the storage battery, assuming that the gravity cells will deliver a continuous current of 1-3 of an ampere at sufficient voltage to overcome that of the storage battery. If the ordinary 40- or 80-ampere hour storage battery is used, we do not believe that the voltage will rise above 7½ volts at the end of the charge. For this reason at least 7, if not 8, cells of a gravity battery must be used. This information is, of course, only approximate as we are not holding ourselves as an authority on gravity batteries. If you should want to do a little experimenting before purchasing additional gravity cells, it might be well to connect the 6 cells you have across 2 cells of the storage battery and, by the use of meters, determine whether a continuous current of 1-3 ampere can be obtained over a period of 21 hours without undue polarization of the charging gravity cells.

Is the peanut tube detector used as an amplifier, or is there a specially adapted tube for this purpose?

2. Is a Bradleystat efficient for the adjustment of the filament of these tubes?

3. Is there any special transformer for these tubes.—Henry Hohrman, Bucyrus, Ohio.

1. So far as we know, this tube may be used as either detector or amplifier simply by employing more plate voltage (45-60), when using it as an amplifier.

2. Much finer adjustment of the filament may be had when such a rheostat is used. Although it is not absolutely necessary to the proper working of the tubes, it improves the reception.

3. Preferably one of low ratio (3-1 or 5-1) should be used with these tubes.

Publish a circuit used in the new de Forest D-7 Reflex receiver.—R. C. Stinson, Wabash, Ind.

If you will refer to RADIO WORLD No. 42, dated January 13, page 4, you will find an article on "Reflex Circuits," by Frederick J. Rumford, fully describing this.

Publish hook-up using the following instruments: Loose-coupler, 23-plate condenser, 43-plate condenser, Freshman grid leak and condenser rheostat, W-D 11 tube, batteries, and phones.—Charles Boch, Davenport, Iowa.

If you will refer to RADIO WORLD No. 39, dated December 23, page 18, you will find a very satisfactory fine hook-up by Jack Lyons.

The variometer in this circuit may be omitted to accommodate your own apparatus.

Latest Radio Patents

Fig. 1.

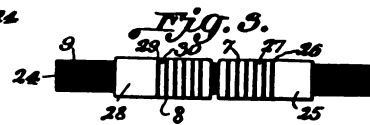
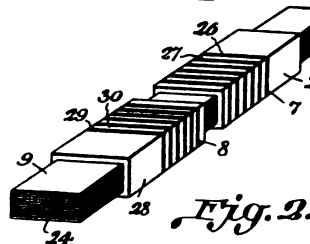
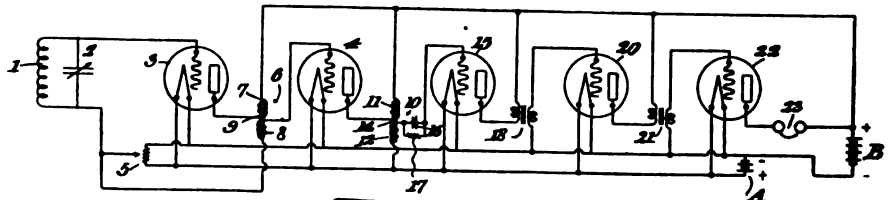


Figure 1 shows connections of a multistage radio-frequency amplifier together with a rectification stage and stages of audio-frequency amplification. Figure 2 is a perspective view of the radio-frequency transformer. Figure 3 is a side view of the transformer showing the windings closely coupled. Figure 4 is a side view of the transformer with the primary and secondary windings more loosely coupled. Figure 5 is a schematic diagram showing the electrical connections of the primary and secondary windings of the transformer. Figure 6 is a perspective view showing the completed transformer removably mounted on the rear of the vacuum-tube panel. Figure 7 is a modified form of transformer construction.

New Amplifying System

No. 1,439,562. Patented December 19, 1922. Patentee: Percival D. Lowell, Washington, D. C.

THE principal objects of Mr. Lowell's new amplifying system may be summed up as follows:

1. To provide a transformer to permit the efficient operation of radio-frequency amplifiers at short wave-lengths and which may be constructed for operation at any

desired wave-length over a wide band of wave-lengths.

2. To provide a radio-frequency transformer in which the capacity between the windings is a minimum.

3. To provide a variable coupling for the primary and secondary windings of the radio-frequency transformer whereby the coupling may be set so as to produce amplification at a particular wave-length only, or a limited band of wave-lengths.

WNAC—Boston's Latest Broadcasting Station

By Frederick J. Rumford, E. E., R. E.

THE first department store in Massachusetts to broadcast daily programs is The Shepard Stores. The firm has engaged artists of standing in the musical world to do their share toward entertaining the radio public. The broadcasting studio is located in the firm's Winter Street store, on the fourth floor, adjoining their radio retail-department. The studio is sound proof, has the most wonderful acoustic properties and is splendidly equipped and furnished for such work. There are accommodations for a large orchestra.

The equipment in the broadcasting station on the eighth floor of the Tremont Street store is the Western Electric apparatus with a type-A speech amplifier such as is used usually in transcontinental radiotelephony. The Shepard Stores has had remarkable success with this station, due entirely to the type-A speech-amplifier where the transmitting set embodies a constant current system of modulation.

The antenna has a natural period of 400 meters, in series with which is used a 750 micro-microfarad condenser. The radiation is 2½ amperes, but the remarkable efficiency of the antenna causes the small amount of current to get an unusual range. Over 350 miles has been covered. Western Electric type 211 A transmitter-tubes are used—two as oscillators, two as modulators, and the others as speech amplifiers. The microphones are of the Western Electric type B, double-button electrostatic type. All wires and power lines are laid in conduit. They are experimenting at present with a counterpoise ground with satisfactory results.

Major John J. Fanning is director of broadcasting and Samuel Curtis, Jr., is chief operator.

On week days, the company broadcasts dance music from 4 to 5 p. m., and a con-

cert program from 8.30 to 10 p. m. on Sundays the services of the Cathedral Church of St. Paul and Tremont Temple are alternately broadcast. Arlington time signals are sent out at 11.55 a. m. and 9.55 p. m., relayed through the courtesy of the Charleston Navy Yard on 360 Meters.

The Shepard Stores invite correspondence from all interested in broadcasting program. Address: Station WNAC, Shepard Stores, Boston 5, Mass.

Tell Us Your Radio Troubles

OUR ADVICE MAY HELP YOU

Give full particulars, make of instrument, local conditions, type and length of aerial. No circular letter proposition, each case is individual. Enclose 25c. and address stamped envelope.

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627 First Ave. No. Minneapolis, Minnesota

Guaranteed Merchandise

- 6 Volt Detector Tubes.....\$2.00
- Amplifiers.....\$2.25
- Large Variometers.....\$2.00
- Couplers, 14 taps, pigtail conn.....\$1.25
- 45 Volt "B" Batteries.....\$1.75
- 22½ Volt "B" Batteries.....75c

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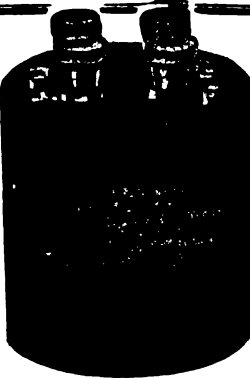
Not just a common horn built into a cabinet. Beautiful, Compact, THE TONE OF FINE GARDNER PHONOGRAPHS. Make your two-step out a **ROCKE HENTERTAINER**. AN SPIROLAS are of the best construction, with fine, rubbed finishes and are absolutely guaranteed.

SPIROLA DUPLIX—Uses any handset. Satin black (SB) Finish, \$3.85. Oak (O) or Mahogany (DM) Finish, \$4.50.

SPIROLA SIMPLEX—Uses Baldwin or other unit. Black (SB), Oak (O), Mahogany (SM) Finish, same prices as DUPLIX.

SPIROLA CONCERT—Complete with built-in unit and cord. Oak (O) or Mahogany (CM) Finish, \$12.50.

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Radio Frequency Transformers

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WALCON Transformers are tested and guaranteed. Particularly adapted for use with W.D.11 tubes.

Four new hook-ups, including a new reflex circuit furnished without charge with each transformer.

Price, \$4.00. We pay postage.

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THE RADIO CENTRE, 2 W. Broadway, N.Y., N.Y.

Denmark Blocks Radio

Laws Forbid Use of Apparatus by Amateurs—Change May Come in Spring

THE radiotelephone has arrived in Denmark, according to United States Consul General Letcher. He reports to the Department of Commerce that it is hoped radiotelephony, now that its advantages have been clearly demonstrated, will soon leave the experimental stage and enter into practical service.

Experiments to acquaint the public with this modern means of communication began in August, with direct wireless communication between Copenhagen and a Scandinavian-American Line ship off the coast of Norway en route to the United States. Recently the Danish Radio Company, which has installed nearly all the radio equipment on ships of that country, established radiophone communication between one of the Copenhagen telegraph news bureaus and Helsingør, about thirty miles away.

A delay in the natural development in the popular field has been caused by the fact that national laws forbid the use of all amateur radiotelephone and telegraph apparatus. In spite of this law, however, there are said to be about a thousand radio amateurs in Denmark. Several firms and institutions have succeeded in securing permission to operate for technical purposes. Nothing will be done to open the air to amateurs and public broadcasters, it is said, until after the International Radio Communications Conference meets in the spring.

Prospects for future developments in Denmark are believed to be good, if laws permitting amateur apparatus are enacted.

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Both the manufacturers' and amateurs' problem on all fine work is readily solved by the instrument constructed for this particular purpose.

THE POST SOLDERING IRON

Platinum Heating Unit—Interchangeable Tip—Universal Current



One Half Actual Size

\$6.00

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Telephone Bryant 4796

My! How th' Lad Has Grown



Cartoon by Harry B. Stillman.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1933. George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

FIRST UNIVERSAL EXPOSITION OF INVENTIONS AND PATENTS, Grand Central Palace, New York City, February 17 to 22, inclusive, 1923.

SOUTH JERSEY'S FIRST RADIO-ELECTRICAL SHOW, Third Regiment Armory, Camden, N. J., February 5 to 10, inclusive.

Crosley Purchases Precision

POWEL CROSLY, Jr., President of the Crosley Manufacturing Company, Cincinnati, largest manufacturers of radio apparatus in the Middle West, announces that his firm has acquired the entire capital stock of the Precision Equipment Company, 2437 Gilbert avenue, Walnut Hills, Cincinnati. It is the first financial deal of any magnitude in Ohio in which the principals are engaged in the manufacture of radio apparatus.

WMH, the broadcasting station of the Precision Equipment Company, will be closed so far as the broadcasting of concerts is concerned, and hereafter the nights formerly used by that company will be used by the Crosley Company, which operates WLW.

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

NEW FIRMS

Lehigh Electric Co., Manhattan, \$50,000; H. N. Croop, M. Lang. (Attorney, W. F. Howell, 2 Rector Street, New York.)
Sterling Lighting Studio, Brooklyn, metal goods, \$20,000; H. Cohn, M. Black. (Attorney, W. L. Post, 50 Church Street, New York.)
Doring Transmissions, Manhattan, electrical engineers, \$12,500; C. H. and M. Levitt, M. Perlman. (Attorneys, Perlman & Levitt, 15 Park Row, New York)

Capital Increases

General Radio Equipment Manufacturing Co., \$100,000 to \$500,000.

South Jersey to Have Radio Show

SOUTH Jersey's First Radio-Electrical Show will be held in the Third Regiment Armory, Camden, New Jersey, during the week of February 5 to 10 inclusive. The exhibition will be under the auspices of the Camden "Post-Telegram." The show promises to eclipse anything ever held in the radio or electrical line in that part of the country. The exhibition advisory board members are T. N. Patterson and W. Bradford Williams.

Heard at the Radio Counter

A Conversation Between Customer and Radio Clerk.
Part XI.

YES, sir! What can we do for you to-day?"
"I would like to inquire whether you can get finer tuning in your secondary circuit by the use of a vernier condenser."

"Most assuredly. By the use of a vernier, either built on the regular condenser or a separate one, you will be enabled to get much finer tuning than by the use of an outside vernier-attachment on the dial. You can make an adjustment of one degree, which, if you stop to analyze it, means just one-forty-fifth of a degree on a forty-five-plate condenser. This is nearly impossible with the use of a vernier attachment."

"Well, I've heard a lot about it; but, of course, much is said about lots of things in radio not absolutely essential to the correct operation of a set, so I thought that I would inquire."

"Well, if I were you, I would not be without one; because if you are using a condenser in your secondary circuit you are most certainly losing a great deal of selectiveness by neglecting really fine tuning, and that is just what a vernier accomplishes. It enables you to tune much finer."

"I never realized it was so important. I think I shall purchase one."

"Certainly. What type do you wish—that already on the condenser, or a separate three-plate?"

"I think the forty-three plate, down there, will just about fill the bill."

"Right! Is there anything else. No. Here is your change. Good day; call again."

(To be continued)

Radio World. 1 Year, (52 numbers) \$6

Radio Aids Seattle's Music Memory

By Mabel Travis Wood

RADIO has proved valuable in a unique scheme to familiarize a city with the best musical compositions. The selections used in Seattle's recent Music Memory Contest, which aroused city-wide interest, were broadcast with splendid results. The Music Memory Contest, promoted by the National Bureau for the Advancement of Music and by Community Service, has done much to increase appreciation of good music. Communities putting on Music Memory Contests use mechanical instruments, local talent contests, music stores, schools, and churches to present the compositions to the public. Stories of the compositions and their composers are run in the newspapers. On the final day of the contest, contestants gather, listen to records of the selections, and write down the name and the composer of each number.

Seattle employed all general means; but through nightly broadcasting of the various selections the field of the contest was largely increased. Not only the city, but every section of Washington had a chance to learn about and hear these examples of the world's best music. The results of the "examination papers" show that the city's musical knowledge ranks high.

The broadcasting was done from the station of the Seattle "Post-Intelligencer" which co-operated with Seattle Community Service in promoting the contest. The mayor issued a proclamation urging all neighborhoods and civic organizations to participate. Prizes valued at more than \$250 were offered, a cash award of \$50 going to the neighborhood with the highest score.

During the three weeks of the contest, the entire twenty-four music-memory selections, as well as short biographical sketches of their composers and descriptions of their history and type of music, were broadcast. Among the radio treats the contest brought forth were the famous sextet from "Lucia," and Cadman's "Land of the Sky-Blue Water" sung by a soprano with flute obligato. A quartet from Plymouth Church broadcast Mendelssohn's "Oh, for the Wings of a Dove." The stirring rhythm of the "Pilgrims' Chorus" from "Tannhauser," and the graceful simplicity of MacDowell's "To a Wild Rose" were borne over the air waves.

On the final day, each of the city's eight high schools were crowded with contestants, many of them radio fans.

To Adopt New Standards

Radio Interests Unite in New York for Bureau of Standards Conference.

THE special conference called by the Bureau of Standards for the purpose of adopting a code of radio standards, held its first meeting in New York City on January 12.

The purpose of the conference is first to consider broadly whether a formulation of standards for radio apparatus and service shall be made; second, if so, what general classes of apparatus or service should be included, and third, what procedure shall be recommended for carrying out the conclusions reached by the conference. If the conference decides that radio standards should be formulated, it is expected that they will be prepared with special consideration of the wide range of interests which are concerned with the subject, and that these standards may ultimately be adopted with the approval of the American Engineering Standards committee as an American standard.

Invitations have been issued to all of the national associations of an engineering and technical nature which are known to be interested in radio standardization. The representation of radio manufacturers will in general be through the trade associations of which they are members. While it is desired to make the conference thoroughly and broadly representative, it is expected that the organizations invited will limit their representation to one or other persons in order that the conference may be as effective as possible.

The deliberations of the conference will be published in the next issue of RADIO WORLD.

Broadcast Bill's Radiolays

By William E. Douglas



"Well, darn his hide, Ill get that pool hall lizard."

LISTNIN' in" 's a habit that I picked up years ago, 'fore Mister Macaroni ever thought of radio. I recollect when Dad put in the first new telephone; I knew the neighbor's voices so I'd sit there all alone an' hear the latest scandal or what they had got for oats. Sometimes they'd argue what wuz best to feed their hogs an' shoats. An' all of that reminds me I've been hearin' things of late which made it plain, to me at least, I should investigate. When I'd sit down to listen to my wireless set at night, I'd hear phone conversation an' I knew that wuzn't right. So, I went to take a look an' found my aerial wire wuz right close by the telephone's—I'll have to raise it higher. I haven't quite decided yet just when I'll

make the change 'cause Tuesday night I heard some talk that sounded mighty strange to "come in" over radio. I guess I might as well explain the situation. Here

is what there is to tell. As I set "listn'in' in" I heard a buzzin' sound er two an' then the voice of Dapper Dan say, "Hullo Gwen, zat you?" Young Dapper Dan's proprietor of our new Billiard Hall, an' to my way of figgerin' he ain't much good at all. Now, Gwendolyn C. Gherkins is my neighbor's only child, an' while we'll all admit she's "spoiled," she's not the least bit wild. I listened to 'em talkin', heard what they planned to do; sez I out loud, "well, Bill, old boy, I guess it's up to you to stop this here elopement." So I called on Gwen's old man an' told him Gwen expected to elope with Dapper Dan. "Elope," sez he, "well dern his hide, I'll get that pool hall lizard. Say, Bill, I'm mighty grateful, you are sure a 'Wireless Wizard.'" So that's the reason why, you see, I'm hesitatin' now 'bout raisin my antenna bein's I have found out how to get the local gossip likewise I can set an' listen to stuff that's being broadcasted without a chance of missin' a bit of juicy scandal, an' I guess that M'ster Cupid will have to say, "Well Bill old top, you're not so awfully stupid."

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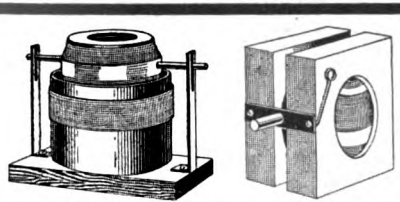
With the **WD-11** Tube

Perfect Results. No Distortion. Full Volume. **LIST**
Immediate Delivery. Write or Wire Orders. **\$5.00**

EXTRA LIBERAL DISCOUNTS TO DEALERS AND JOBBERS.

RADIO COURSES, INC., 554 Seventh Avenue, New York

31 STATES IN 3 NIGHTS
 With Receiver Employing the
ULTRA-AUDION (AM Wave) CIRCUIT
 Set can be assembled for less than \$15.
 Complete Instructions.....\$50
RADIO DESIGNING CO.
 Box 535 Dallas, Texas



VARIOMETERS VARIO-COUPERS \$2.95 EACH
 These instruments, completely assembled and guaranteed, are perfect in construction and design. All parts are accurate. Easily mounted on panel. Coupler primary has seven taps, 2/16" or 1/4" shaft. Effective tuning range 100 to 600 meters.
WILEY VARIOMETER COMPANY
 2523 So. Central Pl. Av. OHNAGO, ILL.

Radio Makes Scribes Happy

Westinghouse Presents National Press Club, Washington, D. C., with Latest Type Set

ONE of the latest developments in radio receiving-sets of the Westinghouse Electric Company has been presented to the National Press Club, Washington, D. C. With this new set, which has a larger wave-range and longer reception radius than the old set, many of the Washington correspondents, whose papers broadcast, now tune in the "home station." Broadcasters in the Middle West and Far South have been brought in since the new set has been in operation. Theodore Tiller, of the Atlanta "Journal," which broadcasts from WSB, was much disappointed the other day when told that he was paged by radio the night before. His paper puts on a special program for him, announcing it over the radio and calling for him to listen in. He was not in the club at the time.

The Westinghouse Company plans to pre-

sent new sets to several members of the Cabinet who are interested in radio, according to Mr. E. L. Norcross, local representative, who has installed a set for Secretary Weeks in the War Department.

The new installation is a big improvement on the old one-dial set, as it enables better tuning. It consists of a two-stage amplifier, transformer coupled, using a push-and-pull circuit on the second stage, which gives a smoother quality to the tone of the signals and eliminates a large amount of distortion. The loud-speaker is also a new device and prevents "blasting." The horn and tubes are mounted on shock absorbers, and the tubes, which are of the new 1 1/2-volt variety, are operated from four dry cells.

Radio in Czechoslovakia

Three Stations Now Operating and Six Are Being Constructed

THREE radiotelegraph stations are now in operation in Czechoslovakia, and six are now under construction, according to United States Consul Winans, at Prague. The station of Brno, Moravia, opened for business last month, establishing communication with the Swiss radio station at Berne. A regular schedule is now maintained three times daily.

Czechoslovakia's principal radiotelegraph station is at Prague, the capital, where a 10-kilowatt set has been in operation since June, 1920. Another smaller station is maintained at Winghrady, which serves the airplanes flying between Prague, Warsaw and Vienna. Exchange rates and press reports are also handled by this service for the government.

At Kbely, near Prague, a 1-kilowatt station is nearing completion for special service to the aviation field at Kbely and public service. At Karlsbad, or Karlovy, another 1-kilowatt set is being installed principally to handle traffic during the "cure" season.

A 5-kilowatt station is in course of construction at Podebrady, Bohemia, which will eventually become the center of Czechoslovakian service. At this place there will also be erected a second station with two 50-kilowatt generators, to be used for international communication. It will be ready next year. Morovaska Ostrava is to have a station for serving the air route and general business in this industrial center. Kosice, Slovakia, has under way another 5-kilowatt station for general service. A 5-kilowatt set is planned for Bratislava, Slovakia, for the International Danube Commission and Danube shipping.

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11 YEARS ON THE SAME SPOT

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Diagraph L. Sp.....	\$13.50	Without verser85
Diagraph Phones	4.85	E. C. A. 712 Transformer....	5.50
Amplitude Phones	5.85	Banker Crystal Sets.....	3.75
Anderson—		Manhattan 2800 ohms.....	2.65
22 Pl. glass enclosed con-		Eveready B Battery, 25% off.	
denser	2.35	Defrost Detector and 2-stage	
43 Pl. glass enclosed con-		amplifier, complete set with	
denser	2.85	phones	65.00
Klesner Verser Rheostat.....	.75	150" Varioscoper, silk wound. 2.15	
Curtler Hammer Verser Rheo-		and a complete line of standard Radio	
stat	1.20	apparatus at reduced prices.	

All tubes at reduced prices. Open till 10 o'clock every night. Money-order or certified check must accompany all orders.



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Telephone 2300 Stayvocat

TRADE "VAC-SHIELDS" MARK



Patent Feed.

"VAC-SHIELDS" do the Trick

The invention of this non-magnetic shield enables you to cut out electric-static effects between vacuum tubes, overcomes interstage coupling, which causes howling, distortion and unnecessary noises which make it so difficult to tune in distant stations—also guards your tubes against breakage. Your set should have them. Specify make of tube when ordering. Attached in a minute.

Price prepaid by mail \$1.00.

ORANGE RESEARCH LAB.

East Orange, N. J.

ASK YOUR DEALER

Attention! Fans and Amateurs!

Have you built your own receiver?
 Are you experimenting with any particular hook-up?
 Are you improving your set?
 Are you doing any interesting constructive work in radio?
 Why not share this knowledge with your thousands of brother fans who read **RADIO WORLD** every week?
 We want pictures of receiving sets with descriptions of how you overcome some difficulty, or of any additional part or unit that you have added to obtain better results. These are the things that, probably, the other fellow is looking for. Send in your information; pictures or whatever you have done to improve the art. Remember the beginner is looking for them.

We intend to print in this paper, each week, pictured information and description of value to radio amateurs. If you have found a newer or better way of doing anything, don't keep the secret but tell it to your thousands of brother fans.

Send in a photograph of your set with or without accompanying diagrams and measurement. State whether you figure in the picture yourself, or not, and without any expense whatsoever to you we will make an engraving and publish it. Be sure to write your name and address plainly on photograph.

Send in your picture at once, or if you have not made a set or done anything else in making radio material, tell the boy next door all about this offer.

Address Technical Editor

RADIO WORLD, 1495 Broadway, New York City, N. Y.

Eight Licenses Granted New Broadcasters

DURING the week ending January 6, the Department of Commerce issued eight licenses for broadcasting on 360 meters, as follows:

- KFEL—Winner Radio Corporation, Denver, Colorado, 150 watts.
- KFFQ—Marksheffel Motor Co., Colorado Springs, Colorado, 10 watts.
- KFFJ—Jenkins Furniture Co., Boise, Idaho, 10 watts.
- WQAE—Moore Radio News Station, Springfield, Vermont, 150 watts.
- WQAN—"Scranton Times," Scranton, Pennsylvania, 100 watts.
- WQAY—Gaston Music & Furniture Co., Hastings, Nebraska, 20 watts.
- WRAO—Radio Service Co., St. Louis, 100 watts.
- WSAT—The Plainview Electric Co., Plainview, Texas, 20 watts.

New Yorker Heard in Europe

GEORGE E. CANNON, of New Rochelle, New York, has actually had his spoken word reported in both England and France. Mr. Cannon's radio telephone is purely an amateur one located in his home residence in New Rochelle.

Wins Broadcasting Honors

Miss Dorothy Weinstein, Eleven, Sends Clearly From New York Public School

DOROTHY WEINSTEIN, eleven years old, a pupil in grade 6B of Public School No. 77, Ridgewood, Borough of Queens, New York City, has broadcast messages with so much thoroughness from the school's transmitter that she has been congratulated by the Society of Radio Artists and Audiences.

John J. O'Regan, principal of the school, has received a letter from Miss Catherine Chute, secretary of the society, stating that the clearness with which Miss Dorothy had broadcast recently attracted the attention of the members of the society.

Broadcasting by the pupils of P. S. 77, through station WHN, was started eight months ago by Principal O'Regan.

The children are not required to attend at broadcasting, which is held after school hours, as it does not form a part of the school program. The feature, however, has created so much interest among the pupils that, since it was inaugurated, close to 200 pupils have had the opportunity to broadcast their voices.

No. 77 is believed to be the only public school in the country with a School Children's Radio Forum. The forum is held every school day.

Choristers Sing by Radio

A UNIQUE radio program was broadcast on Christmas night by WJAX, the radio broadcasting station of The Union Trust Company, Cleveland. The Union Trust Company has a private telephone wire from its radio sending room to the Cleveland Public Auditorium. This auditorium contains what is probably the largest and finest organ in the world.

It was regrettable that this organ should remain quiet on Christmas night when so many thousands of people throughout the eastern half of the United States would enjoy its music, so the Union Trust Company, Lincoln G. Dickey, manager of the Cleveland Public Auditorium, and Edwin Arthur Kraft, organist and choirmaster of Trinity Cathedral, Cleveland, arranged a Christmas night radio program.

Mr. Kraft assembled his entire choir of twenty men and forty-six boys at the Public Auditorium on Christmas night. A complete program of Christmas music, including about a dozen old-fashioned Christmas carols, was given. The fresh, clear voices of the younger boys came over the radio in excellent style and blended remarkably with the full, heavy, rich notes of the auditorium organ.

While the concert progressed, people called up from various parts of Cleveland to congratulate The Union Trust, Mr. Dickey, and Mr. Kraft on the success of the program. Letters have come in from many States complimenting WJAX for this feature. One fan wrote from New Smyrna, Florida: "The choristers came in great last evening and their singing was deeply appreciated by the great crowds that had gathered."

WJAX has been reaching further and further every day. Letters have come in from Nova Scotia, Costa Rica, Tampico and Alberta, Canada, saying that they had heard WJAX easily and clearly.

As It Often Happens

S HHH!! Keep quiet! I just heard music! Maybe it's PWX!"
 "Aw! I wasn't saying a thing. Anyway that fellow wasn't talking Spanish."
 "Shut up! How can I hear him if you keep on gabbin' away like a phonograph."
 Voice in the air announces: "This is station W—H—N, the radio bro—"
 "There, I told you so!"
 "Oh, go fly a kite! That wasn't the station I had on. He drowned PWX out!"

MICON TESTED MICA CONDENSERS



Assure—
Absolute Noiselessness; Accuracy; Clarity of Tone; Constant Fixed Capacity.

Size	Price	Micon Condensers are especially adapted for use with Radio-Frequency, Super-Regenerative and other circuits, where an accurate fixed condenser is required.
.00025	\$.035	
.0005	.35	
.001	.40	
.002	.40	
.0025	.50	
.005	.75	
.006	1.00	
.01	1.50	

For protection against damage to the filament and the consequential short life of filaments, Micon Condensers are invaluable.

At your dealers—otherwise send purchase price and the desired Micons will be sent without further charge.

Chas. Freshman Company, Inc.
 97 Beekman Street, New York City

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

AUTOMOBILE CHARTS

By Victor W. Page, M. S. A. E.

Uniform Size— 24 in. x 38 in.—Price 35c. Each. Location of Ignition System Troubles Made Easy. In this chart all parts of a typical double ignition system using battery and magneto current are shown, and suggestions are given for readily finding ignition troubles and eliminating them when found. Includes latest Delco, Connecticut and other systems. (24 x 38.) Price, 35 cents

Location of Cooling and Lubricating Troubles. This is a combined chart showing all components of the approved form of water cooling group as well as a modern engine lubrication system. It shows all points where defects exist that may result in engine overheating, both in cooling and oiling systems. (24 x 38.) Price, 35 cents

Lubrication of the Motor Car Chassis. This chart presents the plan view of a typical six-cylinder chassis of standard design and outlines all important bearing points requiring lubrication, and is a valuable guide to the correct lubrication of any modern car. A practical chart for all interested in motor car maintenance. (24 x 38.) Price, 35 cents

While each of the above three charts is complete, the set covers all maintenance instructions for the entire automobile.

Location of Starting and Lighting System Faults. The most complete chart yet devised, showing all parts of the modern automobile starting, lighting and ignition systems, giving instructions for systematic location of all faults in wiring, lamps, motor or generator, switches and all other units. Invaluable to motorists, chauffeurs and repairmen. Size 24 x 38 inches. Price, 35 cents

Location of Ford Engine Troubles Made Easy. An enlarged and revised chart showing clear sectional views depicting all portions of the Ford power plant and auxiliary groups. It outlines clearly all parts of the engine, fuel supply systems, ignition group and cooling system, that are apt to give trouble, detailing all arrangements that are liable to make an engine lose power, start hard, or work irregularly. This chart simplifies location of all engine faults, and includes instructions for locating Ford electric starter troubles. Size 25 x 38 inches. Price, 35 cents

Location of Motorcycle Troubles Made Easy. Price, 35 cents

The Six Charts Sent for \$2.00

THE COLUMBIA PRINT
 1493 Broadway, New York City

Pruden Reliable Radio Specialties for Good Results!



Phono-Phane Permanent Radio Detector

The only fixed radio detector requiring no adjustment. Used in place of crystal or vacuum tube detector. Gives excellent quality of sound without distortion, battery or tube noises. Detects telegraph signals at several thousand miles. Detects broadcasted music more clearly than vacuum tube detector, and requires no amplification where the incoming signal has sufficient strength to actuate the sensitive phones.

Ideal for use in regenerative circuits. Handsome, substantial, suitable for assembly in the finest radio equipment. Guaranteed against imperfection or faulty operation. List each \$3.50

THE name "Pruden" back of standard Radio Equipment is a guarantee of mechanical excellence, perfection of workmanship and scientific correctness of design.

Now, more than ever, when the market is flooded with inferior goods, it pays to buy standard trade marked products.

You can pin your faith to "Pruden." Money-back unconditionally if you do not get complete satisfaction.

Just one of the leaders of Pruden Reliable Products shown here that will give you better radio results at no greater cost.

Dealers write today for our interesting proposition.

FREDERICK H. PRUDEN

Incorporated

993 Bergen Avenue

Jersey City, N. J.



For Ready Reference A Neat, Compact Binder for Radio World

We are in a position now to furnish RADIO WORLD readers with a neat, compact and practical binder.

This binder will hold one complete volume of RADIO WORLD ready for instant reference.

Furnished to our readers or the trade for seventy-five cents each, net.

We have only a limited supply of these binders.

Address Sub. Dept., Radio World, 1493 Broadway, New York

D-X-

(DISTANCE)

The Ambition of Every Fan

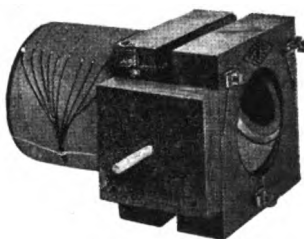
D-X-RADIO COMPANY specializes in Radio instruments designed for DX (Distance) Work. To receive distant stations your instrument must be built with proper equipment. And that means the D-X-Radio Company—particularly since we offer highest quality radio parts at lowest prices.

TO RECEIVE WVF (Fort Wood)
NAA (Arlington)
USE



Vario-Wave Tuner

Guaranteed Wave Length 200 to 3,000 Meters.



PRICE

\$8.50

For D-X Work We Recommend

	List Price	Our Price
Bulldog Grip Plug, round tele-phones	\$1.50	\$0.75
Ameco Potentiometer	1.25	.95
RCA Potentiometer, for "A" Battery	2.00	1.75
Ameco Rheostat	1.25	.65
Bradleystat Rheostat	1.85	1.55
Cutler-Hammer Co. Rheostat	1.00	.75
Plunger Rheostat	1.20	.40
Eakette Socket	1.50	.80
Moulded Socket	1.25	.45
W.D. 11 Socket	1.99	.55
Erandoe Superior Head-Sets, 3,000-Ohm.	8.00	5.95
Federal Head-Sets, 3,200-Ohm.	8.00	5.25
Dr. Selbt, Head-Sets	12.00	6.99
James Ross of London, Head-Sets	12.00	6.99
5-ft. Lengths "Spaghetti"	.30	.19
Acme Type A-28 Transformers	5.00	3.95
Murad Radio Frequency Trans-formers	6.00	2.95
Thordson Transformers	4.50	2.95
UV-712, RCA, Amplifying Transformers	7.00	5.45
UV-1714, RCA, Amplifying Transformers	6.50	4.95
Mercourse Tested Condensers, 60005-60050	.40	.20
Mercourse Tested Condensers, 6002	.50	.25
Mercourse Tested Condensers, 600	.60	.30
5 Pl. Variable Condensers	1.25	.85
A.B.C. 25 Pl. Variable Con-densers	3.00	2.00
A.B.C. 45 Pl. Variable Con-densers	4.00	2.50
Ameco Vernier 48 Pl. Variable Condensers	6.00	4.50
Ameco Vernier 38 Pl. Variable Condensers	5.50	4.00
Competition, 8-in. Dials	.99	.25
4-in. Dials, with knob, 180 deg. Tubular, enclosed in glass, Safe-T Grid Leaks, 1/4, 3/4, 1, 2, 3, 4, and 5 Megohm	.65	.50
5th Type, single Jacks	.85	.50
5th Type, double Jacks	1.00	.70
Hard Rubber Panels:		
7x10	1.75	1.05
7x18	3.15	1.30
12x18	4.20	2.50

Remittance must accompany all Orders. Checks or stamps not accepted. Merchandise shipped post paid east of Mississippi.

FREE CATALOGUE ON REQUEST

D-X-Radio Co.

126 Liberty Street New York City

With the DX Nite Owls

(Continued from page 19)

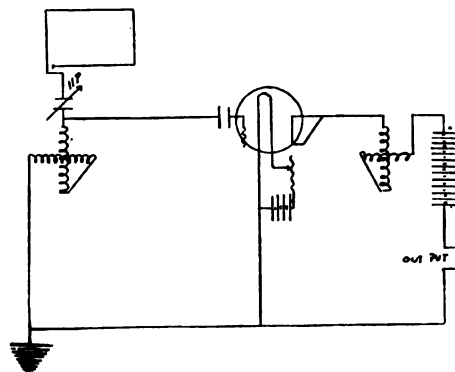
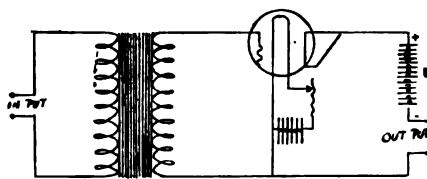
consisting of only one stage of amplification, I have tuned in on stations from the "calm and peaceful waves of the Pacific" on the west, to the "stern and rockbound shores of the Atlantic" on the east, and from the snow-capped mountains of Canada to the sunny coast of Texas. However, I am not claiming a record. I heard very clearly the speech of Vice-President Coolidge described in RADIO WORLD, and would like to know if it was received in France.

(No report has been received that the Vice-President's speech was heard in France. It was heard in England.—The Editor.)

A Remarkable Hook-up

From D. P. Metzgar, Radio Operator, Hotel Randolph, Des Moines, Iowa

I HAVE been a reader of RADIO WORLD for some time and feel that I should report. I have been using a circuit composed of one 11-plate variable condenser and two variometers with one detector-tube and one step of audio-frequency. For my



Schematic diagram of the hook-up described by Mr. D. P. Metzgar in his letter.

aerial, I have No. 18 insulated wire around the molding of my room. I have used separate B batteries for the plate voltage, but the filaments of the tubes are lighted with one A battery. This circuit is made of spare parts from the regular receiver. My results are: East, KDKA; West, KFAF; South, WSB; North, CFCN. I have copied clearly KUO. His distance, I think, is about 1800 miles.

Good Work of Radio World Set

From Luther A. Smith, 108 West 141st Street, New York City, N. Y.

IN October, 1922, I became interested in radio and decided to purchase a small set which produced all I expected of it, but I desired still better results. A few weeks later, I decided to build the set described by Ed. Chas. Ehlert in RADIO WORLD, No. 30, dated October 21, page 12.

I am not claiming a receiving record, but here is a list of stations received:

WJZ, WEA, WOR (without an aerial), WHN, WBS, WAAM, WBAN, WRW, WIP, WMAF, WHK, KOP, WOC, WHAS, KDKA, WNAC, WLK, WWJ, WDAP, KYW, WSB, WJAX, WLW, WBZ, WAAK, WGY, NOF, KSD, and NAH.

The following were also heard, and I ask that you give their location if possible; CJCG, (Manitoba Free Press, Winnipeg, Canada); 6ALE (W. W. Lindsay, Jr., 5107 Eleventh Avenue, Los Angeles). 2ZG, 6ALE, 2CMO, 2CT, 2BH, 2EL, and 2SR.

RADIO MAP

(New Edition)

Featuring District Divisions, Time Divisions, and All Broadcasting Stations in U. S. and Canada.

35c.

Open 9-9 and Always smiling

Radio Distributing & Auto Supply Co.
64 WEST 66th STREET

"B" Batteries That Last for Five Years
Send for Catalogue

Sidbenel

RADIO EQUIPMENT MFG. CO.

Dept. "B," 1008 JEROME AVE. NEW YORK, N. Y.

PENN RADIO COMPANY

IN THE PENN. AREA

New De Forest D4 Regenerative Tube Set, complete with De Forest Tube, Eveready Storage Battery, Burgess "B" Batteries, (45 volt), Dictograph Phones, Antenna \$63.50 Kit

De Forest D5 2-tube Amplifier for above, with 2 De Forest Tubes, Burgess "B" Batteries \$42.50 (90 volt)

De Forest Reflex D7, Complete with loop (3 steps radio, 3 Audio on 3 tubes), 3 tubes, "A" Battery (Eveready storage 90 A. H.), 2 "B" Battery (Eveready 90 volts), Dictograph head set, Dictograph loud speaker, 2 \$175.00 telephone slugs

146-150 W. 34th Str.

An "Ad" Plan That Hit Radio Distributing and Auto Supply Co.

TEL. COLUMBUS 8884
64 West 66th Street

RADIO WORLD, 1463 Broadway
New York City.

New York, December 29th, 1922.

Gentlemen:—In starting our business as a retail distributor of radio goods, the writer had placed some advertisements in RADIO WORLD, while connected with another company, and was so impressed with your pulling power as an advertising medium that the suggestion was made that we advertise only in RADIO WORLD.

Our plan has been, as you know, to take a column one week, giving an itemized list of our offerings with prices, and on the following week to take but three- or four-inch space, mentioning but one or possibly two special items.

Although our store has not a particularly good location, our advertising has not only proved highly profitable but has resulted in sufficient mail order business alone to give us a handsome profit from our advertising in RADIO WORLD. Therefore, we take pleasure in telling you that we have found RADIO WORLD to be a most profitable advertising medium.

Very truly yours,

RADIO DISTRIBUTING & AUTO SUPPLY CO.
B. K. OWEN.

SO MANY READERS ARE disappointed in not receiving their copies of RADIO WORLD on the newsstands regularly, from week to week—due to early selling out by dealers—that we suggest that you place a standing order with your newsman. Ask him to save you a copy of every issue.

Transatlantic Tests a Success

Two-Way Communication May Soon Be Regular Feature of A. R. R. L.

WE are highly enthusiastic over the success of the transatlantic tests, which have greatly surpassed our most optimistic expectations," says Kenneth Warner, Secretary of the American Radio Relay League, in "The World," New York. "In the tests a year ago thirty-three American amateur stations got across the ocean. We knew we would do better this time, but did not dare to hope that we would do ten times as well. It is particularly gratifying to know that our amateur signals are received in such abundance in France and Switzerland.

"Our reception of our European comrades in the second half of the tests has been a little disappointing. There are relatively few of them and their skill in operating transmitters is not as great as ours, and of course that handicaps us from the start, but even so I feel that the results are indicative that the European amateurs as a class have us outclassed in long-distance reception.

"These tests will have a wonderful effect in the development of international radio communication between private individuals. The door has been opened now. In fact, we expect to pick out our best transmitter and the best transmitter on the other side, assisted by the best receiving stations in each country, and hold the air quiet for the first attempt at two-way transatlantic communication between amateurs. I believe it will be successful and that it will soon be a regular feature of our league."

IMPROVED REINARTZ CIRCUIT

My highly improved circuit brings in all important stations on both coasts and the Mexican border without any distortion or other noise.

We came to music from Atlanta received on one loud Baldwin unit.

Build one of these super-sensitive sets from my blueprint and specifications. Price \$60 or with a perfect and complete double wound spiderweb coil \$8.99 by mail. No other windings used.

Photo of my set on a glass panel with every order. Everything clearly shown. Cheap and easy to build. Easy to operate.

S. A. TWITCHELL, 1923 Western Av., Minneapolis, Minn.

One Year of Health Broadcasting

ON the first anniversary of its broadcasting, the Public Health Service announced that since its inauguration, a year ago, on NOF, the service has grown until, today, ten stations in nine States and one in Canada are carrying its educational talks. It is unique in that it is the only national health radio-service in the world. Its messages are not only heard by thousands, but are being used extensively in the foreign language press in both America and Europe. For the first time, a call is being made for replies from listeners-in to determine exactly how extensive is its scope and how its 102 broadcasts are received.

Club Notes

THE G-E Radio Club has been formed at Fort Wayne, Indiana, for the purpose of helping all who are sufficiently interested to become active members, to become more familiar with the theory and practice of receiving broadcasting programs and to co-operate in reducing interference during program periods. Address: M. J. Payton, G-E Radio Club, General Electric Co., Fort Wayne, Indiana.

Radio Warning Saves Life

A WOMAN in California, listening in on a radio set, heard a warning from the State Board of Health regarding the dangers of rabies. She had been bitten shortly before by a sick dog. The advice coming through the ether caused her to have an analysis of the dog's head made, which showed that the dog had been suffering from rabies and she reported for treatment to save her life from the dreaded disease.

It is possible for aircraft to cross the Sahara Desert safely by means of a buried cable through which an electric current flows.

AMERICAN RADIO STORES



DIALS

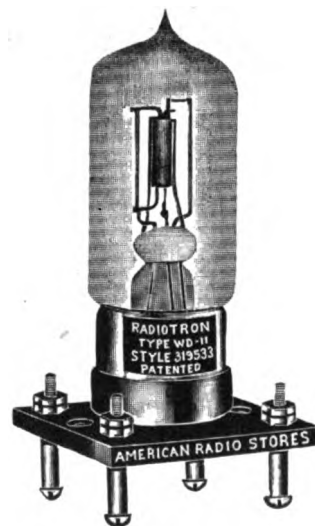
The dials as illustrated are of German Silver made by Government Specifications and will be found to meet the requirements of those making their Regenerative Sets. They are an Anti-Capacity Dial. Illustration is one-half actual size.

PRICES

Variocoupler Dial	\$2.00
Grid Variometer Dial .....	.50
Plate Variometer Dial .....	.50
Condenser Dial .....	.50
Condenser Dial without knob..	.50

VARIABLE CONDENSERS

43 Plates	\$2.25
23 Plates	1.50
Federal Headsets	5.00
Bakelite Sockets .....	.25
Potentiometers .....	.50
Rheostats .....	.50



WD-11 Socket, Genuine Bakelite..... \$0.25

American Radio Stores

235 Fulton Street (mail orders)
1887 Broadway New York City

REPRESENTATIVE WANTED

ONLY SPARE TIME NEEDED

NEWS In every city RADIO WORLD wants a representative to give us the local radio news. Especially of the activities of the local Radio Clubs, new radio inventions, etc.

SUBSCRIPTIONS RADIO WORLD now has 70,000 readers. We are making a drive for a hundred thousand before the end of the year. Ninety per cent of our readers renew their subscriptions. A marvelously high average.

ADVERTISING RADIO WORLD, the national radio illustrated weekly, is the oldest radio weekly, having the largest circulation. Radio manufacturers and distributors appreciate that RADIO WORLD is a most profitable medium to carry their trade notices.

COMPENSATION The work is entirely in your spare time. We pay a liberal commission. Previous experience not needed, as we give our representatives full detail instructions and every possible assistance and help. Write telling us all about yourself—age, education, business experience—and we will immediately give you full details. Telling you just how you can materially increase your income. DO IT NOW.

RADIO WORLD

1493 BROADWAY

NEW YORK CITY

Attention, Newsdealers

You should keep a good supply of back numbers of RADIO WORLD on hand all the time. It has been the experience of many dealers that a purchaser of RADIO WORLD for the first time will almost immediately want the back numbers, some of which are already out of print and some of which are difficult to get. THE PUBLISHER WILL FURNISH BACK NUMBERS TO DEALERS DIRECT OR THROUGH THE AMERICAN NEWS CO. AND ITS BRANCHES. Dealers should hold their unsold copies for a reasonable length of time. RADIO WORLD of October 28 contained a full page of contents of back numbers to that date, 15 cents per copy; any seven numbers for \$1.00. RADIO WORLD, 1493 Broadway, New York.

NEEDED BY ALL AMATEURS

5 RADIO-WIRE TABLES, BY FREDERICK J. RUMFORD, E.E., R.E.

These tables, showing the number of feet in a pound and fractions of a pound, were published in RADIO WORLD as follows: No. 1—Enamelled Magnet Wire, RADIO WORLD, No. 34, dated Nov. 13, No. 2—Single Cotton-Covered Wire, RADIO WORLD, No. 25, dated Nov. 25, No. 3—Double Cotton-Covered Wire, RADIO WORLD, No. 38, dated Dec. 16, No. 4—Double Silk-Covered Wire, RADIO WORLD, No. 40, dated Dec. 20. Sent to any address postpaid at 15 cents a copy, or the complete set of 5 copies for 75 cents. Or start your subscription with any number. Order now. Every amateur builder should have these tables constantly at hand. The supply of back numbers is limited. RADIO WORLD, 1493 BROADWAY, NEW YORK, N. Y.

Radio World, 52 issues, \$6.00.

Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

PRICES SMASHED!

Owing to increase in volume of business we now announce drastic reductions in our quality lines. Send card for complete list or order from the following sample saving. All goods prepaid and shipped within 24 hours after receipt of order. Goods returnable for rebate or exchange. You simply must be pleased!

TWO STAGE AMPLIFIER PARTS
Highest Grade Materials

Panel, Bakelite 7x12 in. Drilled.....	\$1.75	\$2.75
Cabinet of 3 ply wood to fit.....	1.50	2.50
2 Transformers, Best grade, @ \$2.55 each.....	5.10	6.00
2 Filament Rheostats @ 500 ohms.....	1.50	2.20
2 Tube sockets, same best, @ 45c ea.....	.90	1.70
2 Tube socket brackets @ 15c ea.....	.30	.40
14 Binding posts, nickel plated, @ 3c.....	.42	.64
12 ft. of best spaghetti tubing @ 4c.....	.48	.84
12 feet copper connecting wire.....	.30	.45
1 set blueprints giving wiring details.....	.15	.25
	\$12.00	\$21.00

Some other savings are:
Front Phones, 2000 ohms.....\$3.95 \$5.00
Diaphragm, 2000 ohms.....5.95 7.00
Western Electric, 2200 ohms.....0.25 12.00
Detector Tubes, Cunningham, New.....5.95 6.99

Radio Parts Manufacturing Company
16 PARK PLACE DETROIT, MICHIGAN

RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK) FROM PUBLICATION OFFICE
1495 BROADWAY, NEW YORK, N. Y.
BY HENNESSY RADIO PUBLICATIONS CORPORATION
ROLAND BURKE HENNESSY, President and Editor
M. R. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
1495 BROADWAY, NEW YORK, N. Y.

ASSOCIATE EDITORS
Robert Mackay Robert L. Dougherty

SUBSCRIPTION RATES
Fifteen cents a copy, \$6.00 a year, \$2.00 for six months, \$1.50 for three months.
Add \$1.00 a year extra for postage to Canada and foreign countries.
Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

ADVERTISING RATES
One page: One time—\$150.00.
Half, Quarter, Third and Two-thirds pages at proportionate rates.
One inch, one time—\$5.00. Per agate line, \$0.40.
On four consecutive issues, 10% discount.
On thirteen consecutive issues, 15% discount.
Cover and preferred-position rates made known on application.
Terms: 30 days Net. 5% 10 days.

CLASSIFIED ADVERTISEMENTS
Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Noted as second-class matter, March 25, 1933, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patent, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

Secretary Wallace for Radio

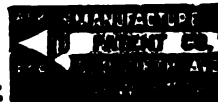
ENRY C. WALLACE, Secretary of Agriculture, states that, as a means of getting market information to the country, radio is growing popular. Although still in an experimental stage, he says, broadcasting gives promise of great future usefulness.

The first agricultural news bulletins were broadcast from the Bureau of Standards December 15, 1920. Today, two years later, the Department of Agriculture has practically a nation-wide broadcasting service for weather, crop, and market reports by radiotelegraph and radiotelephone. Radio is held as an invaluable means of immediately getting news on agricultural affairs to the farmers and others interested in food production and marketing. From sixty-one radio transmitting stations of the Navy, Post Office, State agricultural colleges, and other agencies, market information is broadcast daily. Requests for an extension of this service from other localities have had to be denied by the Department due to lack of funds, Secretary Wallace states.

Record of PWX

PWX. Havana has been hanging up some records to which it can point with pride. Between November 1 and 20, the Cuban Telephone Company received 1,130 letters acknowledging reception of programmes from PWX, covering all but six of the forty-eight States, and in addition, Nova Scotia, Ontario, Saskatchewan, Alberta, Salvador and Mexico. During the same time in December, 1,750 letters were received, including 126 from Ohio, fifty-three from Indiana and fifty-six from Massachusetts.

PATENT
Your Radio Ideas.
Call or Write
FREE ADVICE



SPECIAL OFFER

For a limited time only.
Paragon BA-30...\$25 Grobe GR-5.....\$70
Paragon BA-4... 25 Grobe GR-6K... 65
From F.O.S. Rad Bank, N. J.
A. V. GREGORY
42 Broad Street Red Bank, N. J.

Build Your Own Set

"THE RADIO CONSTRUCTOR"
A book showing twelve plans hook-ups and full details of just how to build your own set saving half its prepared cost. **15c**
S NEWMAN & CO., 71 DEY ST., NEW YORK

RADIO MAILING LISTS

12,400 Radio Dealers, covering U. S. by States.....per list, \$7.50
1,614 Radio Mfrs. covering U. S. by States.....per list, 15.00
1,757 Radio Supply Jobbers, covering U. S. by States.....per list, 15.00
269 Radio Stations.....per list, 4.00
257 Mfrs. who make and assemble complete Radio Sets.....per list, 4.00
25,000 Radio Amateurs and Managers of Radio Stations.....per list, 7.50
Ask for price lists for Canada, England, other lands.
TRADE CIRCULAR ADDRESSING CO.
106 W. ADAMS STREET CHICAGO, ILL.



Made for All Phones

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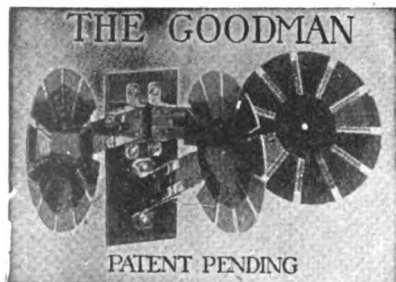
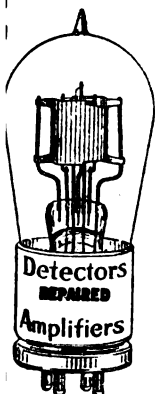
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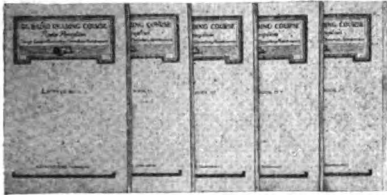
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The man who seems to have solved the problem is Richard Soderberg, employed in the engineering department of the Westinghouse Electric and Manufacturing Company at East Pittsburgh. He has just applied for patents on a machine which, experts declare, will set the manufacturing world 10 years ahead when applied to the balancing of rotating parts.

The machine invented by Mr. Soderberg makes use of the principle of dynamic or running balancing and it is so delicately adjusted, that with it, it is possible to balance even very small rotating parts so that they revolve absolutely without vibration. The machine will first be applied to the balancing of armatures for small motors.

To show what a task confronts manufacturers of small motors, it is only necessary to say that an armature weighing but one pound, turning 10,000 times a minute and only one-thousandth of an inch out of centre will set up a vibrating force of nearly three pounds. About 3,000,000 of these small motors, worth about \$25,000,000, are manufactured each year.

The disastrous effects of vibration is particularly noticeable in railway work, and accurate methods for reducing vibration may enable the railroad officials to obtain the higher speeds they wish but of which they are afraid because of the excessive vibration set up.

Mr. Soderberg first became interested in vibration when studying the science of shipbuilding. His process of inventing the machine is said to be absolutely without parallel in electrical history; for prior to nine months ago, his whole experience had been with ships and shipbuilding. It was only after he secured a position with the Westinghouse Company and was given research duties in connection with the control of vibration that he perfected his machine. The actual inventing of the machine, it is said, is entirely due to correct mathematical analysis. Mr. Soderberg has an unusual aptitude for mathematics in all its branches and, although he was able to build his machine "in his head" through his mathematical analysis, he is one of the few inventors who have been correct the first try.

The inventor has had a broad education. His school days were spent in Sweden. He was graduated from the Tekniska Elementarskolen Harnosand and the Charlier's Institute of Technology at Gottenburgh. After being graduated from the last-named college, he won a scholarship in the American-Scandinavian Foundation and spent a year at the Massachusetts Institute of Technology. After this, he spent some time in research work and located with a shipbuilding firm in New York. Following this he entered the Westinghouse service.

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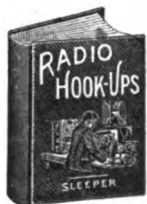


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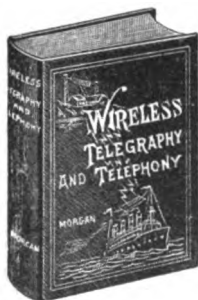
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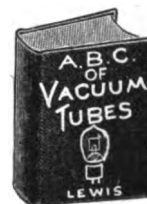


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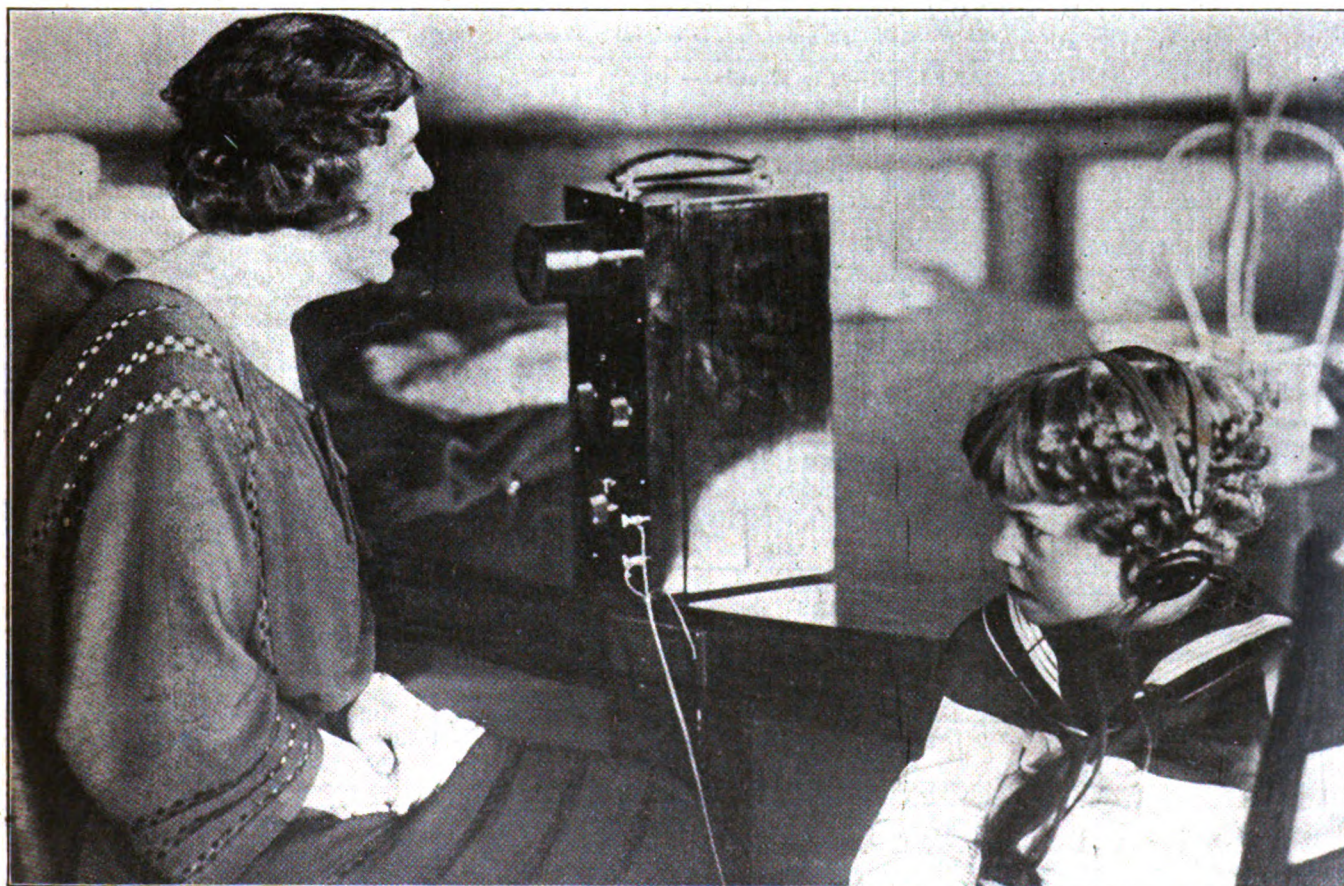
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* * *

Write and Ask Him

Dear Radio Editor:—

Last night between 9:30 and 9:45, I heard music transmitted from a station whose announcer talked on 360 meters. He was very faint but nevertheless clear. I did not get his call letters. Could you tell me what they were, and who the announcer was—Ray Dio.

* * *

It Can't Be Done

Dear Editor:—

I have a boy fourteen years of age, who has always been interested in mechanical things and who is fond of reading imaginative books like Jules Verne's "Twenty Thousand Leagues Under the Sea." Just lately he became interested in radio. What can I do to discourage him?—Anxious.

* * *

Movie Fan Gets Mixed Up

Dear Editor:—

How long has OGN been operator at Newark, N. J.? How old is he and did he ever walk tight-rope with B & B? Is he married? Would he send me a photograph if I wrote to him?—N. Raptured.

Radio Saves Life of Sailor

RADIO messages describe the saving of an American seaman's life by his transfer at sea from a freighter to the Italian steamer, "Conte Rosso," where an operation was successfully performed by the ship's surgeon. The "Conte Rosso" will arrive a day late, having gone more than 150 miles out of her way.

The Lloyd-Sabruardo Company announced the receipt of a radio from Captain Fulvio Cignoni of the "Conte Rosso." Captain Cignoni said that he had picked up an S. O. S. from the American freighter "Eastern King" in which a seaman was said to be in so serious a condition that he would die unless an operation were performed.

The "Eastern King," running from Scotland to New York, was following a northern course while the "Conte Rosso" was on the southern lane. She was also bound here. The Italian vessel shifted her course and reached the other boat. Despite heaving seas, the man was transferred and his life saved by an immediate operation. His name was given as Rick Hubrinette. The "Eastern King" is owned by the Shipping Board and operated by J. H. Winchester of 17 Battery Place.

RADIO UP TO A STANDARD

BUT DOWN TO A PRICE FOR 30 DAYS

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Radio Frequency Transformers UV 1716.....\$7.60 UV 1714.....5.00 Baldwin.....2.25 Amsco.....3.88 Erla.....3.00	LOUD SPEAKERS King Horn.....\$6.00 Dietsgraph.....14.50 Baldwin Claphone.....14.00 Bristol Audiophone.....18.00 Pathe.....17.00	TUBES UV 200.....\$4.00 UV 201.....5.00 WD-11 1 $\frac{1}{2}$ -Volt.....5.25 Meyers.....4.00 De Forest and V. T. 2 in Stock
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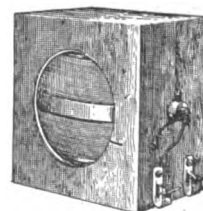
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VOLUME TWO OF
RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879.]

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H. B. Thayer Who Telephoned by Radio from America to England

By Harold Day



(C. Fotograms, N. Y.)

Mr. H. B. Thayer, president of the American Telephone and Telegraph Company, talking from New York to England, by radiotelephone. For two hours the ether over the Atlantic Ocean carried the human voice from New York to a group of distinguished officials, scientists, and engineers at New Southgate, England. The apparatus, which worked very successfully, was a result of co-operation between the American Telephone and Telegraph Company and the Radio Corporation of America. Mr. Thayer was heard by thousands of Englishmen.

THE first transatlantic transmission of the human voice by radio is now on record as a fact. H. B. Thayer, president of the American Telephone and Telegraph Company, 195 Broadway, New York City, and General John J. Carty, vice-president, in charge of development and research, have telephoned to a number of electrical engineers and radio experts at New Southgate, England.

The perfected instruments are not only commercially practical for transatlantic radio, but will be developed in the near future to the point of radio communication half way round the earth.

The device which makes possible international communication across the oceans is a water-cooled vacuum tube, which increases the force of the radio transmitter from 1 kilowatt in the old apparatus to 100 kilowatts in the new.

After Mr. Thayer had been speaking eleven minutes into an ordinary telephone transmitter, from which it was flashed to New Southgate, a cable came back, which read: "Thayer got through to all." Since the new vacuum-tube had not been sent to England return conversation was impossible, but the British officials, engineers and press representatives replied with extended cables of congratulation,

attesting the complete success of the perfected instrument.

Major T. F. Purves, engineer in chief of the British post office, after the first few messages had been sent, cabled:

"I have listened with great interest and pleasure to the far-flung voices of Mr. Thayer and Mr. Carty. Of Mr. Thayer's message I recognized every word. I missed a little of Mr. Carty's, but recognized absolutely his well-known intonations. Send best respects and warmest good wishes to our friends in the A. T. and T. and the W. E. Co.—Purves." They talked into an ordinary telephone transmitter.

The Single Circuit Regenerative Receiver

Since the Release of the W-D11 Tube, Many Amateurs Now Using Crystals Will Be Interested in Building a Single-Circuit Regenerative Receiver. This Article Was Specially Written for Those Considering Such a Set

By C. White, Consulting Engineer

A FRIEND approached me recently concerning the purchase of a radio outfit for his home. At the time I was at work on a five-tube reflex circuit to be used in some special test work; but the question, "What set is best for my use and will be capable of producing good results?" made me stop and think whether the circuit I was working on was best for him, or a simple single-circuit regenerative outfit. The decision was almost immediately in favor of the simple circuit; and I truly think that, for perhaps ninety per cent. of radio-phoners and code amateurs who are just beginning their radio work, this answer will fit their case. Do not imagine that the single-circuit receiver is not capable of sharp tuning. The ability of any circuit to tune sharply depends greatly on the care and scientific precision with which it is built and assembled. While it is true that the tuning characteristics of certain circuits are far better from the theoretical standpoint than others, still, if care in the purchase of good material and apparatus is taken, it is possible to get wonders out of the single-circuit regenerative circuit. I shall endeavor to discuss some of the points that will enable any one to build a simple regenerative-receiver that will not only work easily after built, but will bring in results that will make the owner proud.

In Figure 1 is illustrated the standard connections for a single-circuit regenerative tuner and detector. From the appearance of the wiring connections this diagram is no different than any other for a single-circuit regenerator; but by choosing the correct apparatus and the proper methods of construction we can make it different from hundreds of other similarly connected outfits. The condenser, C, should have not more than 13 plates. This allows a closer adjustment of the capacity in sharp tuning. The general tendency in the past has been to use

too large condensers in the main tuning-circuits. The panel immediately surrounding the condenser should be well shielded with copper foil, which is connected to the ground terminal of the set. While shielding is generally very good, still the use of too much shielding greatly detracts from the strength of the received signal. For this reason many manufacturers prefer to wire up their sets so as to minimize body-capacity effect instead of employing complete shielding. But it is absolutely essential to shield the panel in the immediate vicinity of the condenser. The main tuning-inductance, E, is the stator of a good molded vario-coupler. The tickler coil, F, is the rotor of the vario-coupler. I have found that the molded type of vario-coupler works a little better in a cir-

cuit of this general nature. The grid leak and grid-leak condenser appear rather small in an illustration, but in reality they play a large part in the efficiency of the receiver. There is not only one correct value of grid-leak resistance and capacity for every type of vacuum tube, but there is one correct value for every particular tube. It is up to the amateur to discover this value for his tube by trial.

A recent issue of RADIO WORLD contained a very good article on the manufacture of a reliable and variable grid leak. It would be well for the amateur to make one and place it inside his cabinet. It is also advantageous to try out various sizes of mica grid-leak condensers. I specify mica because the capacity of mica condensers for grid work are sensibly constant, and thus work is sensibly constant, and thus free from noise. Start your testing with a .00025 mfd. mica condenser for the grid, then vary the grid-leak resistance until the best point is found. This should be repeated for another capacity of grid condenser, but for the average type of tube a .00025 mfd. will render the best results. A W-D 11 tube, with a dry cell for an A battery and at least 40 volts for a B battery, functions very well in a circuit of this nature. Next to a vernier condenser comes a vernier filament-rheostat. Do not fail to incorporate a vernier filament-rheostat in your set. The final tuning in of distant stations is invariably easier to accomplish with the filament-rheostat than with any other control in the whole outfit. The operation of tuning in a station is extremely simple: Light the tube filament to the correct brilliancy, set the

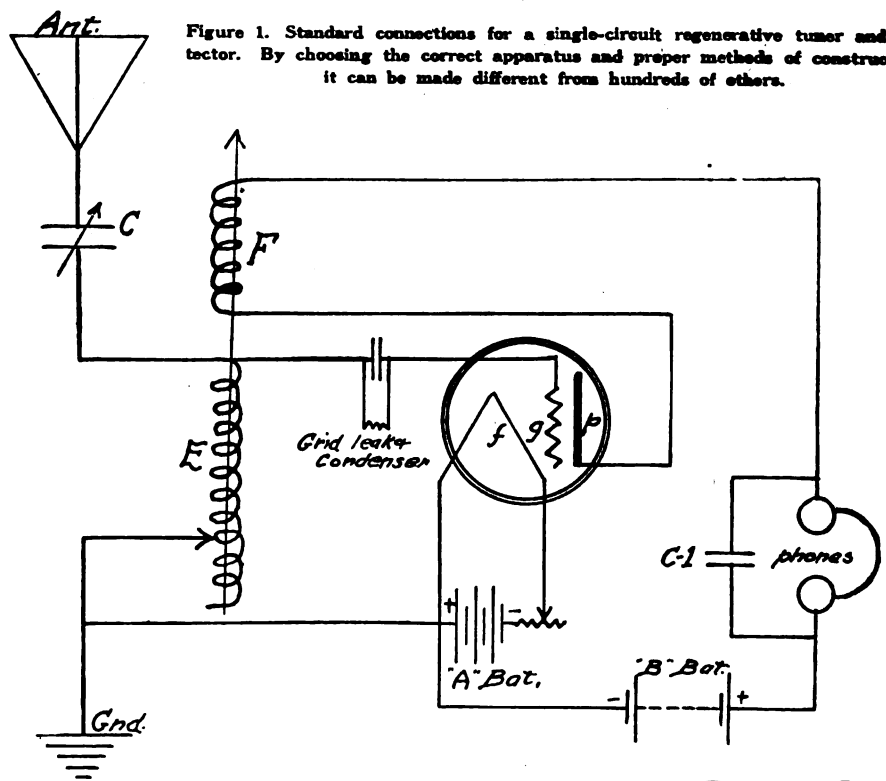


Figure 1. Standard connections for a single-circuit regenerative tuner and detector. By choosing the correct apparatus and proper methods of construction, it can be made different from hundreds of others.

How to Make a 2-Tube DX Set

By John Kent

ACCORDING to the law of averages, by which everything is judged, after a man has been interested in radio for some time he itches, so to speak, to make his own receiver. If he happens to belong to the great army of radioists who have only recently become interested in radio, due to broadcasting, no doubt he will consider this something of a problem. "What circuit shall I use?" "What apparatus will I need?" "How can I do it?" are the principal questions confronting him.

I shall attempt to answer these questions in such a manner as will make it plain to everybody interested just how it can be done.

I advocate that beginners use single-circuits in constructing their apparatus. And this not only applies to beginners, but to old-timers as well. The sketch accompanying this article illustrates the hook-up of instruments. It is a single-circuit, using a variometer as the tuning unit. This not only makes the tuning much simpler, but gives a definite wave-length.

A list of apparatus necessary for the construction follows. The cost,

(Continued from preceding page)

switch-arm at a tap on the stator, adjust C until the station is heard, then adjust the coupling of the rotor, F, to get the maximum signal strength. Finally, raise or lower the filament brilliancy to get the desired quality.

A good pair of phones with a .001 mfd. (C-1) bypass condenser is just as essential as any part of the receiver. Poor phones will cause more dissatisfaction than any other cause. I cannot too strongly advise the amateur, and particularly the novice, to buy good standard apparatus that has stood the test. If you are only planning on using one tube, and, perhaps, one tube for a detector and one for an amplifier in a one-stage audio-frequency amplifier, I think the W-D 11 is the most economical. With the money saved from the purchase of a storage A battery the novice can purchase another stage of amplification. But, if the W-D 11 is used, do not forget to mount the tube socket on $\frac{3}{4}$ of an inch of felt and connect up to the socket with flexible stranded wire so as to avoid the tube being noisy from jars and vibrations. For the average amateur the single-circuit regenerative receiver without, or with, one or two stages of audio-frequency amplification is still the best buy.

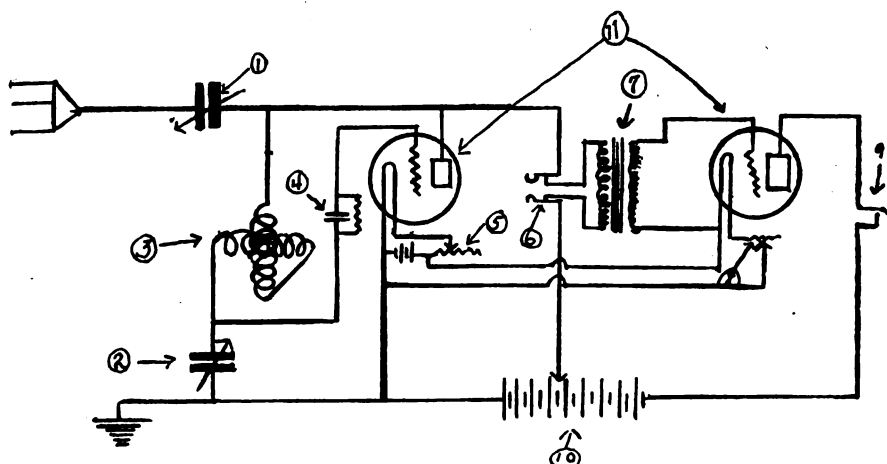


Figure 1. Diagrammatic hook-up of the set described in the accompanying article, with instruments numbered. 1. Vernier condenser, 23-plate. 2. 43-plate variable condenser. 3. Variometer. 4. Grid condenser and grid leak, preferably variable. 5. Vernier filament-control rheostat. 6. Double-circuit jack. 7. Audio-frequency transformer. 8. Rheostat. 9. Single-circuit jack. 10. B battery, 45-volt with 22½-volt tap. 11. W-D 11 tubes. This circuit is a modification of one worked out by Mr. George May in RADIO WORLD No. 35, dated November 25. The vernier condenser in the aerial lead has been found necessary in order to make the circuit oscillate more freely, at lower filament-temperature. A lot of fine tuning may be accomplished with the vernier of the condenser on close wave-work. The variable grid leak is almost a necessity in this circuit, using W-D 11 tubes.

of course, varies a few cents either way; but the complete cost is estimated at \$35:

1 variometer	\$4.00
1 23-plate vernier condenser	3.50
1 43-plate straight condenser	2.00
2 W-D 11 vacuum tubes @ \$5.	10.00
1 vernier rheostat	1.25
1 straight rheostat	1.00
2 sockets @ 75 cents	1.50
1 amplifying transformer	3.00
1 panel, 7x18 inches	1.50
1 cabinet	3.00
2 jacks @ \$1.	2.00
1 B battery (45-volt)	2.25
	<hr/>
	\$35.00

With everything necessary purchased give the panel a thorough sandpapering. Then apply a little oil; rub it in thoroughly and wipe off. This gives the panel a dull finish, which is much more commercial looking than one that is shiny. Next, on the reverse side, lay out the instruments in order to find out how much room is necessary for each. Carefully mark and drill the holes. In doing this be sure you are accurate, as one hole incorrectly drilled will make more trouble than if you had spent an extra half-hour planning it. If the drilling is carefully done and the instruments symmetrically laid out on the panel the finished article will be one you can point to with pride.

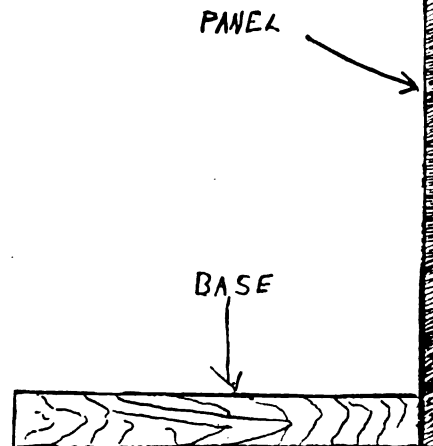
When all holes are drilled mount the panel on a piece of 1-inch wood, as shown in the sketch. This piece should be two inches shorter than the panel and about one inch narrower than the depth of the cabinet. This will permit the amateur to mount his sockets

and transformer and hook them up on the outside of the cabinet. This gives much more freedom in the soldering.

Follow your connections with bus bar or No. 12 or No. 14 hard-drawn copper. Be careful not to let any of them touch. All battery, aerial and ground connections are brought to binding-posts on the front of the panel.

The hook-up used in this article has been thoroughly tested out by the writer and found to give excellent results. Because of its extremely sharp tuning it is a little hard for the beginner to get used to it.

Figure 2. How the panel should be mounted on the baseboard. By doing this you obtain greater freedom in hooking up your instruments as you do not have to work inside the cabinet, and your space, therefore, is not restricted. Be careful to allow sufficient space when making the board to allow for the ferrule that runs around the edge of the cabinet.



First Story of Bureau of Standards Conference on Radio Standardization

A BROAD program of radio standardization was agreed upon at a meeting of representatives of forty radio-trade associations and national engineering and scientific societies, held in New York City, beginning January 12. The meeting was held in the Engineering Societies Building, New York City, at the call of the United States Bureau of Standards in co-operation with the American Engineering Standards Committee. Dr. F. C. Brown, acting director of the Bureau of Standards, presided.

After full discussion the conference adopted resolutions providing:

(1) That standards for radio apparatus and service should be formulated:

(2) That a broadly representative national committee on radio standardization should be formed under the leadership of the Institute of Radio Engineers and the American Institute of Electrical Engineers, under the procedure of the American Engineering Standards Committee.

Specifications for quality and performance of receiving apparatus, no-

menclature, and methods of testing and of rating apparatus are to be included in the program.

Dr. J. H. Dellinger, chief of the Radio Laboratory of the Bureau of standards, showed how the widespread interest in radio had brought with it an increasing demand for uniformity and dependability in radio service and apparatus. The lack of any such standardization has been brought to the attention of the Bureau of Standards by producer, distributor, and consumer. There has not previously been a concerted movement to introduce standardization by joint action of all radio interests.

Dr. A. N. Goldsmith, secretary of the Institute of Radio Engineers, said:

"As every new field of industry passes out of the childhood stage, the need for standardization becomes evident. The main difficulties which at once arise, and which emphasize the necessity for cautious procedure are the dangers of stagnation in an only partly developed art, a possible excessive monotony in the resulting product, and a diversion of the best brains from such a field.

"On the other hand, it is only by a reasonable amount of standardization along wise directions that gross abuses of public confidence can be avoided. As a typical instance, consider the objectionable nature of some of the so-called 'information' appearing on nameplates and in the advertisements of radio apparatus. We have seen 'static eliminators,' 'thousand-mile receivers,' 'twenty-plate condensers,' and a score of other vague or misleading designations. The purchaser of radio sets and the dealers who handle them are all entitled to protection against this sort of loose description. And thus we are brought face to face with the necessity for sane standardization."

The following advisory committee was appointed to assist in the organization of the national committee and the necessary technical subcommittees: Major L. B. Bender, Dr. J. H. Dellinger, W. A. Fitzgerald, Dr. A. N. Goldsmith, J. V. L. Hogan, Commander S. C. Hooper, George H. Lewis, Max Lowenthal, Donald McNicol, L. T. Robinson, M. C. Rypinski, E. B. Warner and L. E. Whitemore.

Radio Entertainment in the Home

By Patrick Nichols

WITHIN the near future madam, while at dinner, will instruct the butler, to push button No. 3 and ask Friend Husband if he prefers the opera to the jazz. He will probably reply that he likes a little jazz, but prefers news bulletins while he is smoking his after-dinner cigar.

Over in the corner of the dining-room stands a neat mahogany cabinet. It resembles a small victrola, with a single cord running to a plug in the base board. From this box come, alternately, as buttons 1, 2 and 3 are pressed, opera, jazz, or news—perhaps other forms of entertainment. There is no aerial lead, no inside antenna coil; there are no dials visible, and the many ugly details of our sets today are absent. No tuning is needed; only the pushing of the buttons is necessary to select the form of entertainment desired. The three waves are constant and the service is on a regular schedule.

All the above is not only practical, but probable. Line-wire broadcasting on electric-lighting systems, predicted and demonstrated as feasible by Major-

General George O. Squier, Chief Signal Officer of the United States Army, last March, has come true.

At the Bureau of Standards recently R. D. Duncan, radio engineer for the North American Company, gave a practical exposition of "wired-wireless" broadcasting over the system of the Potomac Electric Light and Power Company. At a distant sub-station in Georgetown an assistant "put on" informal entertainment through on ordinary broadcasting set over the 2,500-volt alternating circuit. Through the maze of underground and overhead wires and cables the radio messages came into the Signal Corps Radio Laboratory at the Bureau from an electric light plug. The voice of the spokesman was picked up by a tube set coupled in with condensers. A 5,000-meter wave was used, and the transmitting current was .05 ampere. There was no radiation. No other radio fans knew what was going on; but, if they had, they could not have picked it up from the air—it wasn't in the air. Secretary Hoover will never have complaints of interference on this

broadcasting scheme, as, being confined to the electric wires, it leaves the air clear for long-distance broadcasting; it needs no wave assignment, and neither the station nor operator will have to secure a license.

General Squier's patents for directed radio have been purchased by the North American Company, New York, which owns and operates electric-lighting utilities in Cleveland, Milwaukee, St. Louis, and several other cities. This company plans to furnish its subscribers with wired-wireless entertainment in the near future. Mr. Duncan is completing the details of a standard installation, and predicts the early use of the system in several cities. All that the subscribers will have to do is to consult their lighting companies, secure a good long-wave tube set, a condenser, or special plug, to protect their sets from the high-potential circuit, and plug in just as they do with common electrical appliances.

General Squier's demonstration on a private lighting circuit of 110 volts direct current, nine months ago, has been applied to a city-lighting system.

My Rejector, or Filter, Circuit

By Frederick J. Rumford, E.E., R.E.

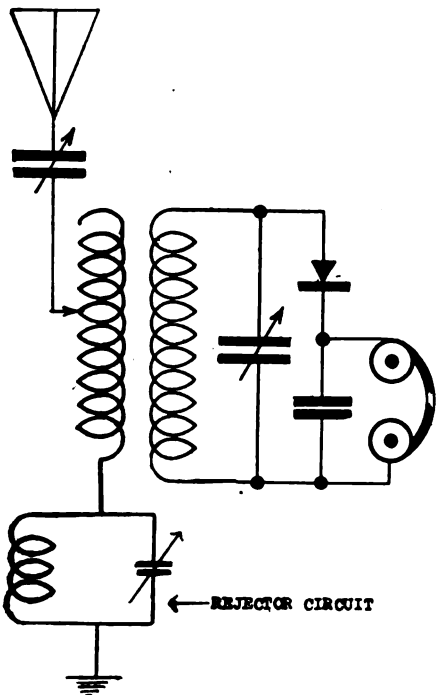


Figure 1. Showing the method of connecting in the rejector circuit of the receiving set. The rejector circuit is tuned until interference of the undesired station is decreased to a minimum.

RADIO fans who have suffered interference in reception due to living in a locality infested with numerous transmitting stations and other sources of QRM, will find the hook-up described herewith, a superior patience saver. It is known as rejector circuit, radio-frequency trap, and absorption circuit. All have the same meaning. Many fans have worn their patience threadbare trying to get some long-distance station, but little spark stations have hammered in and destroyed all DX chances.

The rejector circuit has proved very efficient, but I advise the prospective builder to experiment first to find the proper number of turns of wire, the correct size of wire, also the proper capacity to be used for his individual needs. A coil wound with from 20 to 50 turns of either No. 20 or No. 22 wire will do to start with. The condensers used should be of the common dielectric type.

In many instances, fans living close to A-C power lines experience difficulty in receiving due to interference from these power lines. To them the rejector circuit will prove of value and will decrease interference to a minimum.

Figure 1 shows the method of connecting in the rejector circuit of the receiving set. The rejector cir-

cuit is tuned until interference of the undesired station is decreased to a minimum. Then the receiving circuit is tuned until the desired station is heard with maximum clearness and loudness.

Registering for Radio



(C. Wide World Photos)

MYSTERY, DOUBT, JOY!

"Bull" Montana, former wrestler and partner of Douglas Fairbanks in the movies, now recognized as a leading motion-picture actor, has been bitten by the radio bug. This composite picture of Mr. Montana illustrates exactly the same emotions that any other human would experience, and humanly correct. At first Mr. Montana is mystified on picking up the earpieces; secondly, he has a few doubts as to its practicability; finally, on tuning in right, he enjoys some "bedtime stories."

This circuit is very simple to operate; but one fact must be kept in mind: The rejector circuit should not be placed in any inductive relation to any part of the receiving circuit. If that is done, the rejector circuit will function poorly, if at all.

It will be noted that the oscillating circuit of this rejector circuit is connected directly, or conductively, with the ground lead of the receiving circuit. If the radioist should attempt reception on the same wave-length as the interfering source, it is obvious that here is no means of separating the signals. But satisfactory results have been

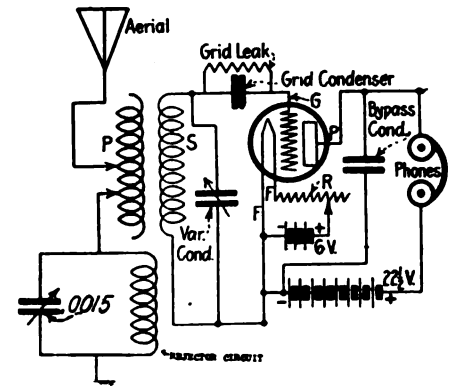


Figure 2.—Rejector circuit used in the usual audion vacuum tube.

obtained on the rejector circuit when the signals were only a few meters apart in wave length. In a case where the signals from the station causing interference are very strong and the waves broadly tuned, and with no sharp defined resonant point on your receiving set, it generally is entirely impossible to entirely eliminate interruption, but the intensity of interfering signals may be greatly reduced.

It has been found that in some instances, it was possible to use a standard wave-meter in a rejector circuit which has an oscillating circuit similar in every respect to the oscillating circuit of a rejector or trap.

Those fortunate enough to own a wave meter and find it convenient to use, should employ it in the rejector circuit. It has its advantage for all standard wave-meters are calibrated for reading directly the wave length of any adjustment.

Figure 1 also shows the rejector, or trap, in function with the usual crystal rectifier.

Figure 2 shows the rejector circuit used in the usual audion vacuum-tube which is used also as a rectifier. This hook-up has also been tried and has proved efficient.

The Art of Proper Tuning

By *Kenneth M. Swezey*

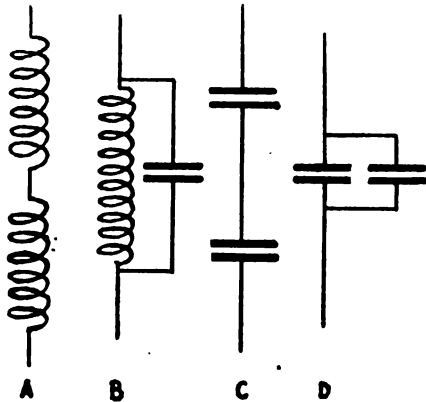


Figure 1A—Connecting coil in series to increase wave-length valves

BEFORE considering the actual mechanical operation of tuning it is quite necessary to understand the fundamental principles, otherwise this important radio process would have to be done in haphazard fashion. Dials would be turned and sliders moved without definite order.

For instance, take the harp. The first thing we notice in that musical instrument is the difference in the thickness and the length of its strings. By plucking the various strings we find that they produce different notes—the long, thick strings giving out deep bass tones, and the short, thin strings the higher soprano tones. In reality these notes, or tones, are vibrations in the air of varying rapidity.

We generally associate slow things with low tones, and large things are relatively considered slow. Speed suggests highness and shrillness, also smallness. Just so with sound waves: The long, thick strings of the harp vibrate slowly and give a low tone, whereas the short, thin strings vibrate more rapidly and give out a higher tone.

The tension of the strings also affects their tone. Tight strings give out higher tones than slack strings.

If we arrange another harp in the same room as the first—both harps having strings of equal thickness, length and tension—and pluck a string of one of them the corresponding string of the other harp will vibrate in unison and in a most uncanny fashion. When this phenomenon occurs the two vibrating strings are said to be “in tune.”

What has really happened? When one string was plucked it began to vibrate at a rate, or frequency, as it is called, depending on its length and tension. The air surrounding the

string was disturbed and little waves were sent out into the room, one for each complete vibration of the string. It is these waves that reach our ears in the form of sound. They are actual mechanical movements of the air; so, when they come in contact with the other string, they push it and pull it and cause it to vibrate at the same rate as themselves. Other bodies are pushed and pulled by the sound waves, but the effect on them is not nearly so great as it is upon bodies that are “in tune.”

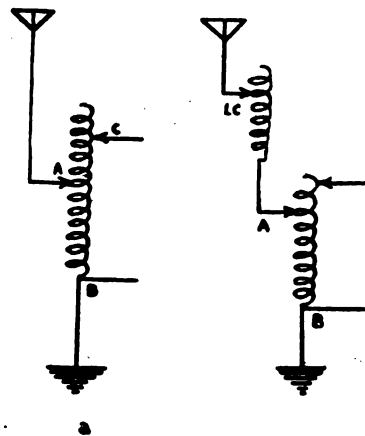


Figure 2A—The simplest, practical tuning arrangement

In radio work we also have waves to deal with, but instead of traveling through the air they travel through a thinner medium, called “ether,” and they are much larger than sound waves. But, however, they must be tuned the same as their companion air-waves. The transmitting station may be considered as one harp and the receiving station the other. The different transmitting stations send out waves of varying lengths. In order to receive them the receiving station must be properly tuned.

Instead of tuning with length and tension, as in the preceding case, we have two factors called inductance and capacity. In a general sense we may consider our coils of wire as inductors

Figure 3—The two-circuit set which is quite popular and, as a rule, more selective than the single-circuit type

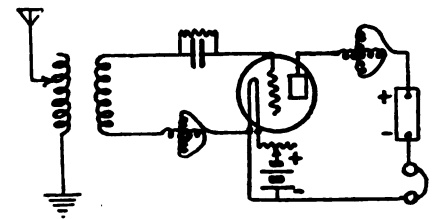
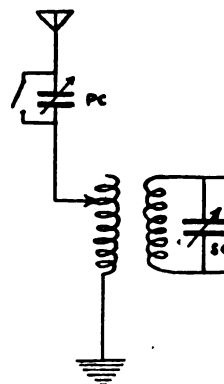


Figure 4—The most popular single-tube and-lion set. It is known as the two-variometer type regenerative set

or as possessing inductance in concentration, and our condensers as possessing concentrated capacity. The aerial system possesses both inductance and capacity, but in this case the values are distributed.

The frequency of radio waves is highest when the values of inductance and capacity are small; and, as frequency is the reciprocal of wave-length, a high frequency means a low wave-length. Therefore, short waves do not require as much inductance and capacity as do long waves.

By connecting coils in series you increase the wave-length value. (See Figure 1A.) This result may be accomplished also by connecting a condenser in parallel to a coil. (See 1B.) Condensers in series result in a reduced capacity, and, hence, a reduced wave-length. (See 1C.) Condensers in parallel give an increased capacity. (See 1D.)

Let us now look at the different sets in common use and decide the best method of tuning. With a single-slider crystal set there is no option. Tuning must be accomplished by moving that lone slider back and forth until the loudest signals are obtained. Figure 2A shows the simplest tuning arrangement that is practical and fairly selective. It is the two-slide tuning coil. The turns between A and B may be considered as the primary, or aerial circuit; and the turns between B and C as the secondary, or closed circuit.

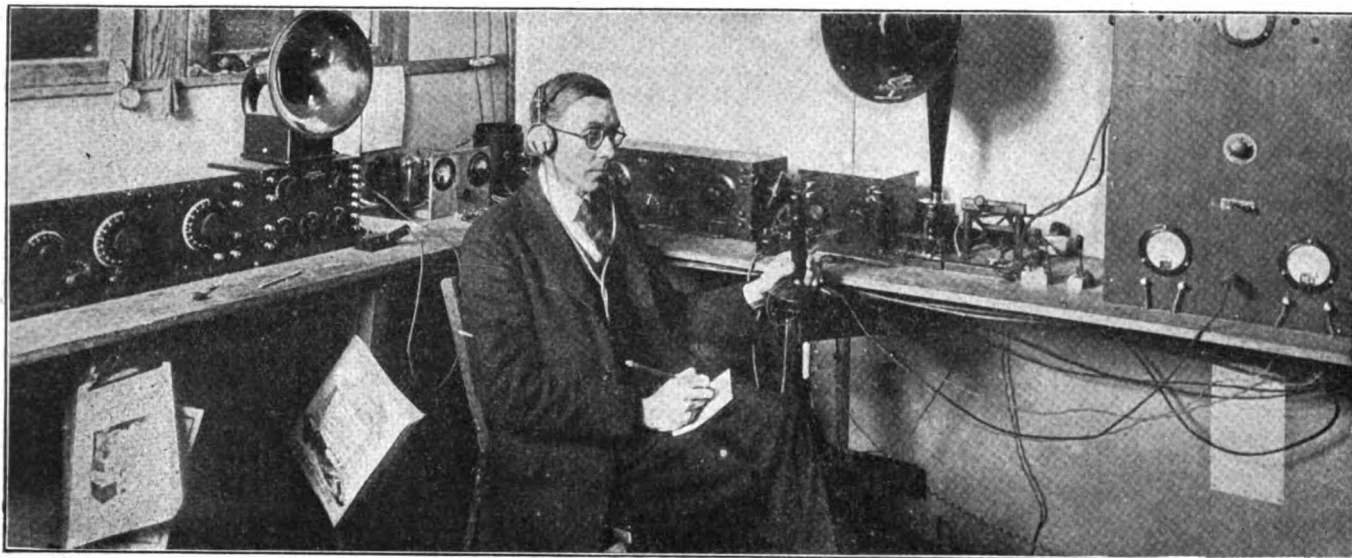
The method of tuning is as follows: Place slider C at some arbitrary point on the coil. Now move slider A until signals are heard. An adjustment of slider C will now bring the signals in louder.

With such a set interference may be minimized by connecting in a loading coil, LC. When a station cannot be tuned out otherwise the effective coupling may be reduced by adding more turns in the loading coil and cutting out turns between slider A and B.

The two-circuit set, shown in Figure 3, is quite popular, and is generally

8 CYB, Heard in Manchester, England

By Peter Gray



(C. Wide World Photos)

The transmitting apparatus of Station 8 CYB, Washington Court House, Ohio, recently heard in Manchester, England

THE amateur broadcasting station 8 CYB is owned by H. E. Daugherty, the nephew of Attorney-General Daugherty. Mr. Daugherty, whose station is located at Washington Court House, Ohio, recently transmitted to Manchester, Eng-

land, by means of C-W signals, using the 200-watt transmitter, seen in the upper right-hand corner of the photograph. The man in the chair is the owner and operator. Mr. Daugherty has found it more interesting to experiment in radio than to enter politics.

In the extreme left-hand corner of the photograph may be seen one of the receivers used in the station. It is a Paragon regenerative, with two steps of amplification. The amplifier is directly under the small loud-speaking horn. Next to it and directly back of Mr. Daugherty may be seen the small transmitter used for local work. This is an advantage. When it is desired to talk short distances only there isn't the disturbance and interference caused if he had used the large 200-watt set. Near the operator may be seen a Grebe regenerative receiver with amplifier and Magnavox loud-speaker. This station is an example of a well-equipped and well-handled amateur station. It illustrates the fact that the amateurs are right up to the minute in everything on the boards. It is not to be wondered at that the American amateur is so far ahead of his foreign cousin in radio when such a wide interest is taken in radio.

New V. T. for Radio

A NEW and improved vacuum-tube for radio—to be known as UV-201-A—which uses but one-fourth the filament current of the present type radiotrons, has been perfected by the General Electric Company. This tube may be used either as a detector or an amplifier, and is interchangeable in all receiving sets now using radiotrons UV-200 or UV-201 tubes.

According to W. C. White who developed this new tube, its outstanding features are:

1. The filament current is but one-fourth that required for the UV-201, which means the storage battery will last four times as long without recharging.
2. Quieter operation; no tube noises.
3. Greater amplification due to greater filament and plate area.
4. Greater electron emission—about five times that of the present type tubes. Much less distortion of received signals.

(Continued from preceding page)
more selective than the single-circuit type. The variable condenser, PC, shortens the natural wave-length of the primary circuit, and may or may not be used. The secondary coil, S, is shunted with a variable condenser, SC. This condenser increases its wave-length.

To tune: Set the secondary condenser at a low value. Set the primary condenser at about the half-way point. Move the primary slider, or switch, until signals are heard. Now adjust SC until you get maximum response. If you do not experience any interference the coupling between the primary and the secondary coils may be tightened, with a further increase in signal strength. A slight adjustment of PC and SC might now help. If interference is experienced the coupling should be loosened.

The most popular single-tube audion set seems to be that shown in the circuit Figure 4. This is called the two-variometer type regenerative set. The method for adjusting this is as follows: Have fairly tight coupling between the coils in the loose coupler or variocoupler. Set both variometers at zero. Adjust the primary slider until signals are heard. Adjust the secondary variometer for maximum response. Next you must carefully adjust the

plate variometer. By moving it toward maximum you will come to a point where a little squealing noise is heard; moving farther you will come to a spot where there is another squealing noise. The proper spot is between these two squeals. Do not try to regenerate too much as this action will result in greatly distorted signals.

Another type of regenerative set employs a tickler coil for the feedback coupling. This set is adjusted in the same manner as the ordinary two-circuit set with the exception that the coupling of the tickler coil must be adjusted after the regular tuning is accomplished.

For very close tuning with any of these circuits instruments known as verniers may be used. These are condensers, or coils, of very small capacity that are used in connection with large condensers, coils, or variometers, affording tuning qualities between turns or between the points on a scale.

Large coils and large condensers afford a great wave-length, and an increase in either will result in an increase in wave-length. Short wave-lengths require a reduced number of turns in your coil and a smaller capacity in your condenser. A condenser in series with the aerial circuit will decrease its wave-length. Sharpest tuning is obtained with loose coupling.

The Radio Primer

*For Thousands of Beginners Who
Are Coming into Radio Circles*

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

WHAT is meant by capacity when applied to a condenser?

A condenser has unit capacity—termed farads—when a charge of one coulomb creates a difference in potential of one volt between its terminals. This farad being too large for practical radio purposes the term microfarad (one millionth of a farad) is used.

* * *

What is a coulomb?

A coulomb is the quantity of electrical unit. It is the amount of electricity passing a point in a circuit when a current of one ampere flows for the space of one second.

* * *

What is a farad?

Farad is the unit of capacity.

* * *

What is meant by ampere?

Ampere is the unit of flow and is that value of current maintained in a circuit having a total resistance of one ohm when actuated by one volt.

* * *

What is meant by ampere hour?

Ampere hour is the unit expressing the quantity of current passing through a given circuit, or amperes flowing through a circuit in one hour. Thus to find out the ampere hour multiply the amperes flowing through the circuit at any given time by the number of hours the current flows.

* * *

What are meant by damped waves as applied to radio?

Damped waves are a series of oscillations which gradually decrease in amplitude. The further the distance from the source of the oscillations increase the more the amplitude decreases.

* * *

What is meant by undamped waves—continuous waves—abbreviated in radio to C. W.?

The undamped waves do not decrease in amplitude in relation to the distance from the source of the oscillations.

* * *

What is fading as applied to radio signals?

Fading is a term applied to signals that slowly decrease and then increase in receiving power, though the power

of the transmitted wave is constant. It is due to atmospheric conditions, and is common in spark (damped) wave signals.

* * *

What are the advantages of an undamped transmitter over one of same power but using damped waves?

In an undamped transmitter (C. W.) the waves are of constant amplitude, and there is no decrement. Consequently they are confined to one wave-length or frequency. Being continuous the amplitude need not be so great; therefore, lower potentials may be employed. Due to their being continuous radiotelephony is made possible as it will carry the modulations of the human voice. The tone may be controlled at the receiving operator's will. The efficiency is greater; and, as the decrement is *nil*, the wave radiated is much sharper.

* * *

What is meant by the term I. C. W.?

The term relates to continuous waves that, due to the agency of an interrupter at the transmitting end, are audible in a crystal (non-oscillating) or straight audion-circuit. The interruption is generally caused by a buzzer or a tone wheel—a small metallic wheel, the periphery of which is either slotted or has a small metallic projection, which will serve to break and make the current rapidly when rotated at high speed.

What does "modulation" mean when used in connection with radiotelephony?

Voice modulation is the superimposing of voice tonal vibrations on the radio-frequency oscillations generated by the transmitter. Due to the fact that the voice vibrations vary in amplitude the modulating agency gives a corresponding rise or decrease in the amplitude of the transmitted wave.

* * *

How may undamped waves (C. W.) be received on a crystal or straight audion-set?

By employing a small metallic wheel, preferably brass or copper, and providing it with a sliding contact. This wheel is inserted in the detector circuit. When rotated at fairly high speed the increase or decrease in resistance—due to faulty connections between the rotating wheel and the stationary sliding contact—rapidly interrupt the current flowing in the detector circuit, making the undamped signals audible to crystal or straight-audion by interrupting the received signals.

The Amateur Gets Wise

By Harold Day

IN these days, the unsuspecting amateur fully knows and appreciates good material, and will buy no other. Aside from the market and initial price consideration, there has been a general trend to cut down the operating expense attached to the maintenance of a large multiple tube-receiver. While it is true that the general high cost prevalent for tubes in the first place has prevented many amateurs from considering large installations, still I believe that if the ultimate cost of operating such sets were reduced and simplified, there would no doubt be many more large receivers.

Radio World's Modest Aim

RADIO WORLD from its very inception has attracted and held the interest of the radio public to such an extent that the publishers have decided that everybody connected with all branches of radio—scientific, manufacturing—distributors, dealers, professionals, amateurs, factory workers, broadcasters, receivers, and all others interested in radio, are potential readers of this publication.

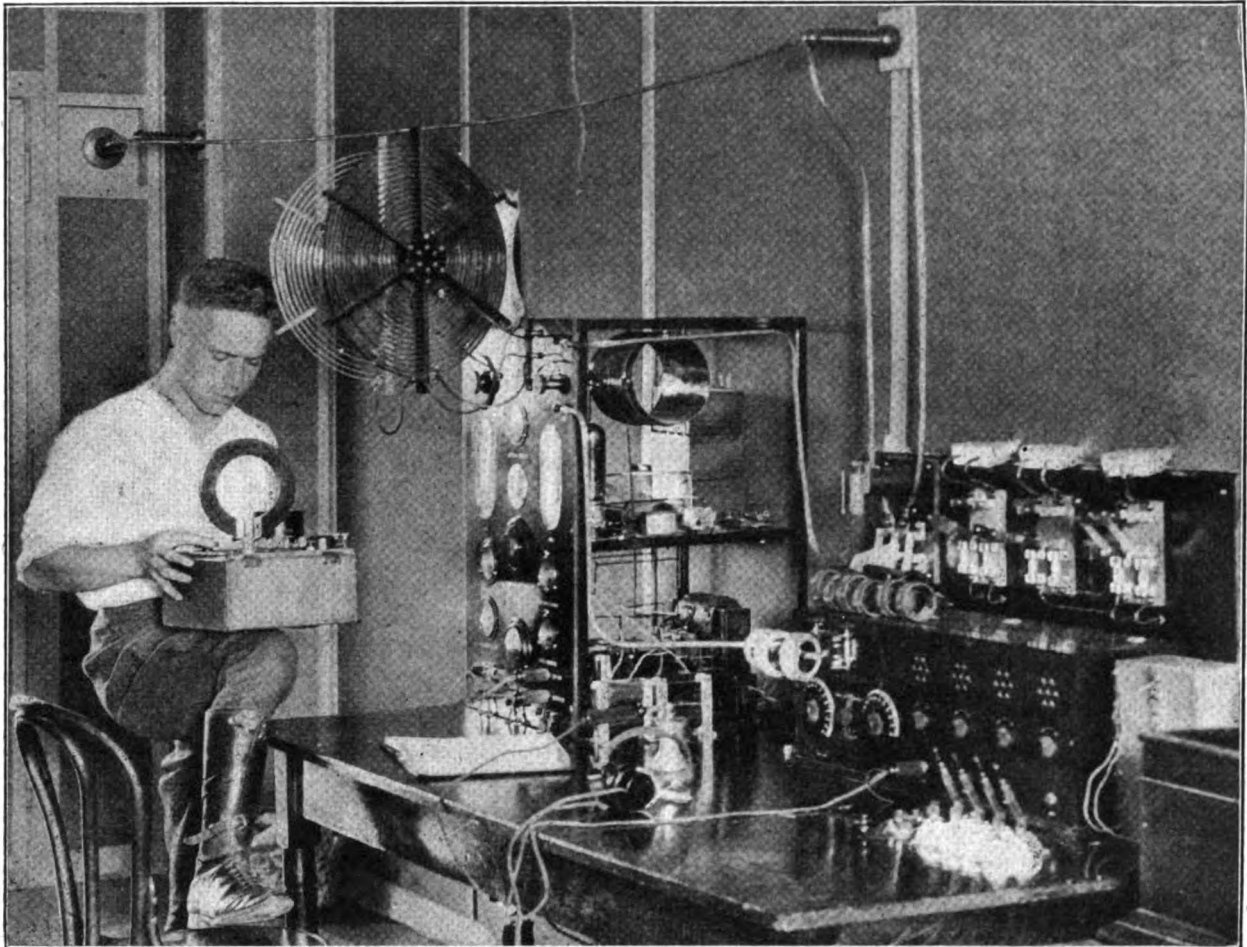
Our modest aim, therefore, is to start a subscription and newsstand campaign that will bring everyone in the different ranks of radio workers into the RADIO WORLD fold as regular every-seven-day readers.

Watch for sensational developments in connection with RADIO WORLD'S circulation during the coming months, and starting immediately.

It can be done!
Watch us do it!

THE PUBLISHERS.

KDYL, Heard by Many of the DX Boys



(Photo by Sainsbury, Salt Lake)

Station KDYL, described in the accompanying article. Mr. Ira Kear, the operator, is holding a wave meter.

STATION KDYL is owned and operated by "The Telegram," Salt Lake City, Utah. This station uses the Heising system of modulation and transmission, and is one of the real "DX boys." Motor generators are used to supply the high-plate voltage. They are located in a separate room and are controlled by the switchboard seen directly above the receiving set. Mr. Ira Kear, the operator-in-chief of this station, is

checking up on the wave length of the station, a daily performance in most all of the most prominent broadcasting stations of to-day. The receiver, as will be noticed, is of the popular three-unit feed-back type using the well-known honeycomb or duolateral coils as the inductances. Take note of the extreme neatness and care that is taken of every instrument. This station is regularly heard over a distance of 1800 miles in the following

districts: East, New York; North, Wrangle, Alaska; West, 1,800 miles out in the Pacific Ocean; South, Mexico City, Mexico. The station operates on a wave length of 360 meters for general program and 485 for weather reports, market reports, and other matter. The schedule for the station is 7 to 8 p. m., mountain time, every week night. It does not operate on Sundays. It is known to a large number of DX enthusiasts.

The Care of the Variable Condenser. *By Robert Clayton*

OF all the apparatus used by the amateur in constructing a set, probably none is more necessary than the variable condenser. But this apparatus, although necessary, generally receives less attention than any other. How many amateurs realize the fact that a condenser may be short-circuited by tiny particles of dust which collect unnoticed between the plates, cutting the usefulness of this apparatus considerably. Sometimes, also, when the condenser is working hard, it is a common thing for an amateur to

douse the bearings with oil. This is all very well; but, if too much oil is used, it generally spreads and, eventually, collects additional particles of dirt and dust, forming a short cut for the fine currents and visibly cutting down the effective range of the set. I have evolved a set of simple rules, which I have been using with good results, regarding the care of this particular piece of apparatus. They are as follows: 1. Once a month, carefully blow the dust from the plates. Use a fine rubber tube so as not to bend

the plates. 2. When the condenser is working hard, take a toothpick and a very little light oil, like sewing machine oil, and put just enough on the bearings to take the hard turn out; but not enough to flood the entire bearing. 3. Due to the fact that the bearings wear down, gently adjust the set screw, which allows the plates to be moved back and forth. 4. NEVER ATTEMPT TO STRENGTHEN PLATES IF BY CHANCE THEY ARE BENT while the condenser is on the panel. Remove it first.

Government's New Broadcaster, NAA, Has a Hard Time Winning Fans from NOF

NOF has passed—the government's principal broadcasting station is no more. NAA, its big brother, has taken its place; but many fans were disappointed to see the Navy's Anacostia Station return to research work. Some find it difficult to get accustomed to NAA at Arlington and tune it in on 710 meters, the new wave assigned for government broadcasting from Washington.

A hurried survey of the neighboring radio-population indicates how well they liked NOF; but it shows, also, that some must secure better sets or add a coil to old ones and learn to tune in on longer wave-lengths. Out of 83 replies, 61 who have picked up the station since January 3, like the transfer and receive the music of the Marine and Navy Bands well enough. Of those who object, 22 prefer NOF and the old 430 meter-wave.

Favorable replies to an inquiry were received at NAA from New York City; Manchester, New Hampshire; Worcester and Malden, Massachusetts; Wilmington, Delaware, and Pittston, Pennsylvania. Some neighboring fans claimed the broadcasting was too loud; others too weak. Fort Humphreys,

By W. R. Service

Virginia, an Army station, approves the service as "fine." It is doubtful if the wave could be changed to a shorter one, due to the fact that short waves interfere with the regular waves used on other sets at NAA for handling official traffic for the government. But some consolation is found in the fact that the bands are playing at the Marine Barracks in Washington, two or three miles away, and a single land-line is used for the transmission to the radio station. This will be improved by the installation of a special line, it is expected. Now the musicians play Wednesday and Friday nights in a barn-like room too large for the purpose and uncurtained. A sort of transmitting tent is being made, however, which will tend to restrain and concentrate the music for transmission over the line to Arlington, which is certain to improve the concerts.

Some rather frank expressions as to the preference for the concerts was expressed by listeners-in, who declared that some of the official talks broadcast were a bore. Others complain of

a hum and fading, and say NOF was perfect.

Other returns have come to the Public Health Service, which sought to learn how its broadcasts from NAA were received by the radio public. Out of 100 replies over half declared they could not get NAA on the scheduled nights, while 31 stated they got the broadcasts "O. K." The usual short-wave sets were found difficult to tune in on 710, but the sets built for longer wave-lengths gave less trouble. Generally the health fans prefer NOF. Sixty out of 80 declared that, of four large stations heard regularly, they got NOF best. It is regretted by the Navy that NOF had to be closed, but the work there was experimental, and other work must be undertaken. NAA is hardly "shaken down" as yet.

One of the first duties of the Advisory Committee on Radio will probably be to relocate wave-bands for all classes of service, including broadcasting, and it may be necessary to put some broadcasting up as high as 1,500 meters, which will make it necessary to add additional inductance to increase the range of wave-lengths of receiving sets.

White Radio Bill May Soon Be a Law

By Carl H. Butman

THE amended White Radio Bill has been reported out on the floor of the House by Chairman Green of the Merchant Marine Committee. As predicted, minor controversies were adjusted, ambiguities corrected, and the bill was printed Saturday. No opposition is expected in the House, where the bill will probably be taken up within two weeks, it is said, by members of the committee.

Secretary Hoover and Secretary Denby and their advisors have agreed to a compromise, and the bill now carries a clause that Army and Naval Stations shall not require commercial licenses, that their wave-lengths will be assigned by the President; but that, when commercial traffic is handled, rules and regulations designed to prevent interference with other radio stations will be observed. In other words, governmental stations, when transmitting other than official matter, will use

commercial wave lengths and comply with all regulations set down by the Secretary of Commerce.

One feature of the bill increases the membership of the Secretary of Commerce's advisory committee from twelve to fifteen, including a represen-

No Storage Battery Required

A NEW type radio-receiving set with loud-speaker which operates entirely by dry cells and has an equal or better reception range than the average two stage set using storage batteries for the filament current has been perfected by the General Electric Company. It uses three of the new type GE tubes which consume sixty milliamperes filament-current per tube. The A battery, which is the storage battery in ordinary receiving sets, consists of three dry-cells such as used for door bells. These supply the filament current at 4½ volts. The B battery consists of four 22½-volt units which supply ninety volts to the plate of the tubes. There is also a C battery, consisting of a small three-celle flashlight dry battery.

tative of the Treasury Department, and other from the Shipping Board, and an additional member who is not a governmental official.

The only cost to the applicant for an operator's license in the past has been the cost of an affidavit; the government did not charge for examination or permit, neither did it charge for station licenses. The new bill, as some may have forgotten, provides for a schedule of fees for station licenses ranging downward from \$300 for a transoceanic station license to \$2.50 for amateur transmitting stations. Operators' licenses will cost from \$2.50 for commercial extra first-class operator's license to \$1 for amateurs, with small additional charges for examinations. These fees, it is planned, will aid in the payment of the Government expenses in handling licenses, inspecting stations and giving examinations.

In the Radio Interior of an Atlantic Liner

By Charles J. Taaffe



(C. Wide World Photos)

The heart of the "America's" radio transmitting and receiving apparatus—one of the most complete in deep-sea service.

IT will be remembered that the Atlantic liner "America" holds the distinction of being the first of the gigantic passenger steamers to talk from mid-Atlantic to shore by radiophone. This was the radio sensation of the spring of 1922. It was the first time in the history of radio that telephoning by radio over a long distance was successfully tried. To-day is just another example of the tremendous strides that have taken place in radio during its first year. But what was considered as a miracle last spring is common-

place now. Stations like KDKA and WDAP have been heard over 5,000 miles. Dr. E. E. Wood, of the "America," is seen in the illustration diagnosing a case of toothache on another ship and giving instructions as to the treatment. This phase of radio, alone, is one that is never without human interest. Because of it, a sick man on a ship hundreds of miles away may receive expert medical treatment. More than once, a man's life has been saved by the agency of radio. Although radiotelephony has taken great strides in

a year, radiotelegraphy plays an equally important part. This is made evident by the panel directly in back of Dr. Wood. The complete radiotelephone equipment is seen on the extreme right of the picture, directly in front of the operator. By use of the intercommunication service now installed aboard ships, it is possible for the captain of one ship to talk directly, from the bridge, to the captain of another ship scores of miles away and as easily as if he were at home and with less trouble than "central" would give him.

In Radio World No. 45, dated February 3

Various Filament Resistances and How to Make Them

By MARIUS THOUVAIS

General Secretary of the Radio Club of Colonge

With sixteen working diagrams to guide the radio amateur in construction.

One of the many big features of next week's Radio World

RADIOGRAMS

The Latest Important Radio News, from the World Over, Briefly Told for the Growing Army of Radio Fans

FRENCH authors are urging a radio copyright on books that are broadcast. The latest problem in the copyrighting of literary works, especially of fiction, concerns the rights of the author when his books are broadcast to the public by radio. Today there are the book rights, the serial rights, the rights of translation, the rights of dramatization, and the moving-picture rights. To these must now be added, France's literary men declare, the radio-broadcasting rights. The matter has been brought to the attention of the Society of Men of Letters by M. Joseph Renaud, who urged on his colleagues the necessity of authors reserving and protecting the broadcasting rights in contracts with publishers, particularly in the United States and other countries which are "up to date" in the use of radio.

With an Armstrong superregenerative set Benedict Goldman, of 330 East Eightieth Street, New York City, believes that he heard a French amateur station during the amateur tests recently concluded. The message, which was received on a wave-length of 150 meters, was, "French amateur testing. Hello, U. S. A.," and was signed "8XD." Mr. Goldman is an experienced operator, having been in charge of the radio installation on board the *Slaw City* during the World War, and was also stationed at the Brooklyn Navy Yard. In his spare moments he directs the activities of the Federation Settlement Radio Club, at 106th Street, near Lexington Avenue.

Radio broadcasting in the United States is now heard in all parts of Mexico. Even stations on the Atlantic Coast are clearly heard. President Obregon is an enthusiastic radio fan, a set now being installed in Chapultepec Castle. Secretary de la Huerta has ordered a set installed in his home near the lake in Chapultepec Park.

Officials of the General Electric Company have just announced the successful conclusion of their carrier current experiments in telephone communication, which appear to be something like the wired-wireless system. According to an

announcement the G-E engineers have communicated over a 70,000-volt transmission line for a distance of forty miles, using apparatus similar to a radio outfit. For power companies, it is said to have many advantages over ordinary land-telephone lines for communication purposes. Carrier current, it is claimed, insures greater permanency and privacy, eliminates static, interference and fading, and does not require a radio operator.

The operating department of the Radio Relay League, from final figures just compiled, reports the following amateur stations, located in the extreme Western States, heard by amateurs in Europe during the transatlantic amateur radio tests just completed:

Arizona: 6ZZ—H. L. Gooding, Douglas.
California: 6AV—P. T. Nesbit, 625 Fitch Street, Healdsburg.
6ADG—F. Noel, 301 West Avenue Forty-three, Los Angeles. 6KA—F. E. Nikirk, 1050 West Eighty-ninth Street, Los Angeles.
Utah: 6ZA—Ira J. Kaar, Salt Lake City.

For the first time in South America a demonstration of point-to-point radio communication has been made, according to a cablegram received by G. E. Pingree, vice-president of the International Western Electric Company, from Colonel N. H. Slaughter, one of this company's chief radio-engineers, now at Rio de Janeiro. Point communication is distinguished from radio broadcasting in that two-way conversations are carried on between two stations equipped with both transmitting and receiving apparatus.

Several scenes from the performance of "The Old Soak" at the Plymouth Theater, New York, were broadcast by radio from WJZ. The question of whether a dramatic performance would be benefited or injured by broadcasting was answered on the following morning at the Plymouth, according to box-office men. It was declared that, up to 11 o'clock a. m., four patrons had bought tickets, declaring that they had been actuated by the radio record of the night before; inspired by the applause which registered through the receiving apparatus. The transmitting device was hung over the proscenium arch.

Broadcast Bill's Radiolays

By William E. Douglas



When it comes to home-made sermons, Sweet Minerva ain't so worse

IN these chilly winter ev'nin's, 'fore it's time to go to bed, how I like to sit and listen, rubber ear-muffs on my head, to the singin' and the speakin' comin' in by radio; weather don't make any difference—let 'er sleet, er hail, er snow. While I'm list'nin'

there so peaceful to the music from the air I kin also get enjoyment in a game of solitaire. I like most a game of canfield; there are others I kin play, but I never knew it had a name until the other day, when a drummer down at Perkin's store explained

how it wuz done in those classy gamblin' joints where they don't play jest fer fun. You hand out yer fifty dollars, or I guess it's fifty-two, then a gent gives you a deck of cards, an' after you are through fer each card up in the ace now he will hand you back five beans. Gosh! I like the game much better, now I've found out what it means. So when wifey goes out callin', leavin' me at home alone, I get out a deck of cards an' play there by my radi'phone. It combines my fav'rite pastime, an' the times goes by so fast that the clock soon strikes nine-thirty, an' I know my bedtime's past. So I play another hand er two while waitin' fer the time that they broadcast out from Arlington before I start my climb. Sweet Minerva, that's my better half, religiously inclined, hasn't took so very kindly to my habits, so I find just because on Sunday ev'nin when she went in town to church I said I'd stay at home an' listen—kinda left her in the 'lerch. That wuz not the only reason, fer while workin' Saturday I had sprained my back most awful loadin' up some bales of hay. So she went to church with Willie—I stayed home to listen in an' I reckon she'd forgive'd me if it only hadn't been. I'd forgot that it wuz Sunday an' wuz playing solitaire as I listened to the choir, an' the sermon from the air. Min came home an' caught me playin'—I kin tell the Universe when it comes to home-made sermons Sweet Minerva ain't so worse. Now I'll sit these winter ev'nin's 'fore it's time to go to bed an' do nothin' else but listen since Minerva's say is sed.

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Radio and the Woman

What the Great Game of Radio Brings to a Woman Who Has a Set in Her Home

By Crystal D. Tector

IT is surprising how many young folks have taken to radio. The younger son of a very dear friend of mine had become addicted to loafing about town in various places. His mother worried, fearing that his associates were not having a very good influence on him. For his birthday, the boy received a complete radio-receiving outfit. Since then, he has become so interested in it that he has never so much as asked to join his old associates. Instead, he has joined a radio club and even holds meetings up in his "radio shack," as he calls it.

FRIEND Husband came home very excited the other evening —was so wrought up that I really couldn't make any sense out of the erratic convolutions of his speech. Finally, when he had worked off some of his extra excitement, he was able to make me understand that his "boss" is about to install a large receiving set right in his office! "Gee! that will be something like it!" exclaimed F. H. "I have been pestering him for the past two months. I guess having him up here for supper last Sunday wasn't such a bad idea, after all—was it?"

Well, I see where I can go back to pre-radio days and wait for him to come home to supper again—but at least I'll know where he is.

IT is the easiest thing in the world for one who doesn't know anything about the construction of radio apparatus to absolutely ruin a set in five minutes trying to "fix something."

It took an expert probably seven or eight hours to assemble and test everything in the set and put it in working order. Why try to adjust it further when you do not understand it? Save money and time by having some one "fix it" who understands.

This little stunt was firmly imbedded on the writer's mind the other evening: I had been visiting a man who had just become interested in radio. We went into the parlor to talk with his family. When I left the room the set was working perfectly; but, due to the fact that his B battery was failing, it was not steady—the set was noisy. All of a sudden there came a disgruntled yell from the region of the house where the set was located. Going up I found the owner of a "once-was-good" set with a large screw-driver in his hand and a surprised look on his face contemplating the wreck. He had tried to tighten "something" and had received a slight shock, which caused him to remove his hand suddenly—also the glass of the bulb and half a dozen connecting wires.

Moral: If you don't understand what you are doing leave it alone until somebody who does can fix it.

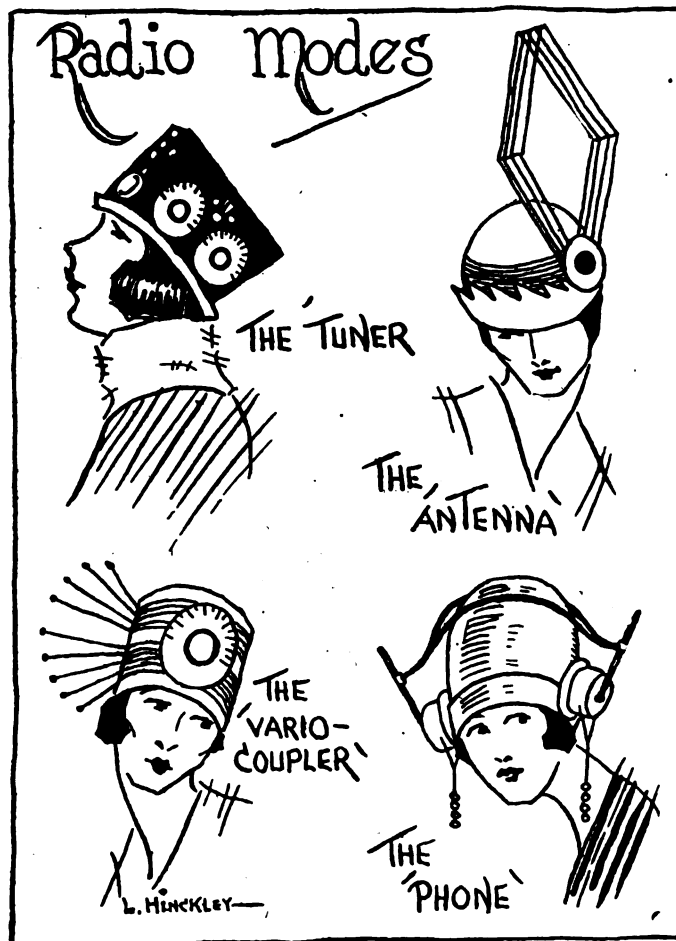
M. R. and Mrs. Tector have received an invitation to the "First Radio Ball in the Country." It states that the affair is to be a "Bal Masque," with costumes representing some piece of radio apparatus. He was highly insulted when I told him to dress up as a vario-coupler because he is so "changeable." He retorted that I had better dress up as an amplifying set because I always try to make the most of things; but I will fool him and go as a crystal detector.

THE Ladies' Society of our town has inaugurated a radio club, with a class for those who do not understand the principles of radio. Lectures are to be given by the physics and science professor of the high school. All my friends are attending, and have nominated me president. I really do not know how I am going to spend all my spare time, what with radio clubs, radio classes, and a hundred other things, besides looking after Friend Husband and the house. I really will have so much time to myself that I will have to feed F. H. on bacon and eggs three times a week.

NOW that the radio clan is sharply divided between radio-frequency and audio-frequency Friend Husband and I have some wonderful arguments as to the efficacy of both. He staunchly defends radio-frequency because he can always get it working better than I can; but it is too complicated for me. I stick to the old audio-frequency. It's simpler to handle and fix.

THERE have been several occasions while in the city when I noticed that, more and more, things are becoming adapted to radio in general. Only the other day I noticed that the car of a certain party well known in theatrical circles had a complete working radio set installed, and the concert from WJZ was coming

You Must Be in Style!



Cartoon by Lawrence B. Hinckley

through the window of the car. Seems as if we will soon be able to keep in touch with radio even while we are traveling under the city in the subways.

I HEARD the other night, over the radio, that the station at Atlanta, Georgia, is giving a box of candy to the first person in every state who hears the station and reports. Too bad I didn't know that when they first started. I like candy.

A LITTLE girl met me on the street the other evening about half-past bedtime, crying her eyes out. I stopped her and asked her what the trouble was. Sobbing her little heart out she said: "I-I-I tried to f-f-fi-nd the p-p-o-poor l-l-little b-bunny t-t-that got l-l-lost in the w-w-w-woods by Unc-Unc-Uncle W-W-Wig-Wiglies hou-house, and I-I-I'm-m l-l-lost. I-I want m-m-my m-m-mama!"

Poor little bunny was lost, and so was the little girl who was looking for him. So I took her to my house, called up one of my friends, who has a local broadcasting station, and asked him if he would be kind enough to announce the facts over the radio.

Inside of a half an hour the mother and father appeared and told me that they didn't even know that she was out of the house; that she had been told to go to bed about an hour and a half ago; and, as she generally goes to bed herself, they didn't notice that she had gone out. They thanked me a million times; but I think that they had better thank radio.

Monster Radio Tower Installed

WORK has just been completed on the first of the two 100-foot 12-ton steel towers on the roof of Aeolian Hall, one of the big skyscrapers on 42nd Street, just west of 5th Avenue, New York City. These masts will be used for the most powerful broadcasting station in the United States—WJZ. When the other tower—one similar to that used to illustrate this article—is completed, which will be about March 1, this new station of the Radio Corporation of America will begin to broadcast the concerts given in the building, for Aeolian Hall is a home of music. Recitals are given almost twice daily. It is then seen how easy it will be for the station to broadcast all the famous artists' concerts, symphony orchestras that take place in Aeolian Hall.

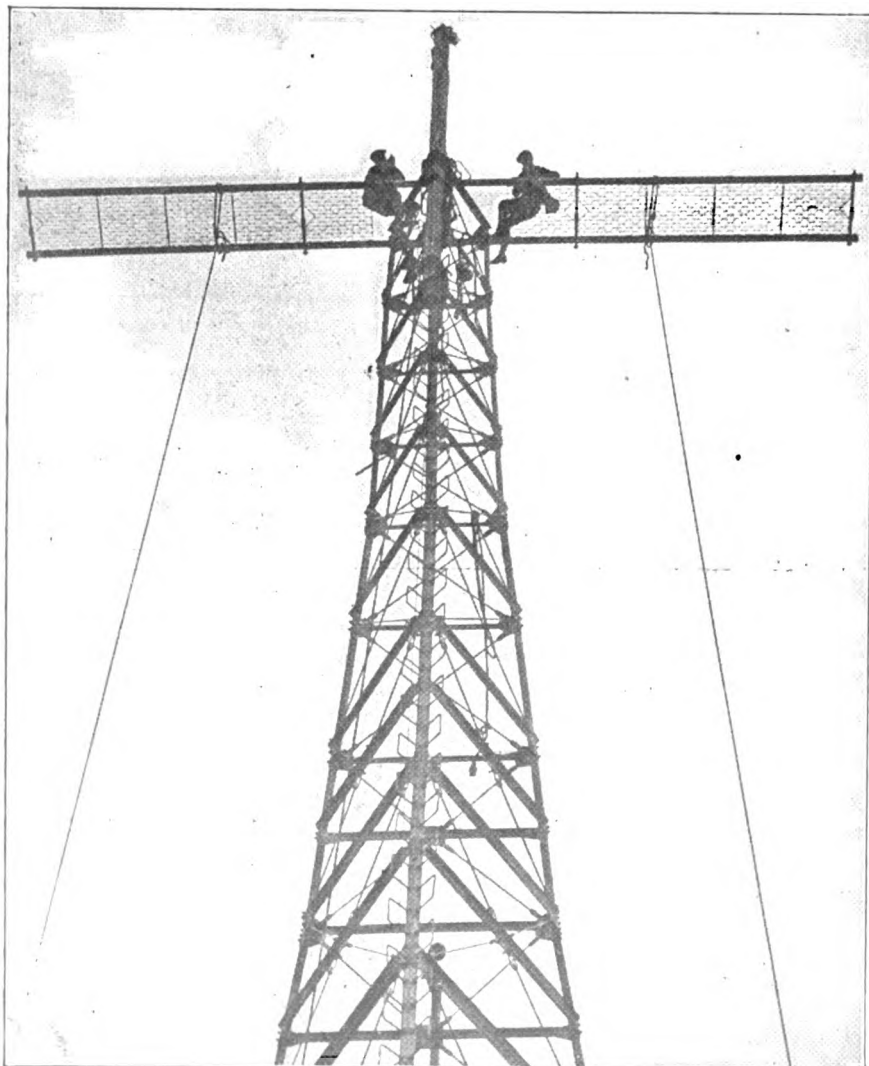
On the sixth floor of Aeolian Hall there has been constructed a special room for the regular radio-concerts. The walls of this room are packed over two inches thick with felt and other "noise killers." The floors are of a special rubber and cork composition laid on felt to deaden all exterior vibration, and all corners are rounded, to insure perfect acoustics. The broadcasting room was designed by an acoustician and will be the most perfect broadcasting room in the world.

There is a strong possibility that this station will operate on two different wave-lengths, sending out chamber music, and orchestral selections on one wave, and popular music on the other, simultaneously. It may replace WJZ altogether.

Because of the great weight of these immense towers and the fact that this particular section of the city is honey-

The Country's Biggest Broadcasting Station on the Roof of Aeolian Hall, 42nd Street Between 5th and 6th Avenues, New York City, Is Nearing Completion. One 12 Ton Steel Tower is Completed.

combed with subways, it took months to perfect some way to relieve the weight of the structure from the immediate building. This was finally accomplished by the use of a special steel-foundation attached directly to the steel framework of the building. The weight of these towers is distributed in such a way that the sides of the buildings bear most of the weight, but not so much that the building has any chance of being endangered. This construction is the first of its kind to be attempted—and not without considerable danger. The building itself, after the manner of all tall buildings, has a "give." By this it is meant that the structural work is not firmly rigid. If such were the case, the first strong wind of any high velocity, or the first shock, such as a strong blast, would endanger the building. The building is constructed so it will sway, or give. This presented a serious problem to the builders of the station, one which had to be overcome in such a way as would make the



The photograph at the left shows two of the workers putting the finishing touches on the massive towers of the Radio Corporation of America's new station, on the roof of Aeolian Hall. Imagine working in the bitter cold, over 350 feet above ground, and over 100 feet above the roof—working on a slim iron framework, which, on these cold, snowy days, become ice coated and slippery. It is not the most pleasant job in the world, and it certainly takes a lot of nerve. But the manner in which the steeplejacks and steel workers climbed about gave the writer the impression that they did not mind the height any more than if they were walking on the ground. The photographer who snapped this was invited to roam around the top crosspiece, and he remarked after the experience, "Never again!"

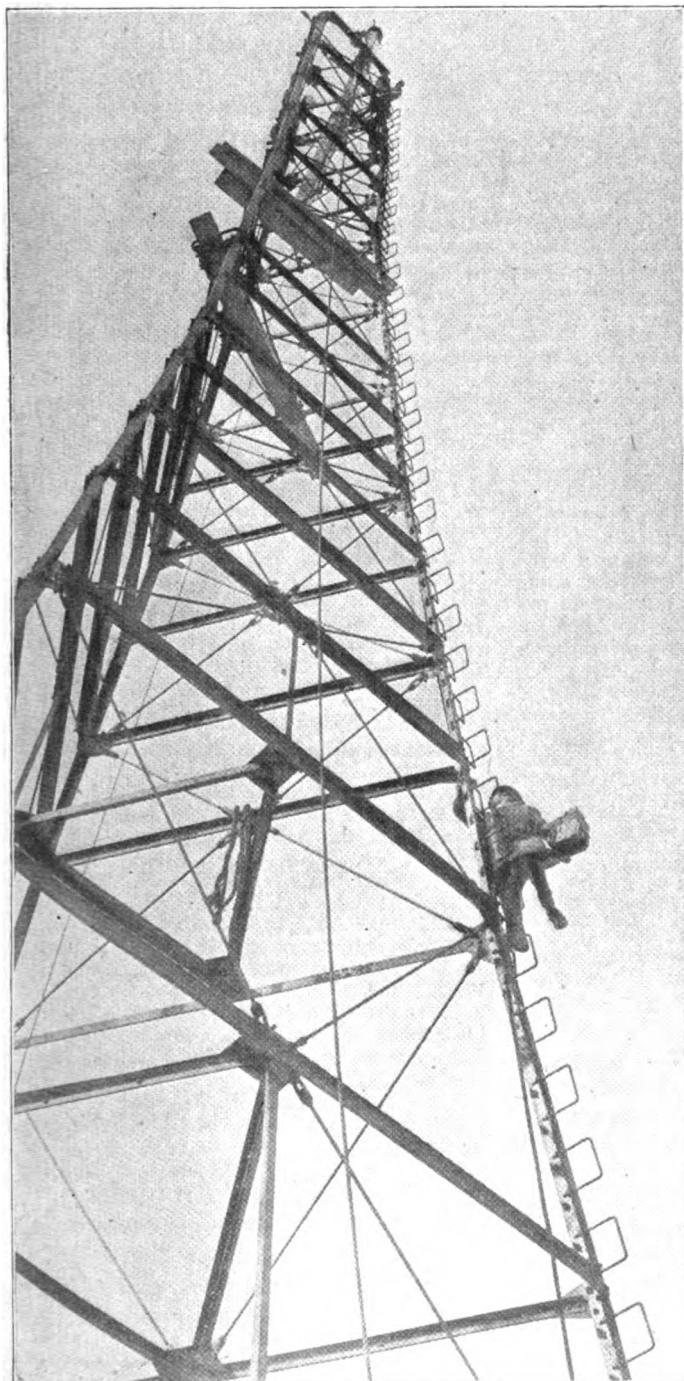
As may be seen, the towers are constructed to form an equilateral triangle with the point of the triangle facing the direction of the greatest strain, namely towards the second mast. This is done to relieve any possibility of either mast buckling, as the strongest part of a triangle, when there is a pull on it, is at the peak. There will be utilized, also, a heavy wooden pole, to act as a mast for the lowering and raising of the wires.

on Roof of New York Skyscraper

By Robert L. Dougherty

tower absolutely safe. While the base of the tower is much wider than the top, the entire tower would be endangered if it were not properly designed to take the "give" of the entire building. In case it were too rigid, there would be great danger of it breaking in two or ripping up at the base. This gives an idea of the situation the builders were compelled to face in order to insure absolute safety.

In order to get an idea of the monstrous size of the tower, compare the man crawling up the side of the ladder with the width of the tower itself. This tower can be seen from New Jersey when the air is not cloudy. It looks like a monstrous finger pointing into the heavens. From the street below, the men working on the tower look like flies crawling about a gigantic web.



(C. Kadel & Herbert)
One of the hundred-foot towers. A photograph taken from the base of the massive structure



(C. Kadel & Herbert)
Aeolian Hall is twenty-four stories high. Situated in the heart of the busiest section of the world, it is ideal as a location for a broadcasting station. The building, one of the highest in the locality, will give the aerials of the new broadcaster a clear and open range without any obstruction. From the mechanical side of broadcasting, so to speak, the location is ideal; but the public will be benefited because New York, being the mecca for so many who can add their gifts to broadcasting programs, will not be inconvenienced by a trip to another city.

The building of this station marks an epoch in radio. There has never been much importance attached to radio, in the mind of the layman, but this venture, the first of its kind, attests the wonderful thing radio has become in the past few years. Had anyone predicted five years ago, that millions of dollars would be spent on radio and stations such as the one pictured on this page would be made possible, he would have been considered a madman. But the impossible is being accomplished.

How long before cities will be dotted with masts and stations like the one pictured herewith—each capable of talking to stations ten thousand miles away? It is only a matter of time.

The location of this station makes it particularly adaptable for long-distance work. Being in a section of high buildings—the massive aerials topping them all, with the possible exception being the Woolworth Building, five miles away—suggest possibilities of remarkable DX accomplishments.

With the DX Nite Owls

Similar to E. A. Wright's Hook-up

From Fred Morton, President, Flathead Radio Association, Kalispell, Montana

WE wish to submit a report of the results we have obtained using a hook-up very similar to the one described by Mr. Earl A. Wright in RADIO WORLD, No. 39, dated December 23, 1922. We receive many western stations, and going farther we hear St. Louis, Chicago, Dallas, Fort Worth, Houston, Atlanta, Duluth, and a number of other high-power stations. We once heard KDKA; once WEAJ, New York City; three times KDYX, Honolulu, and once WGAD, Porto Rico. This is by no means a complete list of even the high-power distant stations. After reading the article by Mr. Wright, one of the club members tuned in fifteen stations in thirty minutes.

The hook-up we use is essentially the same as that used by Mr. Wright with these modifications:

1. We find that a variable phone-condenser, rather than a fixed condenser aids greatly in tuning.
2. We use a grid leak.
3. We use a variometer, connected as a vario-coupler. The variometer is wound with No. 20 wire, the stator is used as the primary, and the rotor as the tickler.
4. Negative A and negative B are connected, instead of positive A and negative B.
5. The primary condenser has a capacity of .001 instead of .0005.
6. The grid condenser has a capacity of .0025.

As Mr. Wright has explained, the tuning is done with the tickler half way between minimum and maximum, the rough tuning is done by means of the primary condenser, the fine tuning by means of the phone condenser, and, finally, by means of the filament rheostat.

Using this hook-up, we have received signals as loud and, in many cases, louder than either the Paragon or Grebe sets with one-step of amplification. We can also tune in many more stations in an evening and with very little trouble.

Using 3 power-tubes for audio-frequency amplification, with 45 volts on the plates of all tubes, and with a Baldwin Type-C unit as the loud-speaker, we receive music and phone so loudly that it can be understood 800 yards from the apparatus, near the center of the city. We shall be glad to receive letters from other clubs or "bugs."

The Flathead Radio Association, Kalispell, Montana, is the Radio Club of the Flathead County High School. We are entirely surrounded by high mountains.

Good Radio Work

From R. Diamond, 413 Royal Street, New Orleans, La.

I HAVE written to you before regarding the stations I have heard; but since then I have added fifteen more to the list. All have been heard on a single-tube regenerative set. The stations and the miles by air-line are:

KHD, Colorado Springs, 1,000; KHJ, Los Angeles, 1,650; KLZ, Denver, 1,050; KSD, St. Louis, 600; KUO, San Francisco, 1,875; KPO, San Francisco, 1,875; KYW, Chicago, 850; PWX, Havana, 1,000; WBL, Anthony, Kansas, 700; WEY, Wichita, Kansas, 700; WGM, Atlanta, 450; WGY, Schenectady, 1,050; WHB, Kansas City, Missouri, 700 (received best); WJZ, Newark, 1,150; WKY, Oklahoma City, 400; WLK, Indianapolis, 750; WOK, Pine Bluff, Arkansas, 300; WOS, Jefferson City, Missouri, 600;

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups from the "DX Nite Owls" who send in records with a view of publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

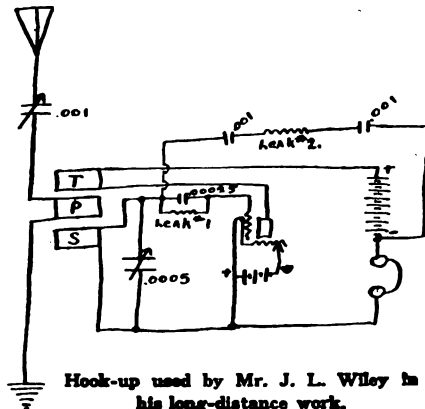
WPA, Fort Worth, 500; WPM, Washington, D. C., 1,000; WRR, Dallas, 450; WSB, Atlanta, 450; WWJ, Detroit, 1,000; KDKA, Pittsburgh, 1,000; WAAD, Cincinnati, 750; WLW, Cincinnati, 750; WBAP, Fort Worth, 500; WCAE, Pittsburgh, 1,000; WDAG, Amarillo, Texas, 800; WDAJ, College Park, Texas, 450; WDAL, Jacksonville, Florida, 500; WDAP, Chicago, 850; WEOA, Columbus, 810; WFAA, Dallas, 450; WFAF, New York, 1,200; WFAV, Lincoln, 875; WHAS, Louisville, 650; WKAL, Orange, Texas, 225; WLAC, Raleigh, North Carolina, 800; WLAH, Syracuse, 1,180; WLAJ, Waco, Texas, 430; WMAC, Cazenovia, New York, 1,200; WMAQ, Chicago, 850; WMAT, Duluth, 1,200; WLAG, Minneapolis, 1,100; NSF, Anacostia, D. C., 1,000; WFAT, Sioux City, South Dakota, 1,025; WOC, Davenport, Iowa, 825; WEAB, Fort Dodge, Iowa, 900; WOI, Ames, Iowa, 900; Portland, Oregon, 2,215.

These stations come in pretty regularly.

An Unusual Circuit

From J. L. Wiley, Jr., Stuttgart, Arkansas.

I HAVE been reading the DX records in your fine magazine; and as I have been doing some DX work lately, some of the DX owls may be interested in my record and hook-up. I think my hook-up is a very useful one. I have never seen another like it.



My long-distance records are KHJ, Los Angeles; PWX, Havana; WGY, Schenectady; CHBC, Canada; KDKA, Pittsburgh; WDAY, Fargo, North Dakota; WFAU, Boston; KFAF, Denver; WLW, Cincinnati; KDN, San Francisco; WOAI, San Antonio, Texas; WOR, Newark; WLAG, Minneapolis; KDYL, Salt Lake City; KLZ, Denver. These are just a few of the stations I have heard, not only once but several times.

I am enclosing hook-up which I use in this set. You will find that it resem-

bles the Flewelling in that both of the grid leaks are very particular. I use a piece of cardboard with pencil marks on it, as a leak. It took me about an hour to get leak No. 2 to work; but when it did, it was worth all the trouble.

To make the set work: First hook-up coils in regular manner shown, but leave out leak No. 2 and two .001 fixed condensers. Next hook up condenser and leak. When first hooked up they will not make any difference in the working of the set, but careful adjusting of the two leaks will soon enable one to advance rheostat and burn the filament brighter without making tube oscillate as rapidly as before. Condensers are not critical. Primary, 35 turns; secondary, 50 turns; tickler, 75 turns. After getting set to work with condensers in circuit, most of the turning may be done with secondary condenser which should have a vernier. Use very close coupling and most of capacity in primary condenser. Use a V-T one tube with 25 volts on plate; a U-V 200 with 18 volts, or a U-V 201 with 60 volts. U-V 201 will give best results as grid leaks will not be so particular.

My Six Months' Record

From Russell Sheehy, Newfields, New Hampshire

THE following stations were received during the past six months on a home-made, single-circuit set. KHJ, Los Angeles, comes in on one tube:

California (2), South Dakota (2), North Dakota (1), Colorado (1), Oklahoma (3), Texas (8), Louisiana (2), Florida (2), Wisconsin (4), Utah (1), Kansas (1), Georgia (3), Nebraska (1), Illinois (4), Michigan (4), Missouri (3), Indiana (2), Ohio (7), South Carolina (1), North Carolina (1), Minnesota (4), Iowa (3), Alabama (1), Tennessee (2), Maryland (1), Virginia (2), District of Columbia (4), Delaware (1), Pennsylvania (15), New Jersey (11), New York (16), Connecticut (4), Rhode Island (4), Massachusetts (9), Maine (2), Vermont (2), New Hampshire (1), Cuba (1), Porto Rico (2), Canada (4).

This makes a total of 144 stations in 38 states and territories.

Need a Life Belt?

From Perkins Bennegan, 627 Poplar Ave., Fresno, California.

I WISH to add to my record, published in RADIO WORLD. Using but one tube, I have heard the following stations: QSA, WGY, PWX, WSB, WGM, WDAJ, WWJ, WCX, WDAP, KYW, KSD, WX, WMAT, WLAG, WOI, WHB, WDAF, WFAA, WBAP, WFAT, WKY, CFCN, KFBB. The only stations on the list which I have not heard at least twice are PWX, WMAT, WFAT and KFBB.

There are 22 of them, fans, and all over 1,000 miles. Seven are 2,000 miles or more. The nearest is KFBB, 1,025 miles; the furthest, WGY, 2,500 miles. Let's see if you can beat this record, DX owls!

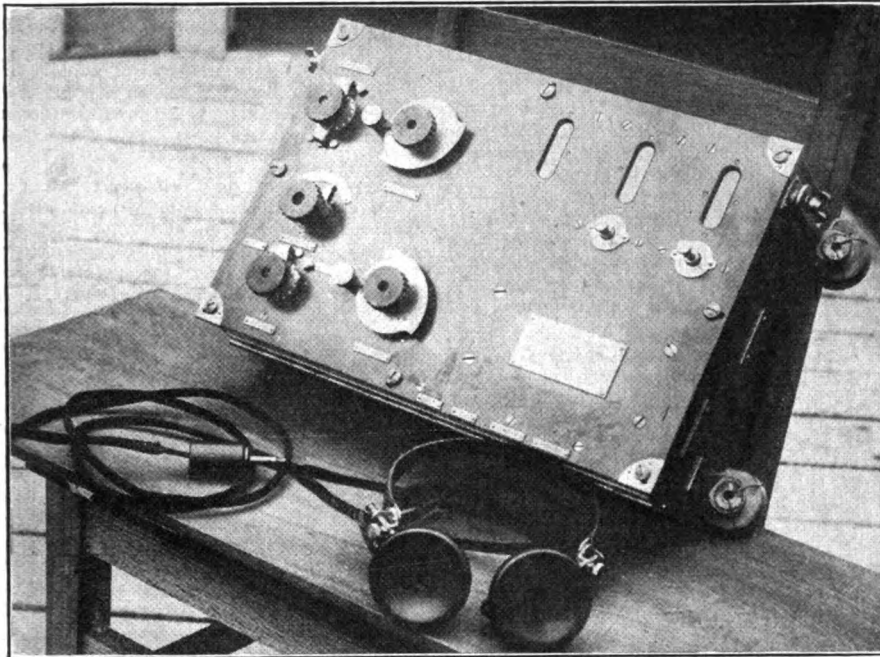
Mr. Smith, I sell first-class life belts for only \$5.95!

Adds 2-Stage Amplifier

From G. C. Neely, Box 263, Manor, Pennsylvania.

I AM using a three honeycomb-coil hook-up. I am about twelve miles from KDKA and get their concerts loud enough to be heard all over the house with a Baldwin type "C" phone and one U-V 200 tube. The .0005 variable condenser, shunted around the phones, provides a good smoothing-out

Radio Receiving Set of U. S. Army



The type SC R 75 Receiver at present used by the United States Army in its airplane service throughout the country. A close inspection of this photograph indicates that several novel features are incorporated in this receiver that might be successfully utilized by the progressive amateur who constructs his own apparatus. One of the most important is the switch—the second from the right. By means of this switch, all jacks and plugs are eliminated. It is evident that you can leave your phones connected into the set and by the mere push or pull of a small switch, automatically the amplifying circuits are connected into the circuit. This will call the inventive genius of the constructor into play. Note that the receiver is constructed as to be rigidly fastened to the framework of the cockpit where it is used. In order that no more vibration than is absolutely necessary is produced, there are heavy gum-rubber washers, and gaskets fastened to the sides and back where it is to be fastened. Take particular note of the method of keeping the corner of the front panel-screws securely fastened by means of little pointed springs.

With the DX Nite Owls

(Continued from preceding page)

effect. I sometimes add a two-stage amplifier which brings in long-distance stations, loud and clear, through the loud-speaker. I get the best results with three 50-turn honeycomb coils. It requires a good ground. I could not get sharp tuning with a water-pipe ground; but by burying a copper wire of several feet, directly beneath the antenna and combining the two, I can tune very sharply.

* * *

Nova Scotia Seems Ideal

By Owen C. Fraine, Gay's River, Nova Scotia.

WITH a simple single-valve hook-up, I have heard the following stations: WJZ, WBZ, WGY, WOR, NOF, NSF, ZXI, WOO, WIP, KDKA, WIK, WAAM, CHAC, WGL, WRP, WHAY, WHAM, CFCA, Toronto; WBAP, WGM, WSB, WBU, WHB, WBAM, CFCF, CKAC, WLW, WGR, WBAN, WBY, WFI, WEAM, WWJ, WBF, WBAK, WNAC, WWZ, WEAJ, WHAZ, WMAK, PWX, WKAQ, WDAF, WZAE, WLKA, WMAF, WAAF, WMAC, WLW, WHAS, WHB, KPAF, and WBAP.

I do not claim this as a record as other amateurs nearby are doing practically as well. This district, thirty-five miles north of Halifax, seems to be an ideal location for receiving. During the warm weather in August, I heard WJZ and WGY, consistently using a crystal receiver. Since the cold weather, WGY, WJZ, WBZ, WTP, WOO, WOR are heard easily with crystal, and on one occasion NOF and KDKA.

With a "Peanut" Tube

From Frank Gruver, Arvada, Colorado

I WOULD like to send in my record so other fans can see they haven't all the good sets. I am using Earl A. Wright's hook-up published in RADIO WORLD, No. 39, dated December 23, 1922, but I am using a "peanut" tube instead of a regular 6-volt tube. I have had my set only a week and have heard the following stations clearly: WBAP, WDAF, KHJ, WOC, WHAL, WFAA, WHHD, KZN, KSD, WOS. I have also tuned in CJCD, Winnipeg, Canada.

Kindly publish a one-step amplifier to this set.

If you will turn to RADIO WORLD, No. 23, dated September 2, page 18, you will find the hook-up you are seeking, in response to the query of Mr. H. S. Houston.

* * *

Uses W-D 11 Tube

From Alfred L. Okhams, 272 Kingston Ave., Brooklyn, N. Y.

SPEAKING of DX work, here's mine. On W-D 11 detector tube, coupler, and condenser; aerial plus lead-in, 100 feet:

Locals—WJZ, WOR, WAAM, WEAJ, WHN.

DX—KDKA, WWJ, WGY, WBZ, WHAZ, WOC, WDAF, WDAF, WPAC (longest reach, 1,600 miles); WSB, WBT. I wish the Navy Yard or Bush Terminal would get over the habit of "butting in" just when the distant announcer tells the call letters. I don't know how many DX stations I've lost that way.

MAGNAVOX Pioneers in the Radio field

IT was in 1913 that the Magnavox electro-dynamic receiver made its first public demonstration, when telephone communication was held between Denver and New York—a revolutionary advance.

The rise of radio broadcasting found Magnavox apparatus already perfected and in successful use.



R-2 Magnavox Radio with 18-inch horn



THIS instrument is intended for those who wish the utmost in amplifying power: for large audiences, dance halls, etc., but requires only .6 of an ampere for the field.

Price, \$85.00

R-3 Magnavox Radio with 14-inch horn

SAME in principle and construction throughout as Type R-2.

Is ideal for use in homes, offices, amateur stations, etc.

Requires one ampere field current from your filament battery.

Price, \$45.00



Magnavox Power Amplifier—Model C

CAN be used with any "B" Battery voltage which the power tube may require for best amplification.

AC-2-C, 2-Stage \$80.00
AC-3-C, 3-Stage \$110.00

The facilities and experience back of each piece of equipment bearing the Magnavox trade mark are unrivalled anywhere in the world.

Magnavox products may be had of good dealers everywhere.

Write to us for illustrated booklet

The Magnavox Company
Oakland, California

New York Office: 370 Seventh Ave.

Answers to Readers

1. *WHAT parts are necessary to construct a crystal set to receive from 30 to 60 miles? What will they cost?*

2. *Would an aerial 135 feet long be too large for use with this apparatus?*

3. *What is the difference between crystal and bulb sets?*

4. *Could I get a greater range with a bulb set?*

5. *Crystal sets are advertised for 30 miles. Pittsburgh is 32 miles. Can I get him with a crystal set?—Henry White, 451 Deer Lane St., Rochester, Pa.*

1. The parts necessary are a tuning coil (2-slide or 3-slide), a pair of phones, a phone condenser, and a crystal detector. You can use a variable condenser in the circuit to make it slightly more selective. They should not cost over \$12.

2. Your antenna is quite correct.

3. This question requires more space for an answer than we can give here. The main point of difference is the extreme sensitiveness of the bulb detector as compared with a crystal. Your range with a bulb set is from 10 to 20 times the range of a crystal set, depending on the circuit.

4. They claim that a crystal set is good for 30 miles; but reception on crystal sets has been covered over a range of 100 miles.

5. See hook-up in this issue illustrating the article by Frederick J. Rumford.

Give me correct hook-up of the De Forest reflex set. Where may the necessary parts be purchased?—Henry Beck, 1098 Woodysess Avenue, the Bronx, New York.

This particular hook-up is patented and cannot be published. We refer you to RADIO WORLD, No. 42, dated January 13, 1923. On page 4 you will find an article, Frederick J. Rumford, describing all constructional data on a two-tube reflex receiver-circuit. This may serve your purpose.

What size variable condenser should be used in the primary circuit of a radio frequency transformer?—Thomas Cortese.

.00025 mfd. should serve the purpose.

Publish a hook-up, or refer me to a back number of RADIO WORLD, that contains a hook-up embodying the following apparatus: Two variometers, one variocoupler, detector phones, etc. The rotors of my variometers are 2 inches in diameter and the stators are 2½ inches in diameter, wound with 60 turns of enameled wire. The coupler has 40 turns on the primary; the secondary has 30.—C. W. Goddard, Tekoa, Washington.

We refer you to RADIO WORLD No. 29, dated October 14, 1922, for the hook-up you require as well as the necessary data on its construction and operation. This is fully described therein, in an article by Mr. George W. May, "Using the Vario-coupler in a Short-wave Regenerative Set," page 4.

I have constructed a set using the enclosed hook-up. I get satisfactory results tuning in long distances, but there is a whistling in the phones when I remove my hand from the proximity of the panel. This whistling stops when I again put my hand on the panel. What is my trouble? How can I remedy it? Is the hook-up correct? Would a vario-coupler and two variometers give me better results?—Theo. Van Dongen, 2454 Meldrum Avenue, Detroit, Mich.

The trouble you are experiencing is common. It is known as "body capacity." This may be remedied by shielding the back of your panel with tin or copper foil. Care should be taken not to let the shielding touch any of the instruments. This will remove the whistling noise. Your hook-up is quite

correct. The distances you are making, according to your letter, indicate that you are doing very well. We advise you not to rebuild your set until you have tried the shielding and noticed the difference.

Must I change my circuit a sketch of which is enclosed? I intend using the new W-D 11 tubes. I am at present using the U-V 200 and 201. What changes will be necessary.—L. W. Ferguson, Killarney, W. Va.

You need not make any changes in the battery circuits. Your sketch is correct. You will find that if you use a variable grid leak, you will get much better results with these tubes as the grid-leak capacity is somewhat critical in these tubes.

Publish or refer me to a back number of RADIO WORLD containing a diagram of a crystal-detector set using vario-coupler, variable condenser, and fixed condenser. What should be the range of such a set using an aerial 75 feet long?—Olaf Peterson, 2098 Fainfield Ave., Bridgeport, Conn.

See RADIO WORLD No. 37, dated December 9. You will find a diagram on page 6, under "Efficient Crystal Sets at Small Cost," by Charles H. Plath.

What is the effect of putting a small condenser across the phone terminals?—E. B.

By putting a condenser across the phone terminals, sounds are made clearer due to the effect that the electrical impulses charge the condenser and the condenser discharges suddenly allowing a clearer sound in the telephones.

I am located 50 miles from New York City. Kindly let me know what set you consider the best for receiving from Pittsburgh, Kansas City, Atlanta, and other distance points. I know nothing about radio. I have heard it said that the 3-circuit receiver is better than the other and vice versa.—William Ash, Kings Park, New York.

It is impossible for us to discuss the relative merits of competitive apparatus in these columns, but we will give a few of the more popular makes of instruments on the market and you can inquire as to their relative merits through friends owning sets or



Trying to tune in Europe. A hard job.
(Cartoon by Marcus in "The Times," New York.)

through the literature of the companies making same: De Forest (D-7); Westinghouse (Senior with amplifier); Radio Corporation (RCA and Radiola IV and V); Sleeper, Grebe, and Western Electric.

You mention the 3-circuit and "the other," but you do not mention what other. There are hundreds of circuits on the market. Each has its own district advantage. The 3-circuit regenerative is very popular and extremely satisfactory when you understand how to manipulate it.

Give me the hook-up necessary for a "Calgary fan" to receive such distances as Regina, Seattle, Portland and Vancouver. Is audio- or radio-frequency necessary with the hook-up? I am using an outside aerial. What apparatus is necessary?—R. H. Williams, Calgary, Alberta, Canada.

We refer you to an article in RADIO WORLD, No. 43, dated January 20, by Ornerus Gordon, entitled, "DX Work With a W-D 11." This article fully describes the necessary apparatus and contains as well a full-size plan for the panel layout. Very fine work has been accomplished with this set. You will make no mistake in building it. You may add two steps of audio-frequency if you desire.

1. *How long will a dry cell (1½ volt) last for radio work?*

2. *Are the tubes advertised as the 1½-volt tube any better than the regular 6-volt tube?*

3. *Will any dry cell be sufficient? Is a special cell manufactured?—W. H. Cook, Ogden, Iowa.*

1. When used with the 1½-volt tube, you can get approximately 100 hours use out of it. It is rather hard to give the exact life of such cells, as they vary; also, the heat or cold of a room affects them.

2. We cannot discuss the relative merits of the various competitive makes of tubes.

3. Any dry cell will give satisfaction.

Are a pair of 6000-ohm phones any better than the regular Western Electric 2200-ohm phones? Herbert & Huesgen have advertised N & K phones which have that ohmage.—William F. Grimes, 21 Hammond Street, East Gloucester, Massachusetts.

When buying phones, it is wrong to consider them in terms of ohms. It is better to consider the number of ampere turns wound on the magnet spools. You can get the desired ohmage by winding resistance wire on the spools, but the magnets will not function. The phones you refer to are a German phone. They are slightly larger than the regular phone, due to the increased size of magnets. They are good phones.

What should be the range of a receiver built according to the diagram published in RADIO WORLD No. 14, dated July 1, 1922, page 13. I am using molded Tusha variometers and couplers? What aerial should I use with the above set?—Fred A. Kurtzborn, Jr., St. Louis.

There is no specified range to any receiver. The range depends partly on local conditions and partly on the strength of the transmitter. Sets using the hook-up you mention have been successful in receiving over 1,500 miles. You should have no trouble in doing similar work with one additional stage of audio-frequency amplification. A one-wire aerial from 100 to 150 feet long is sufficient.

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52 Weeks for \$6.00

If you did not get a copy of Radio World No. 1, send us \$6.00 and we will send you this paper for one year, and start it with our first issue, which will be mailed you as soon as possible after receipt of order.

Fifty Millions May Hear at Once, by Radio

A RECENT achievement in telephony indicates that it may soon be possible to radio a message into the ears of 50,000,000 Americans at the same time, says "The World," New York.

A. H. Griswold, Assistant Vice-President of the American Telephone and Telegraph, was an invited guest at the annual dinner of the Massachusetts Bankers' Association at the Copley-Plaza Hotel in Boston. Mr. Griswold connected by wire a studio at No. 24 Walker Street, New York, where several artists were performing a radio program for the local radio district.

The New York program was played in Boston through the apparatus of a department store. Then, by wire, it was conducted to the banquet hall of the Copley-Plaza. Mr. Griswold put on a loud speaker and the New York program was transmitted to the thousand or more diners with the utmost distinctness.

It was the first time that a radio program in one district had been given simultaneously in another district. The New York station was WEA, and that in Boston WNAC.

Telephone officials and scientists were enthusiastic over the prospect opened by the simultaneous broadcasting of a program from two radio stations more than 200 miles apart.

"Get the picture," said one. "If it is possible and practicable to transmit the speaking or singing voice from New York to Boston at a single point, why cannot the same speaking voice be transmitted to thousands of points at the same time?"

"There are thirteen millions of telephones in America—more, of course, than in any country in the world. It would take a lot of money—millions of dollars—to transmit a program given in one district to, say, forty districts. But if the necessary connections were made, as they were from Boston to New York, with forty other centers up and down the continent from the same point, the entire country could be supplied with the radio program coming from a single studio.

"That would mean that at least fifty million persons in America could hear the same song or the same speech at the same time."

When Sick at Sea

A DH-Medice Radiogram Brings Professional Help from Nearest Source

NEXT to SOS messages, DH-Medice radiograms are given right of way at sea. DH-Medice signifies advice radioed by medical officers to ships requesting assistance in a professional way for ill or injured men. The United States Public Health Service announced last February, that arrangements had been made with the Radio Corporation of America, whereby the Public Health Service would furnish free medical advice to ships at sea through coastal station of the Corporation at Chatham and Siasconset, Massachusetts; Bush Terminal, New York City; Cape May, New Jersey, and San Francisco. It was expected that request for advice would, in most instances, be made by vessels not carrying physicians, although consultations might be requested in some instances by ships' doctors.

An officer of the Public Health Service, on receipt of a request for medical advice, furnishes promptly whatever advice seems

indicated, couched in language intelligible to a layman.

While the Panama Canal was not included in the original scheme, several requests for medical advice have been received there from ships at sea, which have been given prompt attention.

The United Fruit Company has now established a similar system of free medical advice in the Caribbean and the Gulf of Mexico. A message from a ship's captain to any of the company's radio stations in Central America or Colombia giving the details of a case of illness or accident on his vessel,

will be answered by the company's physicians without charge.

The United Fruit Company requires that radiograms requesting medical advice be signed by the captain of the ship and state briefly, but clearly, the symptoms of the person afflicted. Such radiograms should be addressed "Unifruiteco" and may be sent to any of the following United Fruit Company hospitals:

Santa Marta, Colombia; Port Limon, Costa Rica; Almirante, Panama; Tela, Honduras; Puerto Castilla, Honduras, and Puerto Barrios, Guatemala.

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LOOK AT OUR PRICES:

<p>BARGAINS EVERY DAY</p> <p style="text-align: center;">SUNBEAM</p> <p style="text-align: center;">SUNBEAM ELECTRIC CO.</p> <p style="text-align: center;">71 THIRD AVE. (BET. 11th and 12th STREETS) Telephone 2899 Stuyvesant</p>	<table border="0" style="width: 100%;"> <tr> <td>Dictograph L. Sp.</td> <td>\$13.50</td> <td>Without waler</td> <td>.85</td> </tr> <tr> <td>Dictograph Phones</td> <td>4.95</td> <td>R. C. A. 712 Transformer....</td> <td>5.50</td> </tr> <tr> <td>Amphitone Phones</td> <td>5.50</td> <td>Shaker Crystal Sets</td> <td>3.75</td> </tr> <tr> <td>Anderson</td> <td></td> <td>Manhattan 2000 ohms</td> <td>2.50</td> </tr> <tr> <td>25 Ft. glass enclosed set-donor</td> <td>2.55</td> <td>Eveready B. Battery, 25% off, Defrost-Detector and 2-stage amplifier, complete set with phone</td> <td>65.00</td> </tr> <tr> <td>45 Ft. glass enclosed set-donor</td> <td>2.85</td> <td>150' Verticoaster, with wound</td> <td>2.15</td> </tr> <tr> <td>Kleener Verrier Rheostat</td> <td>.75</td> <td>and a complete line of standard Radio apparatus at reduced prices.</td> <td></td> </tr> <tr> <td>Outer Hamner Verrier Rheostat</td> <td>1.20</td> <td></td> <td></td> </tr> </table> <p style="text-align: center; font-size: small;">All tubes at reduced prices. Open till 10 o'clock every night. Money-order or certified check must accompany all orders.</p>	Dictograph L. Sp.	\$13.50	Without waler85	Dictograph Phones	4.95	R. C. A. 712 Transformer....	5.50	Amphitone Phones	5.50	Shaker Crystal Sets	3.75	Anderson		Manhattan 2000 ohms	2.50	25 Ft. glass enclosed set-donor	2.55	Eveready B. Battery, 25% off, Defrost-Detector and 2-stage amplifier, complete set with phone	65.00	45 Ft. glass enclosed set-donor	2.85	150' Verticoaster, with wound	2.15	Kleener Verrier Rheostat75	and a complete line of standard Radio apparatus at reduced prices.		Outer Hamner Verrier Rheostat	1.20		
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Radio Frequency Transformers

Brings in distant stations on a loop—perfect reproduction. No distortion.

THE BEST YOU CAN BUY

WALCON Transformers are tested and guaranteed. Particularly adapted for use with W.D.11 tubes.

Four new hook-ups, including a new reflex circuit furnished without charge with each transformer.

Price, \$4.00. We pay postage.

Dealers and jobbers: Write for our attractive sales proposition, backed by national advertising.

Manufactured by
THE RADIO CENTRE, 2 W. Broadway, N.Y., N.Y.

Attention! Fans and Amateurs!

Have you built your own receiver?
Are you experimenting with any particular hook-up?
Are you improving your set?
Are you doing any interesting constructive work in radio?
Why not share this knowledge with your thousands of brother fans who read **RADIO WORLD** every week?
We want pictures of receiving sets with descriptions of how you overcome some difficulty, or of any additional part or unit that you have added to obtain better results. These are the things that, probably, the other fellow is looking for. Send in your information; pictures or whatever you have done to improve the art. Remember the beginner is looking for them.

We intend to print in this paper, each week, pictured information and description of value to radio amateurs. If you have found a newer or better way of doing anything, don't keep the secret but tell it to your thousands of brother fans.

Send in a photograph of your set with or without accompanying diagrams and measurements. State whether you figure in the picture yourself, or not, and without any expense whatsoever to you we will make an engraving and publish it. Be sure to write your name and address plainly on photograph.

Send in your picture at once, or if you have not made a set or done anything else in making radio material, tell the boy next door all about this offer.

Address Technical Editor
RADIO WORLD, 1495 Broadway, New York City, N. Y.

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How Radio Figures in Big Business

As Told by the Annual Balance Sheet of the Radio Corporation of America

Assets	
PLANT AND EQUIPMENT:	
Comprising High-Power Stations in Operation with the necessary equipment thereto, together with ship stations and sundry machinery, tools and furniture	\$12,702,086.84
PATENTS, PATENT RIGHTS, CONTRACTS, GOODWILL, ETC.....	16,584,845.50
STOCKS OF SUBSIDIARY AND ASSOCIATED COMPANIES.....	598,000.00
CURRENT ASSETS:	
Cash on Hand and at Call.....	\$550,455.74
Accounts Receivable	2,967,497.66
Merchandise Inventories	895,232.80
Investments at Cost (Market Value December 31, 1921, \$494,039.90)	497,737.42
	4,910,923.62
DEFERRED CHARGES:	
Including Organization Expenses and part of the cost of re-establishment of the transoceanic business.....	916,228.58
	\$35,712,084.54
Liabilities and Capital	
CAPITAL STOCK:	
3,955,974 shares 7% Preferred, \$5 par.....	\$19,779,870.00
5,732,000 shares Common (no par value).....	12,039,607.88
	\$31,819,477.88
CURRENT LIABILITIES	954,471.07
DEFERRED LIABILITY	620,000.00
RESERVES:	
For Depreciation of Patents—Balance.....	\$964,284.12
Add: Amount Transferred from 1921 Earnings.....	426,799.59
	\$1,391,083.71
For Depreciation and Obsolescence of Plant.....	818,329.42
Other Reserves	108,722.46
	2,318,135.59
	\$35,712,084.54
GROSS INCOME FROM OPERATIONS:	
From Transoceanic Communications.....	\$2,138,625.86
Gross Sales	1,468,919.95
From Marine Service.....	553,298.71
	\$4,160,844.52
Deduct: General Operating and Administration Expenses, Depreciation of Plant and Cost of Sales.....	3,762,231.48
	\$398,613.04
OTHER INCOME	28,186.55
	\$426,799.59
BALANCE APPLIED AGAINST AMORTIZATION OF PATENTS.....	\$426,799.59

Business Always Good Somewhere

BUSINESS," says Roger W. Babson, the eminent economist, in "Forbes Magazine," New York, "is always good somewhere. The business cycle is continually in progress, but it travels gradually across the country north and south or east and west. The sun rises and sets once in every twenty-four hours, but it rises at a different time in the East than in the West. The sun of prosperity is always shining somewhere. The

student of fundamental conditions will always know where that bright spot is and there he will be selling his wares.

"The selling of goods is very much bound up with the tastes, customs, and fashions of the people. These, likewise, are changing constantly in accordance with definite economic laws. We criticize women as being the slaves of taste, custom and fashion, but can they help it? If they cannot help it, it is due to the fact that taste, custom, and fashion are governed by fundamental laws. If this is so, it is entirely possible to forecast the changes."

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

FIRST UNIVERSAL EXPOSITION OF INVENTIONS AND PATENTS, Grand Central Palace, New York City, February 17 to 22, inclusive, 1923.

SOUTH JERSEY'S FIRST RADIO-ELECTRICAL SHOW, Third Regiment Armory, Camden, N. J., February 5 to 10, inclusive.

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Capital Increases

Paceant Electric Co., Manhattan, \$50,000 to \$150,000.

Redhead Mfg. Co., Manhattan, make tools, \$20,000; H. H. Silverman, B. Rosen. (Attorney, M. E. Levin, 299 Broadway, New York.)

Stenzel Mica Corp., Wilmington, Delaware, mining, \$250,000. (Corporation Service Co.)

Radio Co. of Philadelphia, purchasing agents, \$300,000. (Corporation Guarantee and Trust Co.)

New Representative

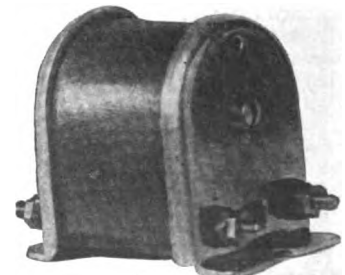
Multiple Storage Battery Corp., Delaware; new representative, N. D. Sturgess, Jamaica.

Claims for the Vac Shield

ONE of the latest radio devices on the market was developed by the Orange Research Laboratories, East Orange, New Jersey. It is known as the Vac-Shield. This is the invention of Ed. H. Lerchen, well known in the electrical industry. The purpose of this nonmagnetic shield is to prevent interstage coupling and electrostatic effects between detector and amplifying tubes, which overcomes stray capacities which cause unnecessary noises and which make it so difficult to tune in distant stations. The Vac-Shield also acts as a guard against breakage of the tube. It is particularly valuable where radio-frequency is used or wherever the distance between the vacuum tubes is less than 8 inches. They are so constructed as to be readily attached to the tubes in a few minutes without trouble, and are made to fit all standard makes of vacuum tubes. On account of their efficiency they are becoming very popular among radio fans.

A New Transformer

AN audio-frequency transformer of unusual design has been placed on the market by the Radio Supply Company, Hornell, New York. It is of the closed-core type, and is also shielded. Due to a unique winding a large core was found



New closed-core type transformer.

to be unnecessary. It is especially recommended to radio enthusiasts living great distances from broadcasting stations. Three stages of audio-amplification may be used with practical results.

License to Broadcast Issued

Official Document Permitting Radio Stations to Broadcast Copyrighted Music Issued—Fee to Be Yearly and Payable in Advance

THE efforts of the American Society of Composers, Authors and Publishers to collect license fees from radio broadcasting stations seems to be taking definite shape. The official license agreements whereby the radio interests are given permission to broadcast the copyrighted music owned by members of the society have been issued. A stipulated sum as an annual license fee is payable in advance. This amount varies upwards from a minimum of \$5.00.

As a matter of fact, it is the intention of the society to issue the license, not so much for the fee, but for fees that it will be necessary to collect in the future when radio broadcasting has reached a stage when it will seriously affect the society's members' revenue from other sources. The contracts now being made are more in the nature of a safeguard of the rights of the composer and others for a later period.

The "License to Broadcast" has been drawn up as simple and as concise as possible. The text of the agreement being entered into between the American Society of Composers, Authors and Publishers follows in full:

LICENSE TO BROADCAST

No.
 AGREEMENT made this day of 1923, between the AMERICAN SOCIETY OF COMPOSERS, AUTHORS AND PUBLISHERS, hereinafter designated as the "Society," and, hereinafter designated as the "Licensee," as follows:

1. The Society grants to the "Licensee" the license to broadcast by radio (as hereinafter limited in Article 3) the musical numbers in the repertory of the Society from the Licensee's broadcasting station, located at, City of, State of

2. The Licensee accepts such license, and agrees to pay to the Society the sum of \$..... annually, payable in advance.

3. This license is not transferable; is strictly limited to broadcasting from the station hereinabove mentioned; and is further strictly limited to broadcasting non-dramatic renditions, vocally and/or instrumentally (with an organ, phonograph, piano, orchestra or band).

4. The Licensee agrees to make the following announcement upon the commencement of each program in which musical numbers from the repertory of the Society are broadcasted:

"By special arrangement with the American Society of Composers, Authors and Publishers musical numbers contained in the Society's repertory will be included in this program."

5. If required by the Society the Licensee agrees to furnish to it (upon forms to be supplied) a list of the musical numbers contained in the Society's repertory used in each program.

6. In case the Licensee shall make default in the payment of the annual license fee, or shall violate any of the other terms or conditions of this license, the Society may, at any time after such default or violation, without previous notice to the Licensee, terminate this agreement; and, upon such termination, this license and the rights and privileges herein granted to the Licensee shall immediately cease and terminate.

7. The Society reserves the right, at any time, to revoke the privilege of the Licensee to broadcast by radio any of the numbers in its repertory, and upon such revocation

the Licensee shall have the right to terminate this agreement forthwith, by written notice, mailed to the Society at its usual place of business; and, in the event of such termination, a pro rata amount of the license fee, paid in advance, shall be refunded to the Licensee.

8. The parties hereto hereby agree that this contract shall be deemed to be, and shall be, extended and renewed from year to year unless either party, on or before thirty days next preceding the termination of any year, shall give notice to the other of intention to cancel the same, such notice to be given in writing by Registered Mail.

IN WITNESS WHEREOF, this agreement has been duly subscribed and sealed by the Society and Licensee.

AMERICAN SOCIETY OF COMPOSERS,
 AUTHORS AND PUBLISHERS.

By
 By (L. S.)

Who Is to Pay for Broadcasting

From an Address by General James G. Harbord, President of the Radio Corporation of America, Before the Illinois Manufacturers' Association

TODAY we have newspapers, automobile schools, electrical manufacturing companies, and chiropractic schools doing broadcasting. Can these various agencies continue when it costs from \$25,000 to \$50,000 a year to put on continuously a generally satisfactory program? If not, who is to do the broadcasting? Theoretically, the 600 stations scattered throughout this broad country are operating on two wave lengths, one of 360 meters and the other of 400 meters. The result is man-made interference and confusion. One of two things happen—either good programmes suffer from this interference, or stations capable of serving many thousands are asked to give up time on a specific wave length to a

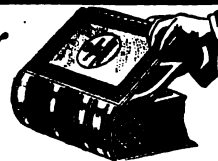
smaller station, which can at best serve only small communities and a limited number of people with inadequate programmes.

It is popularly believed that radio communications being carried on through the air may be operated to an unlimited extent. That, unfortunately, is not true. The spaces in what scientists call the ether, through which communications may be carried on, are very limited. They are like a definite number of paths, or a city street upon which only so many soldiers can march shoulder to shoulder. The government can assign additional wave lengths, but there are not available in the ether 600 wave lengths which can be allocated to telephone broadcasting.

Who is going to pay for broadcasting? I cannot answer that question, but if we have a national service, organized and administered with the ideal "the greatest good to the greatest number" as the watchword, it will no doubt be possible to devise some means of obtaining compensation for the cost of service either from distributors of apparatus, suitable contribution from listeners, or by the public-spirited endowment of a Carnegie or a Rockefeller.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

Whatever Your Question



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"All Wave" Coupler

TRADE MARK

FLAT AND BANK WOUND

Wave Length, 150 to 3,000 Meters

Eliminates the use of all Variometers, Varlocouplers and Loading Coils, inasmuch as it performs in one compact unit the functions of all of these devices combined.

For the Novice—The six efficient hook-ups given free with each "All Wave" Coupler enables the greenest novice to attain the same results attained by the expert in building the simplest, most compact and most efficient radio receiving set possible.

Be Prepared—For the higher wave lengths that have been and will be allotted to broadcasting stations because of their ever-increasing number. BUILD a set that cannot become obsolete.

Unusual Results Attained—Individual users of the "All Wave" Coupler have written us that in Rhode Island it is nothing unusual to bring in stations as far south as Havana, Cuba; while in Mobile, Alabama, Newark, N. J., is brought in daily.

Beware of Imitations—of the "All Wave" Coupler, which is guaranteed with trademark, "All Wave," on the rotor, also the six efficient hook-ups in the box.

\$9.00 Six efficient Hook-ups sent upon receipt of 10c. stamps or Free with each "All Wave" Coupler

GUARANTEED WITH AN ABSOLUTE MONEY-BACK GUARANTEE THOUSANDS OF SATISFIED USERS

Capitol Phonolier Corporation

60 Lafayette Street
 New York City



Claims the "Radio Golf" Record

Robert H. Anthony Makes a Grand Total of 39,345 Miles in 14 Hours and 20 Minutes

OVER 3,576 miles an hour is the radio distance covered by Robert H. Anthony, 18 Cleveland Road, Needham, Massachusetts. This speed was maintained December 30 and 31, over a period of 6 hours and 20 minutes. Among the cities "visited by radio" were San Francisco and Long Beach, California; Roswell, New Mexico; Colorado Springs, Colorado; Dallas and Fort Worth, Texas; Havana, Cuba; not to mention such nearby communities as Milwaukee, Chicago, St. Louis, Atlanta and Birmingham.

The broadcasting of all these cities and many more, totalling 45 in all, was received during 14 hours and 20 minutes operating time on the evenings of December 24, 25 and 30, and the early morning of December 31. The total number of miles covered during this time was 39,345, which establishes Mr. Anthony's claim to being a radio golfer of high rank.

Higher radio golf-cards may have been turned in, but this is believed a record, considering the time of play. "Radio Golf" is a new game invented by Frank Jones, of Tuinucu, Cuba. It is a gentleman's game. Everyone keeps his own score. A record is kept of all broadcasting stations heard. A broadcasting station may be computed only once. The mileage between the broadcasting station and the radio-receiving set is computed from the map and the various distances added up.

Mr. Anthony is New England manager for R. Thomas Sons Co. The equipment

with which he made this phenomenal record was a standard Amrad-radio-frequency receiver employing one stage of radio-frequency and two stages of audio-frequency amplification. San Francisco was heard clearly through a loud-speaking horn.

Below is Mr. Anthony's score card:

December 24. 3 hours' play

Station	Miles
WAAK—Milwaukee	920
WIP—Philadelphia	290
WOC—Davenport, Ia.	1035
WGY—Schenectady	87
WRR—Dallas	1610
WDAC—Springfield, Ill.	1006
WHK—Cleveland	575
WHB—Kansas City, Mo.	1294
WQAA—Parkersburg, Pa.	317
WJZ—Newark	201
WHD—Morgantown, W. Va.	544
WAH—Eldorado, Kansas	1438
Local stations	15
Total	9332

December 25. 5 hours' play.

WJZ—Newark	201
KYW—Chicago	892
WHD—Morgantown	544
WJAX—Cleveland	575
WGY—Schenec.ady	87
WWJ—Detroit	633
CFCF—Montreal	259
WBZ—Springfield, Mass.	66
KSD—St. Louis	1092
WOO—Philadelphia	290
WYJ—Los Angeles	2712
Local stations	10
Total	7361

December 30-31. 6 hours, 20 minutes' Play

WEAF—New York City	201
WGM—Atlanta	978
WIP—Philadelphia	290
KDKA—Pittsburgh	489
WFI—Philadelphia	290
PWX—Havana	1571
WAAK—Milwaukee	920
KSD—St. Louis	1064
WRR—Dallas	1610
WKM—Memphis	1179
WPA—Fort Worth, Texas	1639
WDAC—Chicago	892
KHD—Colorado Springs	1869
WMAF—South Dartmouth	64
KNJ—Roswell, New Mexico	1984
KSS—Long Beach, Calif.	2703
WSB—Atlanta	978
KDN—San Francisco	2818
WSY—Birmingham, Ala.	1093
Local stations	20
Total	22652

Grand total: 39,345 miles in 14 hours and 20 minutes.

Badly Needed

A RECEIVER capable of Noting right through the local broadcaster and bringing in DX on the same wave he is on.

A tube which will not break if bounced on a hard head or floor.

A filament which will not calmly melt when 6 to 66 volts are shoved through it, yet which will operate on 1½.

A questionnaire of all the foolish questions asked about radio.

Copper wire that can be stretched. Buy 100 feet and use it for 500 feet by simply stretching it like rubber!

A squelcher for the spark box supposed to be on 200 meters, but who is heard from 150 to 1000 meters.

A wave filter that will filter.

A radio tube that sells for 25 cents.

A "log book" which will keep itself.

Subscribe direct or through your news dealer. **\$6.00 a year, \$3.00 six months, \$1.50 three months.** Radio World, 1493 Broadway, N. Y. C.

\$ 6.75	Westinghouse Storage "B" Batteries	\$ 4.05
18.00	Westinghouse 60-80 Amp. Batteries	12.00
18.50	Homecharger De Luxe Model	13.00
7.00	All-Meter Triple Bank Wound Coupler	3.65
15.00	Crystal Set Complete	3.95
4.00	Finest 45 Plate Condensers	1.25

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Variable Grid Leak and Micon Condenser Combined



Clarifies signals, lowers filament current, increases battery life, eliminates hissing.
Unbroken range—zero to 5 Megohms; all intermediate points. Fixed capacity, .00025 M. F.
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The HOYT Peephole Ammeter or Voltmeter
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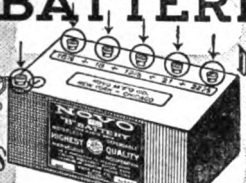
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Club News

THE Amateur Operators' Club of Brenton, Washington, announces the following officers: Walter R. Wood (7ABV) chief operator, president; Eugene Bailey (7 ABW), first operator; Ed. Flodquist (7NG), second operator and traffic manager.

* * *

The Lorain Radio Association, Lorain, Ohio, has elected the following officers: Charles S. Smith, president; O. S. Ellison, vice-president; R. R. Ward, secretary; P. J. Stephen, treasurer.

* * *

The Wireless Society of London has changed its name to the Radio Society of Great Britain.

Look Out for Radio Stock Fakers

WARNINGS are being sent out again regarding offerings of bogus radio company stock. One concern uses a name so similar to one of the successful companies that people are buying its stock believing they are investing in the older corporation.

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A DELIVERY wagon was seen at 43rd Street and 8th Avenue, New York City bearing the following sign: "RADIO MARKET. We deliver your purchases anywhere in New York, same day as bought. Try us."
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Heard at the Radio Counter
A Conversation Between Customer and Radio Clerk.
Part XII.

GOOD DAY, Mr. Jones! How did that new circuit of yours work out?
"Fine, old man! Fine! But I need some additional apparatus to get it working absolutely right."

"Why, I thought you had bought everything necessary."
"Well, you see I tried to skimp a bit, and, of course, you can't take half a dose of medicine and expect results."
"Not very well. But, tell me, what is the trouble?"
"I don't exactly know; but, as you gave me

the circuit, I thought you could probably help me out. Here I used a .0025 and here I used a .005. You will notice that the diagram calls for a .005 and a .001. I really can't tell where the difference lies; but I don't get as good results as you say I should; so I brought the diagram and also the condensers, and thought you might be willing to tell me why the change is necessary."

"Well, I think I can change one for you. You can keep the .005 and use it, but the .001 will cost you more. This circuit is known as a capacity-coupled circuit. The fact that the coupling is produced through definite capacities in the circuit renders it absolutely necessary to have the capacities correct."

"Well, so long as it is correct, why I shall change it. And—how much will it cost. By the way, you can give me another set of those mica diaphragms for my phones. They work perfectly, although I was kind of scary about them at first."

"They are the only ones to use. They have a pure tone, whereas others might tend to give a metallic sound to the signals received."

"O. K., Old Man! Drop around and see the set some night when you have nothing else on your mind. I'm going to change it and get it working to-night. Maybe you would like to come up and work on it with me. What say?"



Good Luck and Happiness

I will tell you FREE

Under which Zodiac Sign were you born? What are your opportunities in life, your future prospects, happiness in marriage, friends, enemies, success in all undertakings and many other vital questions as indicated by ASTROLOGY, the most ancient and interesting science of history?

Were you born under a lucky star? I will tell you free, the most interesting astrological interpretation of the Zodiac Sign you were born under. Simply send me the exact date of your birth in your own handwriting. To cover cost of this notice and postage, enclose ten cents in any form and your exact name and address. Your astrological interpretation will be written in plain language and sent to you securely sealed and postpaid. A great surprise awaits you! Write now—TO-DAY—to the ASTA STUDIO, 309 (Dept. 9) Fifth Avenue, New York

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List	Our Price
\$8.00 Elsemann Phones	\$5.25
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1.50 Kloesner Vernier Rheostats	.95
5.50 Workrite Bakelite 180 Coupler	3.50
1.00 Paragon Bakelite Socket	.60
1.75 Bright Star "B" Batteries	1.15

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Perfection Radio Co. of America
119 West 23rd Street, New York

Perfection Radio Corp.
of America

Direct Radio Communication with China

SAN FRANCISCO.—Announcement of a new pioneering step in radio is made by the Federal Telegraph Company. This concern, which established the first radio commercial communication with the Hawaiian Islands, now has established the first direct private radio communication with China. While this latter service is not on a commercial basis as yet, pending completion of the first of five large stations the company is erecting in China, all its own communication is being carried on over it.

The Federal's Hawaiian service was opened in 1912 between stations at South San Francisco and Heeia, island of Oahu, which virtually are duplicate installations. They since have been sold to the government. Until 1914 communication was carried on only at night, but the service was adequate to supply the island newspapers with their first metropolitan press service and to exchange a number of commercial messages.

The new communication channel with China is from the Federal company's Hillsboro station, near Portland, Oregon, where one of the arc sending-sets used regularly in its Portland-San Francisco service has been diverted temporarily to send to a temporary station located in the Astor House, Shanghai, China. Communication is on a wave-length of 8,400 meters, and has been carried on thus far with a power input of only 30 kilowatts, less than half the capacity for which the arc was designed.

"This Is Mr. Thayer"

WHEN the telegraph was completed the first long-distance message successfully transmitted consisted of the words "What hath God wrought!" The telephone was first used for the prosaic command: "Mr. Watson, come up here. I want you." To these historic utterances, says "The Globe," New York, must now be added "This is Mr. Thayer." Last night H. B. Thayer, president of the American Telegraph and Telephone Company, sat in his office at 195 Broadway and, introducing himself with the words quoted, talked across 3,400 miles of tumbling black Atlantic water to a group of men in New Southgate, near London. His words, carried by the magic of wireless telephony, were transmitted almost perfectly; those of his hearers in England who knew him recognized his tones. Mr. Thayer and several other speakers were heard to the extent of thousands of words, and so distinctly that the jovial British listeners were able to register a humorous complaint of the American accent.

This achievement does not come upon us unawares. Radio telephony from Arlington to Paris was successfully experimented with as long ago as 1915, and only last month a woman singing in Newark was heard in Croydon, England. The demon-

stration last night, however (for which the credit must be shared by Mr. Thayer's organization and the Radio Corporation of America), is vivid and dramatic proof of the giant strides in the progress of the art. Practical use of wireless telephony in transatlantic communication is still some distance away, for the number of wave-lengths available is still so limited that not more than four or five such conversations are simultaneously possible. But no one can doubt, in view of the record of the recent past, that these difficulties will be overcome.

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1/4 inch thick, 1 1/2 per square inch, 8/10 inch, 1 1/2 per square inch. Made of the highest grade black fibre. This material possesses high dielectric strength, is inexpensive, unbreakable, easy to work and takes a nice finish. Special offer, 6x8 1/2, 50c; 6x12 1/2, \$1.00. Postage paid.

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Please send me the CORYDON SNYDER CODE METHOD. I have not yet memorized the code and wish to do so. I will give your method a fair trial and will send you one dollar within one week or return method if I can not memorize by it as you claim.

NAME

YOU DX HAMS!

Have you seen the hook-up with complete panel layout in full size and all constructional details in RADIO WORLD No. 43, dated Jan. 20?

This hook-up actually goes out and drags the distance in, and lays it at your table.

It's a wonder! Can't be beat!

Even if you never have made a set yourself, you can do it now.

All that is necessary is to lay the full-page diagram of the panel on your own panel and drill and mark your holes. Simple, isn't it?

If you haven't this copy, send 15 cents to Radio World, 1493 Broadway, New York, N. Y., and copy will be mailed you. Or start your subscription with that number.

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The invention of this non-magnetic shield cuts out electric-static effects between vacuum tubes, overcomes interstage coupling, which causes distortion and unnecessary noises which make it difficult to tune in distant stations—also guards tubes against breakage. Your tubes should have them.

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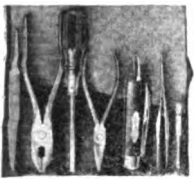
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Book on Chemistry
How to Make and Use a Small Chemical Laboratory.
By **RAYMOND FRANCIS YATTE**. The treatise covers all of the essentials of elementary chemistry. The law of definite proportions, solutions, crystallization, colloids, electrolysis, etc., are explained. The second part of the book is devoted to chemical and electro-chemical experiments. 75c. The Columbia Press, 1493 Broadway, N. Y. C.

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By Victor W. Page, M. S. A. E.
Uniform Size—24 in. x 38 in.—Price 35c. Each.
Location of Ignition System Troubles Made Easy.
In this chart all parts of a typical double ignition system using battery and magneto current are shown and suggestions are given for readily finding ignition troubles and eliminating them when found. Includes latest Delco, Connecticut and other systems. (24 x 38.) Price, 35 cents
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This chart presents the plan view of a typical six-cylinder chassis of standard design and outlines all important bearing points requiring lubrication, and is a valuable guide to the correct lubrication of any modern car. A practical chart for all interested in motor car maintenance. (24 x 38.) Price, 35 cents
While each of the above three charts is complete, the set covers all maintenance instructions for the entire automobile.
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Location of Ford Engine Troubles Made Easy.
An enlarged and revised chart showing clear sectional views depicting all portions of the Ford power plant and auxiliary groups. It outlines clearly all parts of the engine, fuel supply system, lighting group and cooling system, that are apt to give trouble, detailing all arrangements that are liable to make an engine lose power, start hard, or work irregularly. This chart simplifies location of all engine faults, and includes instructions for locating Ford electric starter troubles. Size 25 x 38 inches. Price, 35 cents
Location of Motorcycle Troubles Made Easy. Price, 35 cents
The Six Charts Sent for \$2.00
THE COLUMBIA PRINT
1493 Broadway, New York City

Attention, Newsdealers
You should keep a good supply of back numbers of RADIO WORLD on hand all the time. It has been the experience of many dealers that a purchaser of RADIO WORLD for the first time will almost immediately want the back numbers, some of which are already out of print and some of which are difficult to get. THE PUBLISHER WILL FURNISH BACK NUMBERS TO DEALERS DIRECT OR THROUGH THE AMERICAN NEWS CO. AND ITS BRANCHES. Dealers should hold their unsold copies for a reasonable length of time. RADIO WORLD of October 28 contained a full page of contents of back numbers to that date. 15 cents per copy; any seven numbers for \$1.00. RADIO WORLD, 1493 Broadway, New York.

Radio May Be a Common Telephone

First Successful Demonstration of Carrier Current Communication Shows Amazing Versatility of New Science

PITTSBURG — Before representatives of all the larger light and power companies of the United States, an amazing new use of radio was brought to light when it was demonstrated that voice conversations could be carried on by means of radio waves over high-tension power lines, without the use of switches, similar to the ordinary telephone connection.

The test was conducted between experimental stations located in the Colfax and Burnets Island power stations of the Duquesne Light Company—points located about thirty miles apart—by engineers of the Westinghouse Electric & Manufacturing Company and the power company. It was also demonstrated that this system could be used for remote control of all manner of apparatus.

For a long time, the Westinghouse Company has been working on a method of carrier-current control for use in central-power stations and electric railways, or other points using high-tension electrical lines. The idea behind the whole scheme is to superimpose radio waves on the power lines and thus make use of radio transmitting and receiving for both voice communication and control of remote switches.

The new system was demonstrated over a 66,000-volt line and is unique inasmuch as the system is duplex and operates as does the ordinary telephone. When the telephone receiver is unhooked, the transmitting station automatically starts up, allowing talk in both directions without any switching. This feature is entirely new in radio, as all other transmitting and receiving must be done by switching back and forth, because a station, transmitting, will not receive messages. The transmitting apparatus must first be switched off and the receiving circuit switched in. However, all this is done away with in the newest of systems.

The calling or ringing of numbers is selective and operated by special selector keys which cause the bell to ring only at the station desired. This eliminates the distracting code ringing and allows station operators to keep their minds on their work.

The system developed by the Westinghouse Company has been carefully worked out by C. A. Boddie, radio engineer of the company, and the technical and economic features are now being analyzed by Mr. Boddie, assisted by M. W. Cooke of the Duquesne Light Company.

Church Aids Drive by Radio
United Hospital Fund Trustees Thank Dr. Ernest M. Stires of St. Thomas

THE receipt of nearly a hundred checks for the United Hospital Fund by the Rev. Dr. Ernest M. Stires in response to his radio appeal broadcast from the pulpit of St. Thomas' Church, of which he is rector, was announced at a meeting of the trustees of the fund, at which William Fellowes Morgan was elected president.

No Free List
RADIO WORLD has no free list. The only copies sent out by the publishers are to fill the ever-increasing orders of the American News Company, the large numbers of subscription orders received at the office of publication, and one voucher copy to each advertiser and advertising agent represented in current issues.

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RADIO MYSTERY
TRACKED BY WIRELESS
BY
WILLIAM LE QUEUX
Author of "Mademoiselle of Monte Carlo," "The Intriguers," "The Fifth Finger," etc.
Every radio fan should read this latest mystery story by Mr. Le Queux who so rightly has been called, The Master of the Mystery Story.
This is fiction but Mr. Le Queux is a member of the Institute of Radio Engineers and therefore well fitted to write this engrossing radio adventure.
The plot is woven about a radio operator, Falconer. He is called upon by Scotland Yard to aid in the detection of a band of criminals who have turned the use of wireless into lawless channels.
Falconer eventually solves the mystery during which the latest angles in radio develop—the latest of today and the radio of the future. The book you cannot afford to miss.
Our special price to readers of Radio World—for a limited time only—\$1.85 postpaid. Send check or money order.
Moffat, Yard and Company
Publishers
31 Union Square West
New York City

Broadcasting map, 15c. That is, a complete broadcasting map appeared in RADIO WORLD, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

Uncle Sam Needs Radio Workers

United States Civil Service Examination for Radio Inspector to Be Held March 7

THE United States Civil Service Commission announces an open competitive examination for radio inspector on March 7. Vacancies in the positions of

radio inspector and assistant radio inspector in the Bureau of Navigation, Department of Commerce, at \$1,800 to \$2,200 a year (plus "bonus," see below), and in positions requiring similar qualifications at these or higher or lower salaries, will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

Range in salary.—The entrance salary within the range stated will depend upon the qualifications of the appointee as shown in the examination and the duty to which assigned.

Bonus.—Appointees whose services are satisfactory may be allowed the increase granted by Congress of \$20 a month.

Citizenship and sex.—All citizens of the United States who meet the requirements, both men and women, may enter this examination; appointing officers, however, have the legal right to specify the sex desired in requesting certification of eligibles. For these positions in the Bureau of Navigation men are desired.

Duties.—The duties of radio inspectors will be primarily to inspect the radio apparatus on steamships, to insure its compliance with the law, and to inspect shore stations. The inspectors may also be called upon to examine radio operators. The duties of radio inspectors require some office experience, therefore competitors should outline fully in their applications any office experience they may have had.

The duties of assistant radio inspectors will be primarily the assisting of radio inspectors in the enforcement of the wireless communication laws. Assistant radio inspectors will be required to inspect the radio equipment on board vessels and in land stations, which involves the carrying of 30 or 40 pounds of testing and measuring instruments. The inspection work requires a knowledge of the installation and operation of the several types of radio installations, including the adjustment and tuning of transmitters and receivers.

Subjects and weights.—Competitors will be examined in the following subjects, which will have the relative weights indicated:

1. Theoretical and practical questions in the construction, use, and adjustment of radio apparatus and auxiliaries (eligible rating required) 50
2. Education and experience in the line of the required duties..... 50

Total 100
Applicants must attain an eligible rating in the first subject.

Education and experience.—Applicants must have received a bachelor of science degree from a school of recognized standing, such educational training to have in-

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Guaranteed at \$2.50

AMPLIFIER

Guaranteed at \$2.75

"B" BATTERIES

22½ VOLT

Guaranteed \$0.65
45 Volt \$2.25

W. D. 11 SOCKET

Bakelite \$0.35

PHONES

as per last week's advertisement.

Postage must be included with order. Checks must include 10c. exchange and please have them certified. All goods are shipped P. P. insured.

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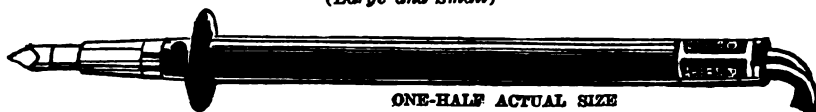


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cluded a special course in radio or kindred sciences, or show that they are senior students in such institutions; or have had the equivalent of a high-school education and at least two years' experience in special radio work, such as the manufacture, installation, or adjustment of commercial or governmental wireless apparatus. It is essential that applicants be wireless telegraph operators.

Statements as to education and experience are accepted subject to verification.

Age.—Applicants must have reached their twenty-first but not their fiftieth birthday on the date of examination. These age limits do not apply to persons entitled to preference because of military or naval service, but such applicants must not have reached the retirement age.

Retirement.—Classified employees who have reached the retirement age and have served fifteen years are entitled to retirement with an annuity. The retirement age for railway mail clerks is 62 years, for mechanics and post office clerks and carriers 65 years, and for others 70 years. A deduction of 2½ per cent. is made from the monthly salary to provide for this annuity, which will be returned to persons leaving the service before retirement with 4 per cent. interest compounded annually.

Photographs.—Applicants must submit to the examiner on the day of the examination their photographs, taken within two years, securely pasted in the space provided on the admission cards sent them after their applications are filed. Proofs or group photographs will not be accepted. Photographs will not be returned to applicants.

(Continued on next page)

American Radio Stores

Double Circuit New W. D. 11-Tube Set, with A & B Batteries. Inside 13x7. Golden Oak Cabinet. Complete with tube and phones. Tested Before Mailing.

SPECIAL, \$30.00

Attach Antenna and Ground and get DX.

TUBE SET

- 1 Rheostat
- 1 W. D. 11 Socket
- 1 W. D. 11 Tube
- 1 Grid Leak Condenser
- 1 "B" Battery, 22½ volts
- 1 "A" Battery, dry cell
- 1 Variocoupler
- 1 "23" Plate Condenser
- Wire for Hook Up Free
- 1 Panel, 7¼x10¼
- Hook-Up Only Given with Set
- Complete

\$10.90

- Essex Phonograph Attachment..... 1.50
- National Headsets 4.75
- Federal Headsets 5.00
- Queens Variometers 3.50
- Queens Variocouplers 3.50
- Skindervickian Button90

American Radio Stores

235 Fulton Street (mail orders)
1967 Broadway New York City

(Continued from preceding page)
Residence and domicile.—Applicants may be examined at any place at which this examination is held, regardless of their place of residence; but only those who have been actually domiciled in the State or Territory in which they reside for at least one year previous to the examination, and who have the county officer's certificate in the application form executed, may become eligible for permanent appointment to the apportioned service in Washington, D. C.

Oral examination.—Applicants may be required to report either in Washington, D. C., or elsewhere, for oral examination to determine their personal characteristics and address, tact, judgment, adaptability, and general fitness for the performance of the duties of the position. An applicant who fails to pass the oral examination will not be eligible for appointment. Applicants will be notified of the date and place of the oral examination.

Applications.—Applicants should at once apply for Form 1312, stating the title of the examination desired, to the Civil Service Commission, Washington, D. C., or to the Secretary of the United States Civil Service Board at any place listed hereon. Applications should be properly executed, *excluding both vouchers and the medical certificate*, and filed with the Commission at Washington in time to arrange for the examination at the place selected by the applicant.

Radio Jokes

A PAIR of fones snapped good and tight,
The Radiotron burning just right,
He tunes 'em in right through the night
That's him!—"The Radio Log."

"Friends, Romans, countrymen, lend me your ears!" cried the orator.

"Evidently he wants to listen in!" we cried.—"New York Herald."

Jimmy—You take this wireless receiver I just finished makin', and go down stairs in the cellar; hold it close to your ear and listen.

Freddy (after waiting in suspense for several moments in the cellar)—Aw, it's a fake. I didn't hear a thing.

Jimmy—Good! That shows it's workin' right. I didn't say anything yet.—"New York Mail."

J. G. Hibben, president of Princeton University, in an address recently, stated that by means of crude apparatus a wireless message was sent some 250 feet at Princeton, in 1832.

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5 RADIO-WIRE TABLES, BY FREDERICK J. RUMFORD, E.E., R.E.

These tables, showing the number of feet in a pound and fractions of a pound, were published in RADIO WORLD as follows: No. 1—Shielding Magnet Wire, RADIO WORLD, No. 34, dated Nov. 18. No. 2—Shielding Covered Wire, RADIO WORLD, No. 35, dated Nov. 25. No. 3—Double Cotton-Covered Wire, RADIO WORLD, No. 36, dated Dec. 2. No. 4—Single Cotton-Covered Wire, RADIO WORLD, No. 38, dated Dec. 16. No. 5—Double Silk-Covered Wire, RADIO WORLD, No. 40, dated Dec. 30. Sent to any address postpaid at 15 cents a copy, or the complete set of 5 copies for 75 cents. Or start your subscription with any number. Order now. Every amateur builder should have these tables constantly at hand. The supply of back numbers is limited.
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D-X-RADIO COMPANY specializes in Radio Instruments designed for DX (Distance) Work. To receive distant stations your instrument must be built with proper equipment. And that means the D-X-Radio Company—particularly since we offer highest quality radio parts at lowest prices.

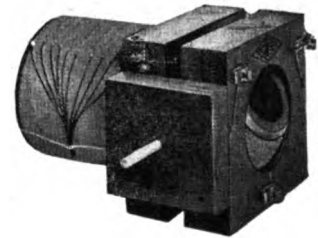
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Guaranteed Wave Length 200 to 3,500 Meters.



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	List Price	Our Price
Building Grip Plug, round telephone	\$1.50	\$0.75
Ameco Potentiometer	1.25	.50
RCA Potentiometer, for "A" Battery	2.00	1.75
Ameco Rheostat	1.25	.65
Bradleystat Rheostat	1.25	1.55
Outler-Hammer Co. Rheostat	1.00	.75
Pittenger Rheostat	1.25	.40
Bakelite Socket	1.50	.50
Moulded Socket	1.25	.45
W.D. 11 Socket	1.00	.55
Branden, Superior Head-Sets		
2,000-Ohm	5.00	5.00
Federal Head-Sets, 2,000-Ohm	5.00	5.00
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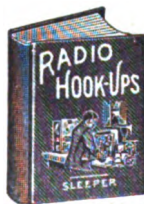
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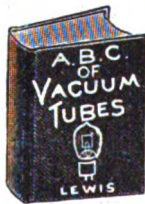


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RADIO

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Selective Receiving Apparatus Used on the S. S. Resolute



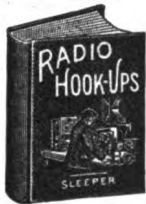
(C. Kadel and Herbert)

The Telefunken receiver shown in this illustration is a type of selective receiving apparatus widely used on board ships. It is very flexible in operation and has a reliable range of from 300 to 20,000 meters, covering practically every wave length used in commercial work. C. B. Smith, the operator, is seen tuning in. The inductances are mounted with a view to saving space in the coupling arrangement. The taps, instead of being varied with switch points and arms, are plugged in. This manner of working, while not as flexible as the former method, is undoubtedly more efficient, since it allows better contact. Not a great deal of tuning, that is, not much jumping around, is done on shipboard. If an operator is listening on 600, he stays on that wave for some time, while the fine tuning can easily be accomplished by means of the condensers, shown in the photograph below the inductances. Most ships, when intercommunicating, use crystal detectors, instead of the tubes. If amplification is desired it is accomplished by a separate amplifying unit which can be plugged in, but which in ordinary ship-to-ship reception is not used. While, of course, most of the naval ships are using tubes throughout, for both reception and amplification, the regular commercial operator prefers the crystal for regular communication, because it is clearer for short distances, and in general is less trouble. A description is given inside.

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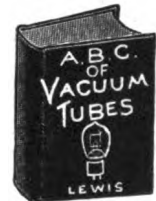
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VOLUME TWO OF
RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879.]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. II, No. 19. Whole No. 45

February 3, 1923

15c per copy, \$6.00 a year

Most Up-to-Date Radio Room on S. S. "Resolute"

By Harold Day

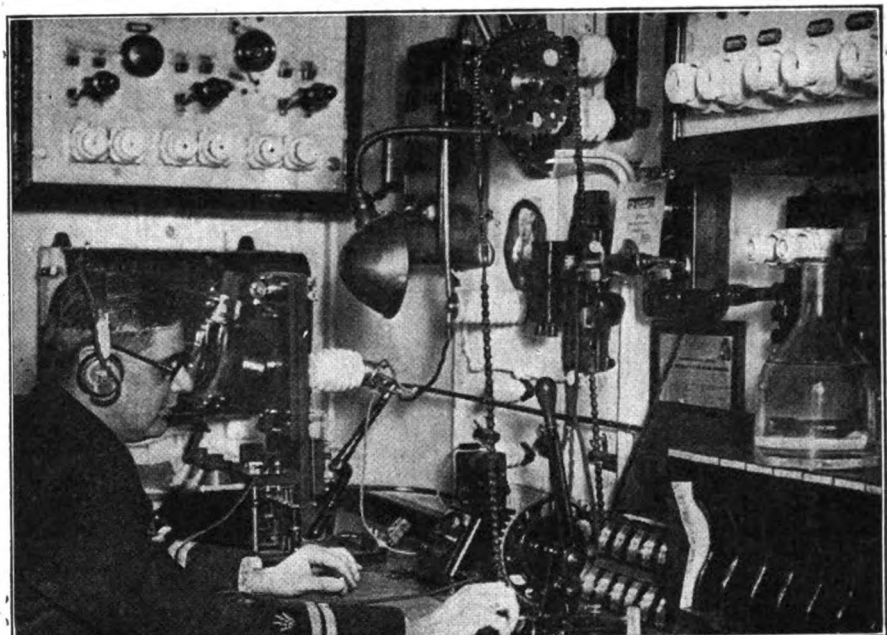
IN this elaborate radio room of S. S. Resolute, mentioned on the front page of this issue, Chief Operator Nelson J. Kearny is seen operating the spark set. The antenna is switched from receiving to transmission by means of a change-over switch, controlled from the operating table by means of chains. This allows the switch proper to be kept out of the way on the roof of the operating room.

There are two switch-boards, one controlling the large set, which is supplied with current from the ship's generating set, and the other by the auxiliary set, worked from the storage batteries. This is necessary on all ships, as the law compels ship stations to embody an auxiliary set in their equipment, to be used in case of trouble with the ship current, which normally supplies the larger set.

Directly under the larger switch-board, on the right, will be seen the telephone, by means of which the captain, or the man in charge of the bridge, can speak directly to the operator. Although the average ship now embodies a telephone exchange, similar to that in a large hotel, the telephone seen on the wall is directly connected so that there will be no delay in communication with the operator.

It will be noticed that the receiver takes up only about one-quarter of the space generally used, the most space being allotted to the transmitting apparatus. As mentioned on the front page of this issue, this receiving apparatus, being compact, and at the same time very flexible as to wavelength, takes up little room.

Many people have heard it said that the radio room is really the "heart of the ship," but they do not understand how true this is. Without the radio room on board the captain would be put entirely at a disadvantage. He would not be able to keep in touch with the ships in the



(C. Kadel & Herbert)

The interior of the S. S. Resolute's radio room. The extreme neatness and compactness of this apparatus are in direct contrast to the old time ship stations. The operator has plenty of room.

vast body of ocean surrounding him, he would not receive the weather forecast or the position of various wrecks, which are a menace to all vessels. Taken all in all, he has become so accustomed to relying on radio that when the set is out of commission, be it only a short space of time, he generally is a very worried man.

Take for instance the ship that is nearing land in a dense fog. Before radio came into use, there of course were not so many large vessels navigating the seas at the one time. Now, the vessels get their bearings any time of the day and night by means of the stations located around the large harbors, which, by means of "direction finders" can tell the captain his exact position, within two minutes after the signals have been heard by the land direction finder station.

It therefore places a great deal of responsibility both on the radio operator and the apparatus he is handling.

For that reason, on all the big trans-oceanic liners, they have several expert operators, all of whom know how to take care of all the apparatus.

You can see that radio is, then, as important to the captain of a ship as it is to the passengers. Many do not know that the little newspaper published on board a modern liner gets its information from the land stations that supply the service to the ships. Many people, especially those who have traveled over the seas numerous times, have become so accustomed to reading the bulletins and newspaper that they would be lost without them.

Consider, also, the fact that serious accidents may happen aboard ship, which need the immediate attention of a medical man or surgeon. The captain gets in touch with a ship in the vicinity, tells the symptoms, or accident, and the doctor in attendance, though he be miles away, diagnoses the illness, or advises treatment.

Twenty-seven Stations May Be Abandoned for Good of Service

By Carl H. Butman

WASHINGTON, D. C.—The abandonment or transfer of twenty-seven minor naval radio and compass stations has recently been recommended by the Special Naval Board on Shore Stations, headed by Rear-Admiral Hugh Rodman, and the recommendation forwarded to Congress by Secretary Denby with his approval. Disposal of these useless radio shore stations should make for naval sea efficiency. Communication experts of the navy believe that when they are closed commercial interests which they now serve will immediately establish new public stations equipped with modern apparatus, and that this will guarantee better service to the public and not interfere with broadcasting. Already the old Miami station is leased to a commercial company, which plans complete new equipment. Most of the old stations were unnecessary from a marine point of view, and the navy could not afford to continue their operation. Many of the radio transmitting stations recommended for the scrap heap were equipped with old spark sets, which interfered with telephonic broadcasting. Some of them had been maintained at a cost ten times the return since the war because no local public radio service facilities

were available at the time.

All the high-powered naval radio stations, such as Arlington, Annapolis, Porto Rico, Canal Zone, Honolulu, Guam, and certain ones in Alaska, will be retained, as well as the semi-high-powered stations in the navy yards at the twelve important naval bases, and a number of minor stations now in use. Today there are 65 traffic stations and 33 compass stations in operation, requiring a personnel of 70 officers and 1,257 men. The elimination of 27 would leave 71 active stations, sufficient to meet the navy's needs ashore.

The board recommends that 8 radio stations on the Great Lakes and those at Buffalo and Cleveland be abandoned or turned over to the army for operation. Nine, located at Baltimore, Mobile, Miami and St. Petersburg, Grand Isle, Louisiana; Port Arthur, Seattle, Navassa Isle, West Indies, and Managua, Nicaragua, will probably be discontinued and abandoned. Radio compass stations at Detour Pass, White Fish Point, and Grand Morais, Michigan, are recommended for transfer to another government department or abandoned. The sites of two old and unused radio stations at Siasconsett and South Wellfleet, Massachusetts, are also recommended for disposal. Some of them might be

operated by the navy if commercial and shipping interests would meet the cost of maintenance.

Commenting on the recommendations made the report of the committee states in part:

"Radio communication is of paramount importance to the fleet. The maintenance of a complete trans-ocean and coastwise system of radio communication by the Navy Department is necessary for the efficient management and operation of the fleets of the United States in peace and war. The control of various independent operations can, through it, be more closely associated and made to conform with the general plan of action. Efficient radio service provides the means to obtain and disseminate information, and gives a nation that most important of all war assets—the power to strike hard with its fighting force. In time of peace efficient radio service is also essential to commerce. Superiority in this service by the navy is a factor of the same order of importance as superiority in number or types or in the trained efficiency of ships. The Naval Radio System is an integral part of the navy. It must be maintained and operated during peace in such a way as to be of the greatest value in time of national emergency."

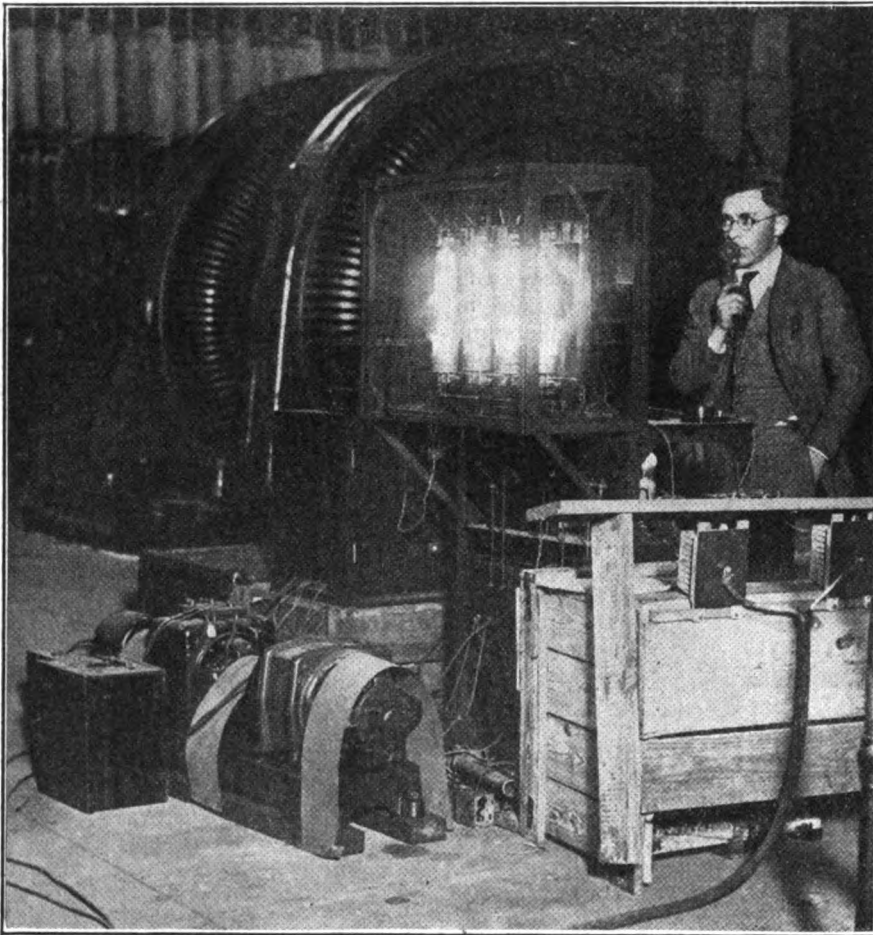
Listening in Through Apartment House Walls



(C. Kadel & Herbert)

The latest method of letting your sweetheart "listen in." This enthusiastic fan, by running a hose through the court to the adjoining apartments, lets his fiancée listen in while comfortably enjoying the privacy of her boudoir. He uses a large hose, similar to that in a vacuum cleaner, one end being inserted in the loud speaker of his set, the other in the loud speaker in the next apartment.

"Wired Wireless" Insures Secrecy in Sending Radio Messages



(C. Underwood & Underwood)

The small generators in the lower left-hand side of photograph supply the necessary plate current.

THE latest improvements in the radio field have mystified a few and have caused others to raise their eyebrows and exclaim, "Well, I never!" This is probably the first published photograph showing the invention of Major General George O. Squire, the head of the signal corps of the United States Army. Major Squire calls his invention "wired wireless," because it does not depend on ether waves for the transmission of the modulated waves. Transmission may be accomplished by using any wires, high tension or telegraph lines, for the propagation of the signals. In the first actual demonstration of his invention, Major Squire used the apparatus shown in the picture, and the high-tension lines that radiate from the sub-station of the Potomac Electric Power Company, in Georgetown, and his message was received at the Bureau of Standards Building, over five miles distant.

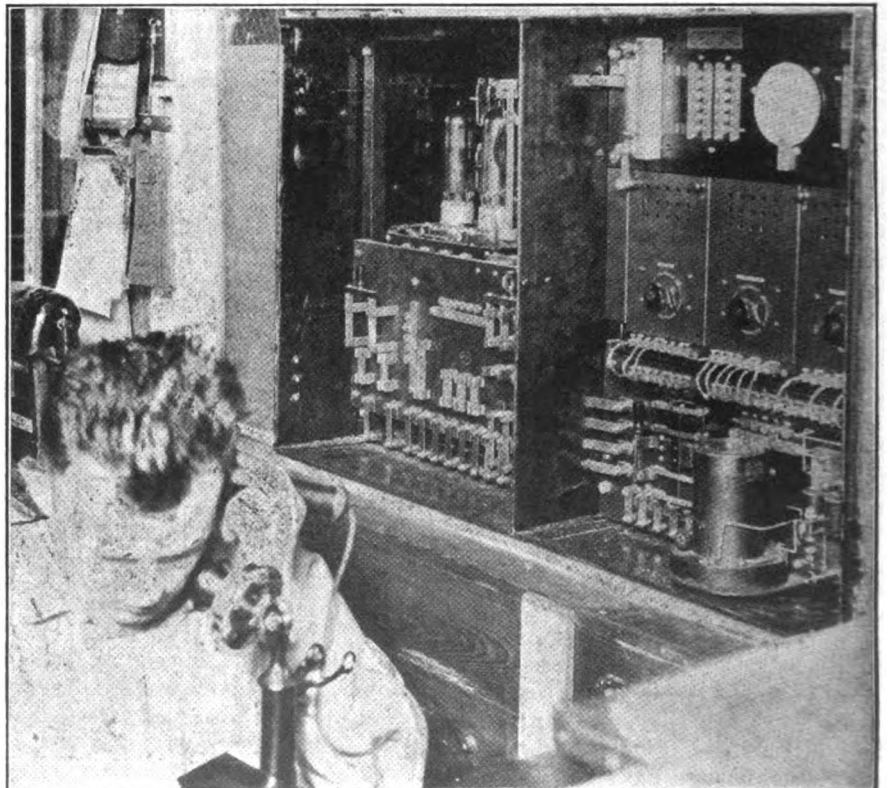
This new system of transmitting speech has countless advantages

over the present method, most of which is its absolute directional effect. A message started over a certain line will follow only the direction of that line, and will be heard only by people having apparatus and using that line for the purpose. Of course, this increases the secrecy of all messages transmitted by the new system. Every word spoken into a microphone at the present time, using the radio apparatus now in vogue, radiates in circles, and is audible to anyone who has a receiving apparatus at any point of the compass.

Major Squire has been experimenting with the new method for many months, and has finally got it to a point of perfection. The photograph shows the battery of tubes that were used, as well as the motor generators used to generate the high current to supply the plate. The necessary condensers are seen resting on the wooden table, under which are located the various controls needed in handling the high currents used.

In order that the high tension, which is a very dangerous thing to experiment with if you don't understand it, may not back up and injure either the operator or the lis-

(Continued on page 7)



(C. Photo News)

Transmitter proper with cover off. The apparatus is automatically shut off, when the cover is shut down. This is done to remove any liability of danger to human life.

Secretary of War Weeks Deplores Action in Harbord Case

THE War Department has issued an official statement on the amendment to the army bill adopted by the House of Representatives for the purpose of depriving General Harbord, president of the Radio Corporation of America, of retired pay. In this statement Secretary Weeks says officially:

"It is most regrettable from the standpoint of the War Department and the public service that the House of Representatives adopted an amendment to the Army Bill which, in effect, takes from General Harbord, until recently Deputy Chief of Staff, his retired pay because he has become president of the Radio Corporation of America. The reason given for this action is that he has been employed by the Company for the purpose of obtaining more business from the Government than the Company could otherwise hope to secure. This is an insult to General Harbord and to the Government itself.

"For nearly forty years General Harbord has been faithfully and efficiently serving the Government and, regardless of what position he may occupy in civil life, the best interests of his government will be his chief concern. Any inference to the contrary reflects on the person making it. As a matter of fact, the government's business with the Radio Corporation is inconsequential. At the present time there is no contract, and, generally speaking, purchases of radio equip-

ment, which are of small moment in total amount, are made from the manufacturers. But there is a much broader question involved in the action taken by the House.

"General Harbord, the son of a western farmer, enlisted in the army. Starting his military career as a private, at the beginning of the World War, at the age of fifty, he held the rank of major. While his rank was not high, he had already impressed himself upon the War Department and his associates in the army to such a degree that he was made Chief of Staff of the American Expeditionary Forces. He went from that position to the command of the Second Division, one of the most conspicuous fighting divisions in the army. He commanded this division during the Marne-Vesle campaign. Things were not going satisfactorily in the service of supply and he was transferred, greatly to his regret, to the head of that service, a position of enormous responsibility and of the greatest importance to the army. He so reorganized and conducted that service that he brought to himself not only the plaudits of his associates in the army, but attracted the attention of men of importance in civilian life who were temporarily serving the government in Europe; in fact, so extraordinary were his services and organizing ability that they have occasioned continual commendation from civilians since the War, and it was because of

this capacity that he was called to the presidency of the Radio Corporation, as the most competent available man for that particular service in the United States.

"The development of the radio is of vast public importance and there is, therefore, a public reason why he should accept and fill his present position, retaining his place on the retired list of the army so that he will be available for service in an emergency. If a British officer, French officer, or an officer of any other nation had performed for his government the service rendered by General Harbord, instead of having this stigma attached to him, that is, the inference that he is dishonest—not to mention taking away his retired pay—he would have been given honors of very important character and certainly in the case of Great Britain, a large honorarium as well. I do not believe the people of this country wish its great defenders treated in such a shameful way, and I should think General Harbord would feel that a country that would tamely submit to such treatment of one of its officers was hardly worth serving. He will certainly feel a sense of injustice which time can never efface."

Secretary Weeks, according to the New York "Times," was recently advised by the Radio Corporation that service to the government would be suspended if the legislation goes through.

(Continued from preceding page)

tener, there are necessary many banks of similar condenser and protective devices. High tension, when out of control, has been known to jump many feet of intervening space seeking a ground, and therefore it is absolutely necessary that all possible care be taken with experiments. In order to insure this the lines were all looked over carefully, to make sure that no one associated with the experiment be hurt.

The second photograph shows the cabinet containing the apparatus. It will be noticed at once that this bears no similarity in appearance to the present transmitting apparatus used for radiotelephony. Particular notice is called to the fact that all the controlling switches have fuses, and the entire cabinet is protected with a metal cover which automatically shuts off all the apparatus the moment the cover is let down. This

absolutely prevents any disastrous results from the apparatus being left in operation when the operator is not present.

These experiments have been carried on with utmost secrecy, and with the idea in mind of relieving the congestion, which is at present so noticeable in the air. When they are finally perfected, it is expected that the present system of broadcasting will be abandoned, in favor of the more efficient one. This, however, is but a supposition on the part of the writer, and only time will tell.

To realize the congestion in the ether, it is only necessary to listen in some evening, and realize how many hundred radiophone and telegraph stations are operating at once, each one supreme in its own particular district. Of course, this causes a great deal of interference, which is particularly annoying when more than one station is operating

on one wave at the same time in very nearly the same district.

Radio Exhibit in Kansas City

ELEVEN jobbers contributed to the success of the radio show held in Kansas City from January 18 to 20. Eight thousand people attended the show, 300 of whom were children. Two local stations broadcasted from the exhibition room. Crystal, tube, and bulb sets were shown. The show was held in the ballroom of the Hotel Muehlebach.

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Various Filament Resistances and How to Make Them

By Marius Thouvais
Secretary of Radio Club of Cologne

AMONG the various accessories required by the experimenter to build his receiving set—one that he can turn out easily—is the filament rheostat. Quite suitable rheostats are on sale for several dollars, but an excellent pattern may be made at home much more cheaply that will be equal to the best of the ready-made apparatus now on the market. From the various known models I shall first describe the simpler one, which I will call the standard type. It is an easy matter to build it as it requires but a few feet of resistance wire, a spindle, a knob, some nuts, a bit of brass, and a little cardboard. To make this rheostat first get a convenient length of resistance wire. About five feet will do, according to its gauge. No. 25 S.-W.-G. is a suitable size, but other gauges will suit as well, provided the total resistance is about six ohms. This is a good average value, usually adopted to control from one to three bulbs. The former, on which the wire is to be wound, is simple to make. With a pair of compasses first lay out two concentric circles on a piece of stout cardboard. The larger circle must be 3 inches in diameter, while the smaller one is but $1\frac{1}{2}$ inches. Next, a little to one side, on the same sheet, lay out two further circles, the outer circumference having a diameter of $2\frac{3}{4}$ inches and the inner one $1\frac{3}{4}$ inches. Make another set of two concentric circles of the latter dimensions. Now cut out the three pieces with a pair of scissors according to Figures 1 and 2. Take the larger piece (1) and glue one of the smaller ones (2) to each side, and give the whole a coat of shellac. When finished it resembles a horseshoe. When quite dry the wire may be wound upon it. This winding must be made tightly and very evenly, taking care to space each turn regularly. The wire is next fastened at both ends (Figure 4). Any regular switch may be used, but as it is intended to hook up the "horseshoe" on the back of a panel a bushing for the spindle will be found useful, though not indispensable. A rod is now fitted in front of the panel; a knob and its pointer is screwed on the spindle, and the sliding blade is secured at the other end of the threaded rod. (See Figures 4 and 5.) The "off" point is obtained when the slider leaves the wire.

This very common form of rheostat is all that is needed with most hard tubes. But in order to get the best

results, particularly with certain kinds of "soft" audions used as detectors, it sometimes is required to have a very critical regulation of the filament potential, so a vernier adjustment is really useful. A good method of adding a vernier control to a regular rheostat is shown in Figure 6, where a second ebonite knob is fitted below the main handle. The spindle of this second knob holds another blade that slides over a single loop of resisting wire, this small arrangement being put in series with the main resistance. This service is all right when there is plenty of room on the panel; but that is not always the case. In most cases the space is very limited. When this is so it is best to take a hollow spindle for the main resistance. A light, threaded rod passes through the main spindle—a small knob at one end, a sliding blade at the other—making contact over the loop of resistance wire, as shown in Figures 7 and 8.

Other very convenient and rather newer patterns may now be described. Like the first three, they are simple to make, and their cost is only a matter of a few cents. All of the four or five types I will describe give an extremely fine adjustment throughout their range, entirely doing away with the necessity of a further vernier. The pattern which is shown in Figures 10 and 11 requires a sort of drum (Figure 9), which may be made either of hard wood turned on the lathe or with any molded insulating material. A convenient size for this drum is 2 inches in diameter and 1 inch in length. This, when completed, must be generously brushed with shellac varnish before winding.

Starting from a point of the drum wind the wire regularly and very tightly in spiral over the circumference, spacing the turns regularly. A second coat of thick varnish may be given after winding so as to strengthen the whole and firmly hold the wire down in its place, for it would be likely to sag under the rubbing of the blade if it were not strongly fastened to the former. Three holes are next bored, as shown in Figure 9, the central one to pass through the spindle; the other two to fit the drum behind the panel by means of two small screws. The sliding blade must be about 2 inches in length. It is bent, as shown in Figure 11, and fitted, as usual, at the end of the spindle between two nuts. At the beginning of the spiral, behind

the maximum resistance point, the rubbing blade finds an "off" position when leaving the wire. At the other end of the spiral the resistance is *nil*, yet the variation of resistance is very regular, and as slow as desired throughout the range covered. With this kind of rheostat a bushing for the spindle is really useful to improve the sliding of the blade over the wire, which must be, of course, as smooth as possible. On the other hand, a dial is no longer of use here, and the standard ebonite knob, without pointer, is all that is necessary.

Another new form of continuously variable resistance is shown in Figure 12. A springy resistance wire is coiled into a spiral around a brass spindle—a threaded rod, at the end of which it is fastened between a set of nuts as usual. The construction of this latter pattern is still more simple than the others previously described. Its working is easy to understand. When the wire is entirely unwound the resistance is maximum, as the current is compelled to flow throughout its length. But as soon as we turn the knob to the right the wire winds itself around the threaded rod, shorting to the conductive body of the spindle, slowly and continuously lowering the resistance till zero is reached. The coil is entirely wound tightly around its spindle. This rheostat, which is certainly the simplest of all, is, perhaps, among the best. It has the advantage of taking very little space on a panel, and therefore will appeal to many experimenters. But its main and, doubtless, only disadvantage is that it has no "off" position, necessitating a separate switch. Fortunately there is a possibility of doing away with that annoying switch, but the mounting then becomes a little more intricate.

Figure 13 shows how to get the very desirable "off" point. Here, as it may be seen, the contact is not taken directly from the spindle. This brass rod is passed through an ebonite, or waxed, cardboard tube, which insulates it from further tubing—a brass tube—which becomes the "shorting" contact. This is what provides the switching arrangement so greatly desired.

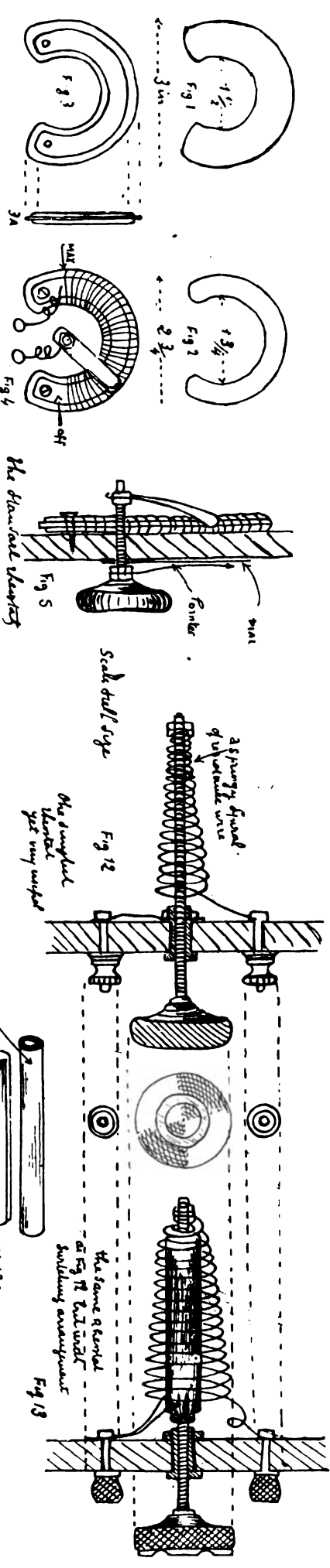
This is how it works: When turning the knob to the left the spiral unwinds regularly, and soon after reaching the maximum resistance the wire swerves from the brass tube, breaking the circuit. Another class of filament

(Continued on page 10)

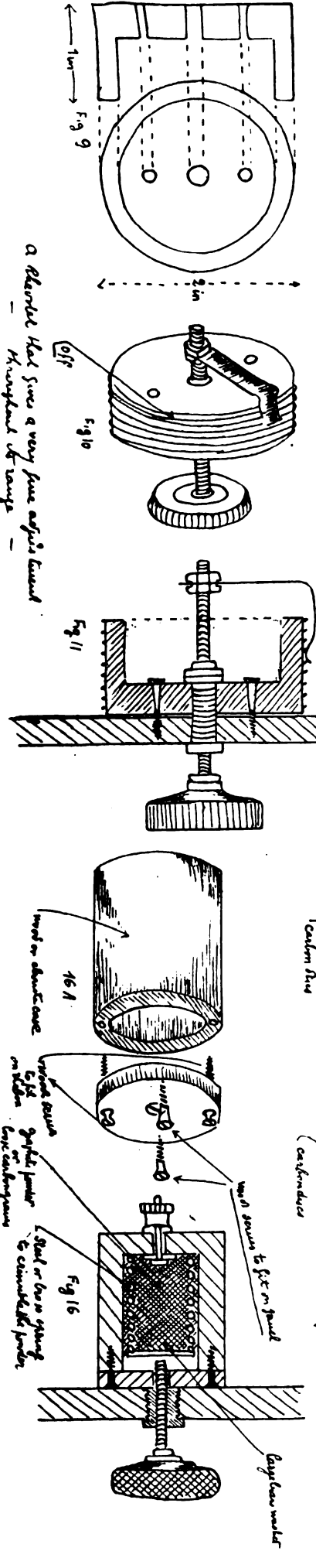
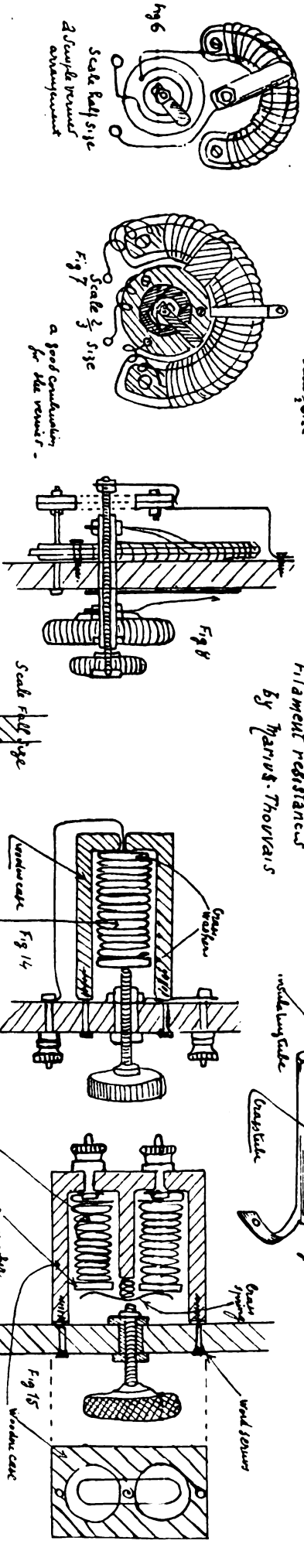
Constructural Drawings of Filament Resistances

Working plans for the various filament control resistances as described in the accompanying article. These drawings should suggest to the constructive amateur something to do in the way of making up his own apparatus. He will find most of the parts necessary for the construction of these novel resistors in his "scraps box." Figures 12 and 13 do not take up much space on the panel, and will probably save the amateur the expense of buying larger panels to accommodate his apparatus.

See opposite page



Filament resistances
by Harry Thovais



A resistor that gives a very fine output curve throughout its range.

The Radio Primer

*For Thousands of Beginners Who
Are Coming into Radio Circles*

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

WHAT is meant by the term *heterodyne* as related to radio?

This is a method of receiving undamped (C. W.) oscillations by making them interact with other locally produced, sustained oscillations. They are generally of slightly different frequency and greater amplitude, causing a beat note between the two circuits, due to the slightly different frequency in each circuit. This makes the undamped oscillations audible, but is not much used owing to the commoner and easier method of regeneration.

* * *

What is the function of the tickler coil in a feed-back circuit?

A tickler coil, through its ability to transfer part of the energy of the oscillating current in the plate circuit set up by the incoming oscillations back into the grid circuit, produces oscillations of a beat frequency, and

(Continued from page 9)

regulator is based on quite a different principle. There is no longer a resistance wire in its construction. The variation of resistance is obtained through a screw-conductive material, the pressure of which may easily be varied, applied, or removed—quickly or slowly and progressively—by means of a milling screw.

Figure 14 shows how such a resistance may be made simply with a pile of carbon discs, while Figure 15 shows a rather more elaborate type, which embodies two piles of discs. In both patterns a large brass washer is put on either side of the carbon filler in order to make a positive contact. The pressure on the resisting material is continuously variable through the screw and its knob.

Finally, there is a model which, although very similar to the preceding ones, embodies a somewhat different resisting material. Its resistance is made of powder—graphite powder or loose carbon grains—enclosed in a small cylindrical box. The only disadvantage of this last type is that the powder tends to “keep crowded” when once compressed. To overcome this inconvenience a coil spring is put in the box in order to crumble the mass when the pressure is removed.

also amplification, making undamped (C. W.) signals audible.

* * *

What are the advantages of an oscillating circuit over a straight detector circuit?

1. Owing to the fact that regeneration is possible with an oscillating circuit a greater response may be had from the detector, due to self-amplification.

2. It makes undamped (C. W.) signals audible.

3. Sharper tuning is made possible.

* * *

What is the quickest way of telling the exact condition of your storage battery (charged or uncharged)?

By the use of a hydrometer.

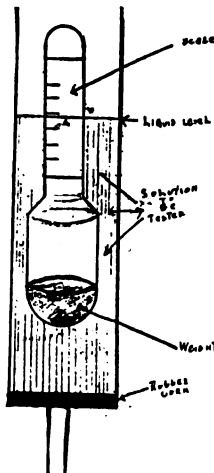
* * *

What is a hydrometer?

A hydrometer consists of a glass tube containing a graduated scale with markings from 1.000 to 1.300. These markings are generally made on paper and inserted inside of the tube, which is small at the top and larger at the bottom, as shown in sketch. The larger part generally contains lead shot or some other heavy substance, which will cause it to remain upright in a solution. This smaller tube is generally placed in a larger tube having a sealed bottom, with a rubber tube projecting. At the top there is a syringe, which causes the solution to be tested to be drawn up in the larger tube, floating the smaller one.

What is the advantage of a hydrometer?

It allows a quick and accurate test



Simple Sketch of a Hydrometer

of the condition of the cell through the agency of the specific gravity of the battery solution, which is higher when the cell is charged than when discharged.

* * *

What is meant by specific gravity of a cell?

By this we mean the weight of a volume of the electrolyte as compared to the weight of an equal amount of pure distilled water, taken as a standard. A hydrometer will therefore show in the graduations how much heavier the electrolyte is than water.

* * *

What are three indications of a fully charged cell?

Gassing (extensive bubbling) of the cell if the current charging the cell is small. Specific gravity as shown by a hydrometer as being 1.220 or greater. Voltage of 2.1 or higher as shown by a voltmeter.

* * *

Is a gassing cell a reliable indicator of a charged cell?

A gassing cell is not always a reliable indicator of a fully charged cell on account of the fact that chemical impurities sometimes get into the electrolyte, causing gas to rise when the cell is not fully charged. This does not always happen, but it is always best to check your cell through either the use of a voltmeter or a hydrometer in order to more accurately learn the condition of the charge.

* * *

What main factor determines the capacity of a cell?

The number of square feet of positive plate surface (active) and the number of positive plates used in the cell. In general practice we allow from 6 to 8 amperes for each square foot of positive plate surface.

* * *

Why is it necessary to add water to a battery?

Because of evaporation it is necessary to add water to keep the strength of the electrolyte constant. The acid does not evaporate, therefore it is not necessary to add any. It is a good plan to empty the entire solution occasionally, and to clean the jars with pure, distilled water before putting back clean electrolyte.

THOUSANDS of radio beginners have come into the radio field since summer. They will find "The Radio Primer," published weekly in RADIO WORLD, a regular source of instruction and aid. For this reason, RADIO WORLD will republish, from time to time, some of the valuable primer articles that appeared in its early issues. These articles, by experts, contain a vast amount of radio information that cannot be duplicated. Every beginner will find them necessary to the building of sets and cooperative with the new material being printed weekly.

Radio Development Is Rapid in Germany

By John Kent

WHILE the activities of England, France and Holland in the field of radio have been concentrated since the war on the establishment of communications with their dominions and colonies, Germany, deprived of all overseas possessions, has been building up within her own borders a system of radiotelegraph and radiotelephone stations that is second to none in the world, says W. T. Daugherty, assistant trade commissioner, in a report to the Department of Commerce. The loss to Germany of her ocean cable system, built up at great cost during the fifteen years preceding the war, made her dependent on neighboring countries for all her international communication, except the portion that she could handle by radio. The logical result has been the increased use of high-power radio stations for overseas communications, especially to the United States.

At present the central office of the Gesellschaft für drahtlose Telegraphie, located in the Oranienburgerstrasse, Berlin, controls the two great transmitting stations, Nauen and Eilvese, and the two receiving stations, Gelton and Hagen. Both the transmitting stations work on schedule, Nauen with New York, Moscow, Madrid, Rome and Bucharest; and Eilvese with Rome and Madrid. Both have transatlantic press schedules as well.

Extensive changes are now in progress at Nauen, says Mr. Daugherty, designed to increase its power and the flexibility of its operating plant. Separate antennas are being constructed for the American, the Asian, and African, and the two European circuits; and a special arrangement is planned for the new Buenos Aires circuit which is to be opened to public correspondence within the next few months. The corresponding station at Monte Grande, near Buenos Aires, is to be maintained and operated by a combination of French, English, German and American radio companies.

The German Post Office station at Koenigswusterhausen, near Berlin, transmits to London, Budapest, Sofia and Sarajevo, and its receiving station at Zehlendorf makes up the return circuit. Norddeich, a coastal station used for hydrographic reports, shipping news and

weather reports, completes this group which is known as the Main Stations Group (Hauptfunkstellen). Although communication is maintained with the foreign cities mentioned, the Main Stations Group operates principally within Germany.

The feeder stations of this system, or "leading stations" (Leitfunkstellen) operate an interior service as subsidiaries of Koenigswusterhausen. The stations located at Dortmund, Breslau, Duesseldorf, Frankfurt-on-the-Main, Hamburg, Hanover, Koenigsberg in Prussia and Munich are each equipped with two sending and two receiving installations. Dortmund operates a special service to Rotterdam as well.

"Simple stations" (Funkstellen) supplementing the feeder stations and equipped each with a single sending and receiving set, are located at Bremen, Darmstadt, Elbing, Friedrichshafen, Constance, Stettin, Nuernberg and Mainheim.

Ship-to-shore stations are sixteen in number and were excepted from the system taken over by the Post Office Department in 1919.

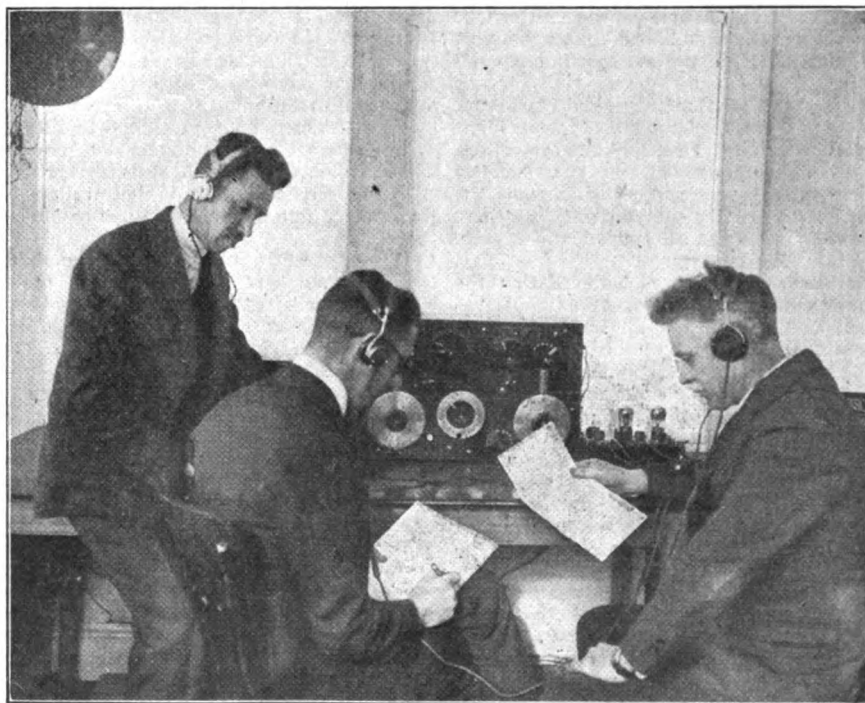
The distribution of the wireless news broadcast from the interior transmitting stations is effected by 75 receiving stations which have no transmitting sets. Similarly equipped stations receive weather reports in nine of the principal cities.

Public wireless telephony was inaugurated in Germany on September 1, 1922, the Post Office Department and the Express Service (Eildienst G.m.b.H.) uniting to establish the service. Subscriptions, open to the public, are based on the extent of the service rendered, and the only additional cost is the installation charge.

The apparatus used may be employed by either telegraphic or telephonic reception, vacuum tubes being supplied. In accordance with the distance from the broadcasting station, amplification in varying stages is provided.

Koenigswusterhausen is the broadcasting station and subscribers to the service are now located in 176 cities and towns. The material furnished so far has been confined to economic news.

Listening in on Europe



(C. Keystone View)

Officers of the American Radio Relay League are here seen listening to signals from European amateurs who are permitted to transmit with high power through special privilege accorded them by their respective governments. At the right of the photograph is seen Hiram Percy Maimin, president of the A. R. R. L. Seated next to him is F. H. Schnell, traffic manager, and on the table is Kenneth B. Warner, secretary of the league.

White Radio Bill Recognizes Privileged Status of Amateurs

By *Washington R. Service*

WASHINGTON, D. C.—Proponents of the White Radio Bill, unanimously reported out by the House Committee last week without amendment, hope for its early passage.

The bill requires licenses for all transmitting stations other than governmental stations, and all except governmental operators. It directs the Secretary of Commerce to classify licensed stations and make rules and regulations for the prevention of interference. The President will assign wave-lengths to government stations. But when government stations, other than vessels at sea, are transmitting

commercial messages they are subject to the regulations for commercial stations and traffic.

Other features of the bill give the President enlarged authority over all radio stations in time of war, forbid aliens from owning radio stations in this country, restrain the transfer of licenses, limit their duration and provide for revocation of licenses. The issuance of licenses rests with the discretion of the Secretary of Commerce.

Congressman White's pending bill recognizes the privileged status accorded to amateurs by the radio act of 1912. It strikes from existing law the words "200 meters," and provides

that "the wave-lengths for amateurs shall not be less than 150 meters nor more than 275 meters." This change was desired by the amateurs, and has the approval of the conference and of the committee. The amateur is the only user of radio to whom a definite assignment of wave-length is made in the law itself. Other wave-lengths are allocated by the Secretary of Commerce. The committee appreciates the value of the service which the amateur is rendering in the development of the art and in the training of skillful operators, and feels justified in continuing special recognition.

The Electrons Work in Radio

By *B. R. Cummings*

Radio Engineer, General Electric Company

IN technical and semi-technical publications reference is more and more frequently made to the electron, and it is the writer's object to point out some of its most unusual characteristics with the hope that those who take interest in the many developments of science will find an incentive to investigate further this fascinating branch of the electrical art.

The electron is defined as the unit charge of negative electricity. It plays a most important part in the composition of all matter.

Those of us who have studied chemistry, even in its most elementary form, know that all materials are composed of atoms, the atom being defined as the smallest particle of any material which retains the characteristics of the material; so that there are atoms of iron, of copper, of oxygen, and of all the elements.

For many years it was believed that the atom was indivisible, and that it itself was the smallest possible subdivision of matter. More recently it has been discovered, however, that the atom is composed of units, the number of which depend upon the material of the atom.

It has been shown that all atoms consist of a nucleus, which is called the proton, which is in reality a positive charge of electricity. Surrounding this nucleus are electrons, the number and arrangement of which depend upon the material of the atom. The structure of the atom is frequently referred to as a constellation, and may be pictured as resembling our solar system, the positive nucleus representing the sun, and the electrons surrounding it the planets.

The arrangement of electrons about the positive nucleus has been the subject of much investigation, and, while there are differences of opinion as to their specific number and exact arrangement, it is commonly agreed that one series of atoms, representing a number of materials, has

from one to eight electrons surrounding the nucleus in what is referred to as the first shell, all of the electrons lying on the surface of a sphere. The atoms of the next series of elements have, in addition to the first shell of electrons, a second shell, which includes from one to eight electrons, also lying on the surface of a concentric sphere. Another series includes a third shell and still another a fourth shell, so that the number of electrons associated with the positive nucleus varies from one in the hydrogen atom to as many as a hundred or more in the atom of the heaviest metals.

It is contended by some scientists that the electrons have definite orbits about the positive nucleus, which still further brings the modern conception of the ultimate form of matter into a system similar to our solar system.

Quite recently it has been shown that the positive nucleus itself is very probably complex and may consist of a combination of two or more units. The probable formation of this structure, however, is as yet unknown.

From the foregoing it is apparent that all matter consists, in the ultimate analysis, of the same thing; that is, of positive and negative electricity, and that different materials, as we know them, have their varying characteristics, due to differences in the arrangement and number of electrons in their atomic structure.

In any material there is practically an infinite number of atoms, associated with which there is a still greater number of electrons. These atoms are in constant motion except when the material is at a temperature corresponding to absolute zero, and while in such motion they collide with each other continuously. Such collisions result in electrons being freed from many of the atoms, so that all materials include a number of so-called free-electrons, which are moving back and forth in the material at extremely high speeds. These are the

carriers of electricity in any material; in fact, they themselves are electricity. Materials which we know as good conductors of electricity, such as copper, have a comparatively great number of free-electrons. Those materials which we know as insulators, such as glass and porcelain, have a very small number. When an electric current flows there is a progression of the free-electrons through the material making up the circuit.

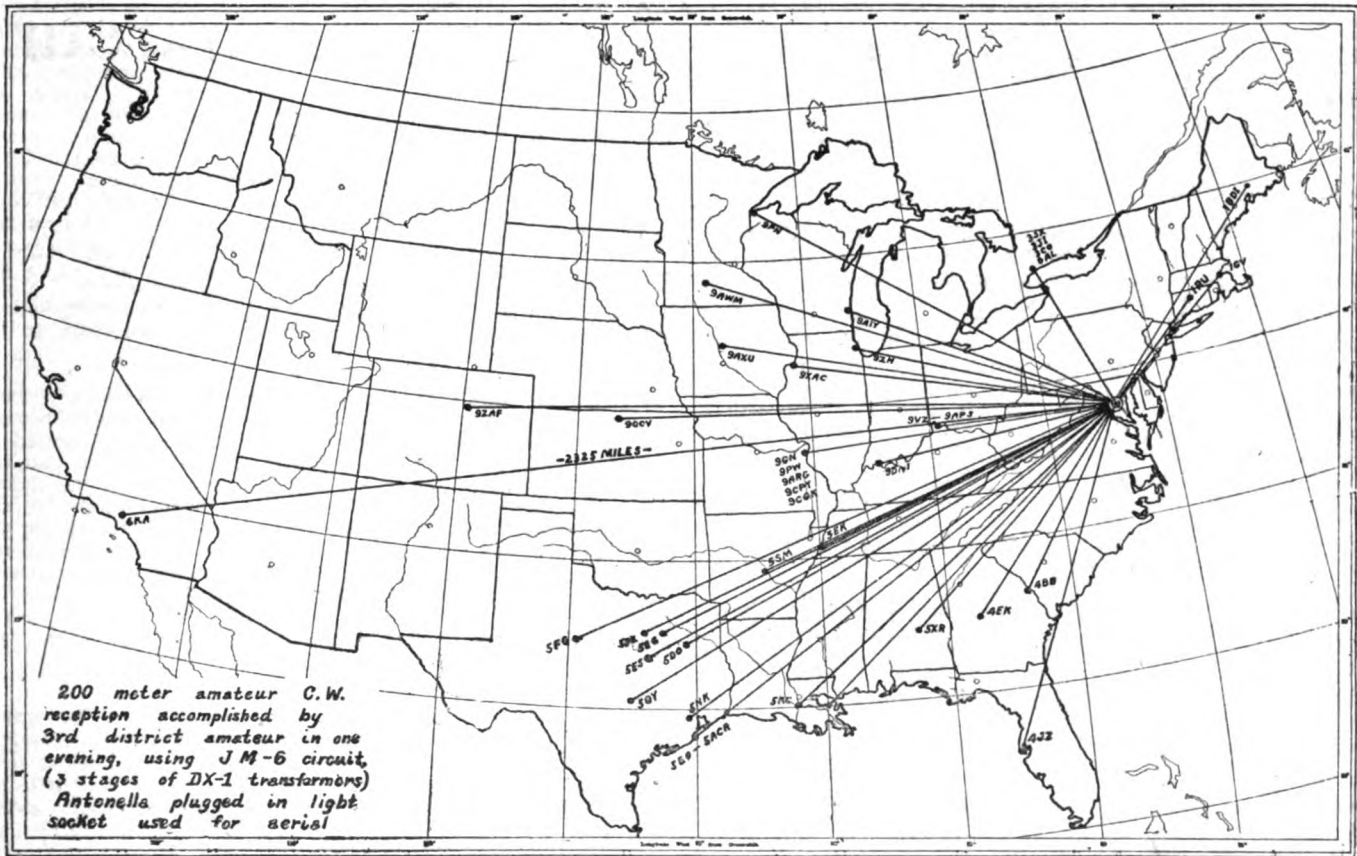
If the temperature of the material is increased the speed of the electrons is increased until, if the temperature is made sufficiently high, as in the filament of a receiving vacuum tube, the electrons break through the surface of the material into the surrounding space.

The characteristics of the electron are extremely interesting. These are not assumed, but have been established by the most painstaking research. The electron is so small that we can never hope to see it directly, for it is much smaller than the shortest wave-length of light, and therefore is incapable of reflecting light. Its diameter, when expressed as a fraction of an inch, is so small as to be meaningless; but some conception of its size can be had from the following:

If a drop of water, which consists of hydrogen and oxygen atoms, and therefore includes a great number of electrons, were magnified to the size of the earth, and all of the electrons associated with it magnified in the same proportion, even then each electron would appear only as large as a grain of sand.

The third characteristic of electrons is the velocity of its travel. Those of us who use vacuum tubes in our receiving equipments know that electrons are given off at the filament, travel across the intervening space between the filament and the plate, and finally enter the plate and then travel through the conductors of the circuit. The current in the vacuum tube is composed of electrons. It is referred to as the electron current, or, to differentiate it from currents flowing in conductors, which are also electron currents, it is more specifically referred to as a thermionic current. When electrons leave the filament of a vacuum tube and start their travel toward the plate they are moving at a speed of approximately 50,000 miles a second.

Accomplished on Indoor Aerial



Map showing the various stations and distances heard by Herbert Hoover, Jr., son of the Secretary of Commerce, in one evening, using the house lighting wires as an antenna, with three steps of radio-frequency. This will give some of the DX boys something to browse over for more than an hour, and maybe give them an idea for charting stations.

THIS map shows the remarkable receiving record of an amateur in Washington, which will give the sceptics something to "think about." All of the stations heard were operated by amateurs, and according to the law an amateur is limited to low power. He is, therefore, to be commended because he uses just what he can, and sees that he uses it as efficiently as it is humanly possible. This is testified to by the fact that he has covered such remarkable distances. Many amateurs, who have good apparatus and plenty of resources at command, pay no attention to getting their station "up to tick," and are fully content to talk to the man five or ten miles away. A little time spent in carefully hooking up and readjusting their sets would really enable them to accomplish wonders.

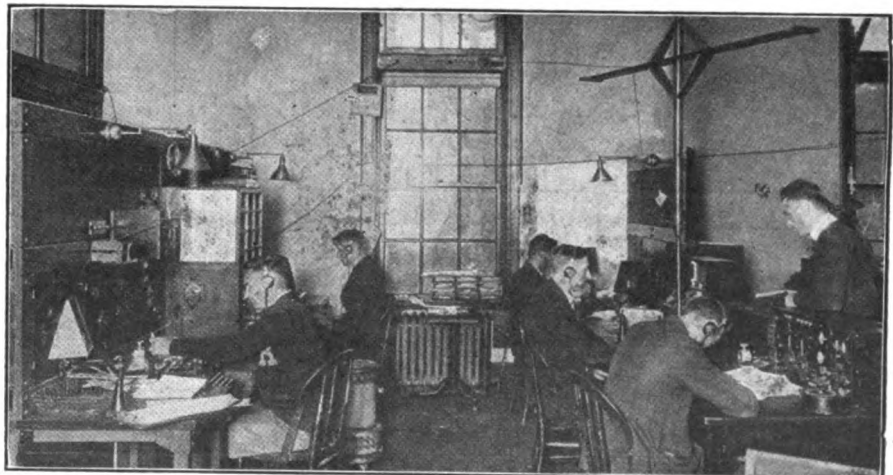
To give an idea of the efficiency of the apparatus that must have been used by this Washington amateur, consider the fact that the stations recorded on the map were all heard on a set using three stages of radio-frequency amplification, and the electric light wires as an antenna, through the agency of a plug, sold for that purpose.

By reference to the map it is easy to see that good reception was ac-

complished from all sections, north, south and west. There was no distance to cover to the east toward the Atlantic Ocean. You will note that most of the reception was really accomplished over distances above three hundred miles.

In these days, radio amateurs seem to be paying all their attention to improving their receiving apparatus, and you do not hear much talk of the transmission end of the game. But you can sit back secure in the fact that for every improvement made in receiving equipment,

someone is improving his transmitter. It is due to the untiring interest and efforts of the American amateurs that radio has reached the marvelous efficiency it has at the present day. Many a radio hero sits up night after night, working and thinking of the many ways in which he can improve his apparatus, and then putting his plans into action. When he does, there is generally something doing in the air besides a lot of noise, and nine times out of ten he will hang up another distance record.



C. Kadel & Herbert.

This shows the interior of one of the largest stations in the United States, that at Chatham, Massachusetts, which is one of the chain of stations that keep in constant communication with ships at sea, to furnish them daily news, as well as with the foreign stations. It is also the terminus of the land wire linking Boston with other cities.

Radiograms

THE Netherland government has completed the new powerful receiving and transmitting wireless telegraph station erected at Kootwyk for communication between Holland and her East Indian colonies. This station has been clearly heard in Java, a distance of 7,500 miles, and also in America. It is equipped with German apparatus and is said to have the same capacity as the Long Island station.

Patients in St. Luke's Hospital, on Morningside Heights in New York City, are no longer cut off from the outside world while they are ill or convalescing. A new radio service has been installed in the hospital's four large wards, the children's receiving ward and in some of the private rooms, and about one hundred patients are daily enabled to listen in on varied programs of grand opera, popular songs, band concerts, selections by famous orchestras and recitations. On Sundays organ music and the services of St. Thomas' Protestant Episcopal Church, of New York City, are provided. Each patient is permitted to listen for from twenty minutes to half an hour, when the radio receiver is passed to some one else.

St. Luke's receives its program from Station WEA, American Telephone and Telegraph Company; Station WOR, of L. Bamberger & Co., Newark, and Station WJZ, of the Westinghouse Electric Company, Newark.

Homesick fowls, attending the annual National Poultry Show, which ran last week at Madison Square Garden in New York City, were able to communicate by radio with relatives and friends at home. The awards in the show were broadcast every evening and prize winning fowls were permitted to send messages back to the farm. An effort was made to broadcast the general hubbub made by the thousands of fowls temporarily inhabiting the Garden.

That radio communication may be of great value in mine rescue work has been shown by experiments recently con-

ducted by the Bureau of Mines, working with Westinghouse engineers, at Bruceton, Pennsylvania. Signals were distinctly heard through 50 feet of coal strata, audibility falling off rapidly as distance was increased. With a receiving instrument 100 feet underground signals from a station 18 miles distant were distinctly heard, but an iron pipe, containing electric light wires, which extended therefrom through the mine, assisted greatly in the reception. The transmitter used sent out continuous waves of 200 to 300-meter wave length. The best results were obtained from vertical antennae, horizontal ones giving practically no reception. A loop of a single turn was used with fair results. The strata at the experimental mine lie almost horizontal; the mine is a comparatively dry mine, but the overburden is damp. Further experiments are to be made along this line.

Owners of vessels equipped with wireless apparatus, companies operating and controlling the apparatus, and radio inspectors are advised to see that all ship stations are properly licensed as required by Section 2 of the Act of August 13, 1912, in that the correct ownership of the vessel and the ownership of the station are shown in the license. When a vessel changes ownership the old ship station license should be surrendered, notwithstanding the fact that the period for which the station was licensed may not have expired, and a new license procured showing the new ownership and any other changes in the data required in the license. It has been reported to the bureau that a number of vessels, especially vessels sold by the U. S. Shipping Board to private owners, are violating the law in this respect.

Radio impulses from a radio receiving set may be transmitted through the air for a considerable distance from the machine and then be picked up and carried by an ungrounded wire. This interesting discovery has been made by Robert Hilliard, the hydraulic engineer in charge of the tank equipment used in "Better Times," at the Hippodrome in New York City.

A New Amplifying Receiver

By *Frederic J. Rumford, A.I.E.E.*

THE latest invention in amplifying receivers is the work of an X-ray expert, Dr. Frances Le Roy Satterlee, of Flushing, L. I. This invention was called to the attention of Major-General George O. Squier, chief officer of the Signal Corps of the United States Army by the inventor. General Squier, after several hours of study and experiment has given it the name of "inductive amplifying receiver."

A test made of this new receiver by army experts at Ford Wood has brought out the following facts. On receiving the radio broadcasting of WJZ, which is about twelve miles away, using this for a test station, the experts obtained an audibility of 400 against 200, the latter obtained with the usual duo-lateral coils. On working out this test, the army experts say they were particularly impressed by the

comparative ease of manipulation and tuning, and also the freedom from all distortion.

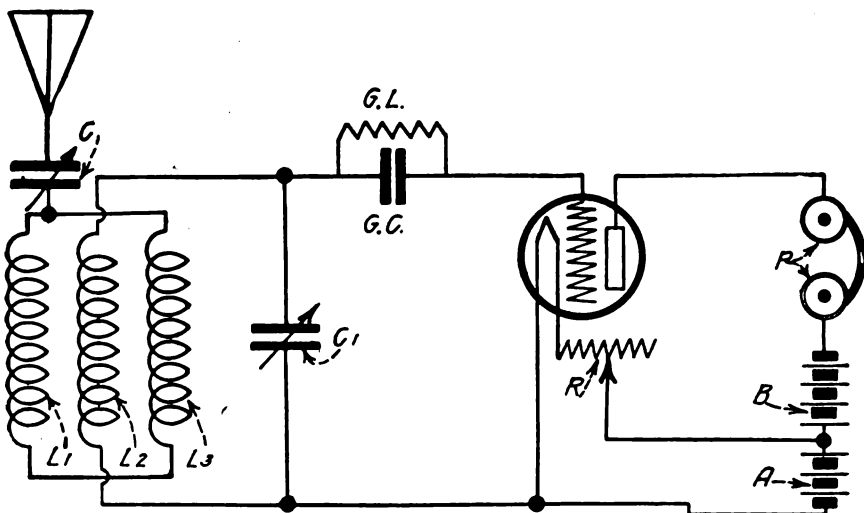
Tuning is done roughly by the manipulation of the two variable condensers C and C1; tuning for finer reception by changing the positions of these coils L, L1 and L2.

These coils are unusual, being wound in the form of flat spiral with litz wire. They are also said to have less distributed capacity than the usual honeycomb and duo-lateral coils, and lower high frequency resistance.

The notable features of this receiver are:

1. Signals which are equal if not better than those received on an Armstrong plain regenerative type.
2. Absolutely no chances of oscillation which will decrease any interference with near-by receiving stations.
3. Very close and sharp tuning.
4. Very low cost of construction.

The coils L, L1 and L2 are similar in appearance to small phonograph records, disc type. L and L2 are pivoted and move like the leaves of a book, while L1 moves in slide fashion in and out between them. The other part of this circuit resembles an ordinary non-regenerative receiver.



Dr. F. Le Roy Satterlee's New Amplifying Circuit.

Radio and the Woman

By Crystal D. Tector

I HAVE just received a letter from a young woman, all the way up in the North Canadian Woods, and this is what she says: "We are snowed in pretty nearly seven to fourteen weeks of the year, and as daddy is a trapper I seldom get a chance to have any fun, except the weekly trip of the Padre, or probably some belated trapper, who will stop in for a few nights to get 'thawed out.' You can see what it means to me, having lived most all my life in a large seminary, in Montreal. Last year daddy let me stay with one of the girls in Montreal, and the winter before I had a party of girls up here; but they all left early, because of the intense cold and hardships. Now that daddy has let me have a radio set, I don't have much trouble enjoying myself when the long nights come. I enjoy your articles, when I get the magazine, which is about every three months, because of the delayed mail, and I generally get all the issues at once."

This girl is very lucky. Can you imagine anything finer than those piney woods in the summer, and a beautiful cabin decked with furs, a radio set and a RADIO WORLD during the winter?

LONG with everything else, I have received a notice through Friend Husband that I can take an examination to become a radio inspector. Imagine that! I will be kept busy, and F. H. will be kept hungry, if I accept his challenge—which I shan't.

DO you notice that most of the popular musical comedies have a "radio" song or number? No wonder radio is so popular with the Tired Business Man. Friend Husband and I went to a widely advertised musical comedy the other evening, and one of the hits of the show was a number on radio. F. H. remarked that the prima donna's voice was wonderful, but I think that that little chorus dancer was much more interesting.

VERY dear friend of mine received a letter from her son, away in a military school, who told her that he had "helped install the radio set." He seemed to be as proud of that as of the high percentages in his studies, and the fact that he stood second in the class.

FRIEND HUSBAND came in the other night wearing a face as long as anything. "Humph! I don't think much of Mr. _____'s views," he said. After a while, not getting any reply from me—because I know that if I show any curiosity when he is angry he will take it out on me for being "curious"—he brightened up and remarked: "Say, if that fellow would only read the White Bill he wouldn't need to argue so foolishly. Anybody with a grain of sense can understand it if he reads it." So long as it was only about the legal points I let it go, for when F. H. talks legalities he simply bewilders me, and I believe that "silence is golden."

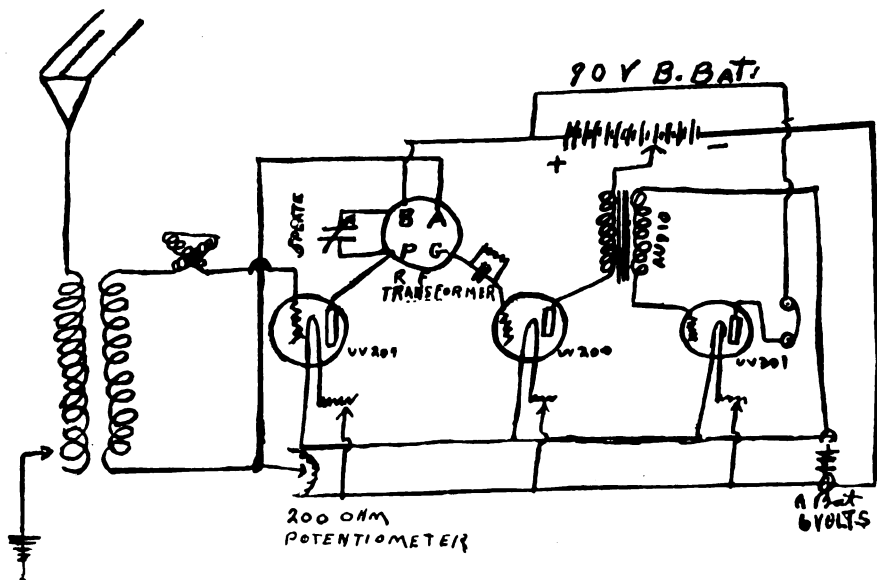
At such times he becomes a silver tongued orator and is likely to rave on all night.

IT is interesting to listen in on some of the daily conversation in the cars and streets today. Most everyone is adapting the radio terms to their daily conversation. Just the other day, while on a shopping tour in New York, I overheard this conversation between a pert flapper and her escort: "Well, talk about interference, when that OW starts to broadcast, everyone else has to pipe down. She started at the beginning of the dinner and, honestly, she drowned us all out." "Oh, don't I know it. Say, she is worse than WEAJ when she starts. You can't even hear across the table when she opens up her transmitter. Somebody ought to tell her to decrease her decrement—her wave is too broad." "Well, Sheba, guess I'll duck. So long for a while. My boss is a bear for opening the program on time, and I have a terrible stack of accounts to enter." "So long, OM. C.U.L." I looked in surprise, but all the rest of the folks around didn't seem to even notice the new language that was being used.

FRIEND husband gave me quite a surprise last evening when he broke the news that he intended taking a license. "What kind, auto, druggist, or marriage?" I asked. "Why, stupid, a radio license, of course. What do you think of that?" Well, all I can say, is that I see where F. H. has been bitten BAD by that insect named "Radio." He will probably never recover, but as it isn't fatal to anything except the wallet, "I don't care."

My Idea of a Radio Set

By Henry N. Fullerton, M. D.



New hook-up for radio-frequency amplification.

BEGINNING with a regenerative circuit using only a detector, I made hook-up using one, two, three, and four stages of audio-frequency amplification.

Not being wholly satisfied with the results obtained, although I was get-

ting as successful results as others with the same hook-ups, I then began experimenting with the non-regenerative class of circuits making use of radio-frequency. Beginning with one stage of radio-frequency and a detector, I have used one, two and three

stages of radio-frequency amplification ahead of the detector, and, also, one and two stages of audio-frequency in combination with one, two, and three stages of radio-frequency amplification.

With the radio-frequency type of receiver, I have had some remarkable results, receiving stations at a distance of 2,200 miles loud and clear. I have received concerts from Chicago, Davenport, Iowa, and other distant places.

Taking all phases into consideration, I think that a nonregenerative receiving hook-up using one stage of radio-frequency detector and one stage of radio-frequency is about the ideal radio outfit. With this hook-up signals are received of sufficient volume up to 1,000 miles and there is the advantage of getting practically no interference from tubes or other parts.

In the set that I have been using, I utilize a vario-coupler and variometer, believing that the basket type of wave adds to the efficiency of the apparatus. For the radio-frequency transformer, I use an Earla. For the audio-frequency transformer, a U-V 712.

I enclose a diagram of the hook-up. I have received concerts and other broadcast programs from about sixty different stations, ranging from 300 to 2,200 miles.

Radio Pl of the

An interesting radio experiment which may be made by anyone possessing a radio receiving set. Several turns of insulated or bare wire are wrapped around the body, which is used as an antenna for receiving signals.

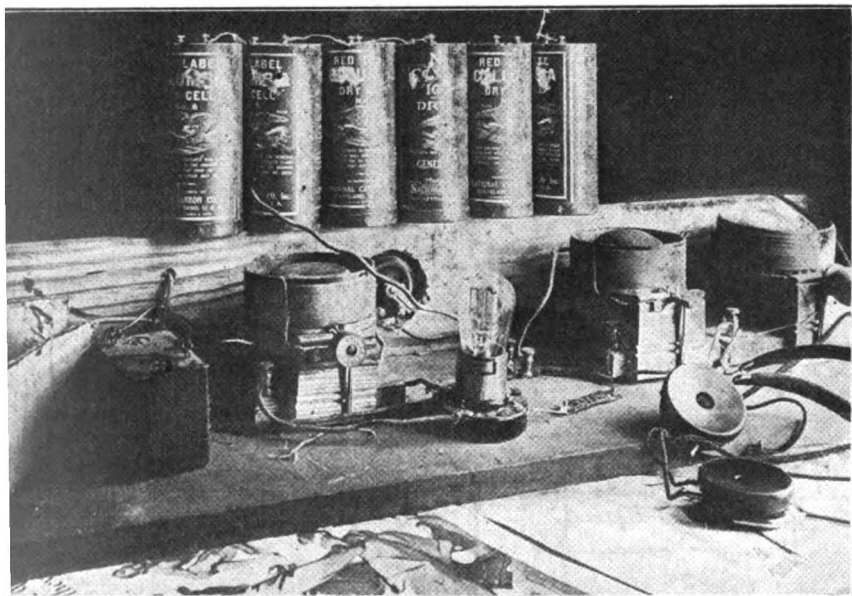


Kadel and Herbert)



(C. Keystone View Company)

Exclusive photograph of Joseph S. Freylinghuysen, Jr., a young amateur has constructed all the apparatus, and hi



Underwood and Underwood)

A simple home-made receiving set that is within reach of any radio fan. It was built by George Stahlman of Nashville, Tennessee, and is capable of receiving concerts from New York, Detroit, Fort Worth, Atlanta, and numerous other distant broadcasting stations. The set, as the photograph shows, is made from odd pieces of wood and cardboard tubing which Mr. Stahlman found lying around the shop. It isn't built for beauty, but for service, and it works.

Captions by Patrick Nichols

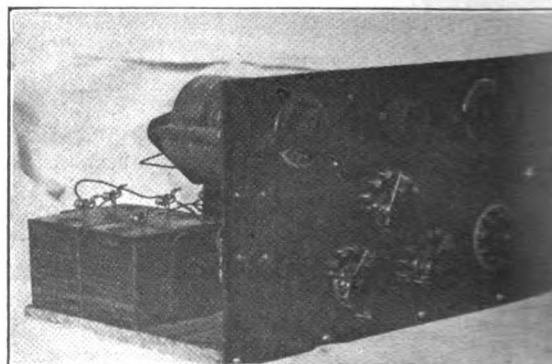


Kadel and Herbert)

top of a London bus a practical demonstration was given showing that radio could be received in a moving vehicle. Your notice is called to the fact that both radio frequency and a o-tube power-amplifier was used. Of course, the apparatus as shown takes up more room than is expected, but it was a hurried last-minute idea, and was carried out very successfully.

A single-tube radio set which Dr. R. S. Piper, a Chicago surgeon, has devised and patented. This set works on a door-bell battery and B battery with very high sensitivity and selectivity and is used either with head phones or horn, whichever way desired at the time. It can also be used with a storage battery.

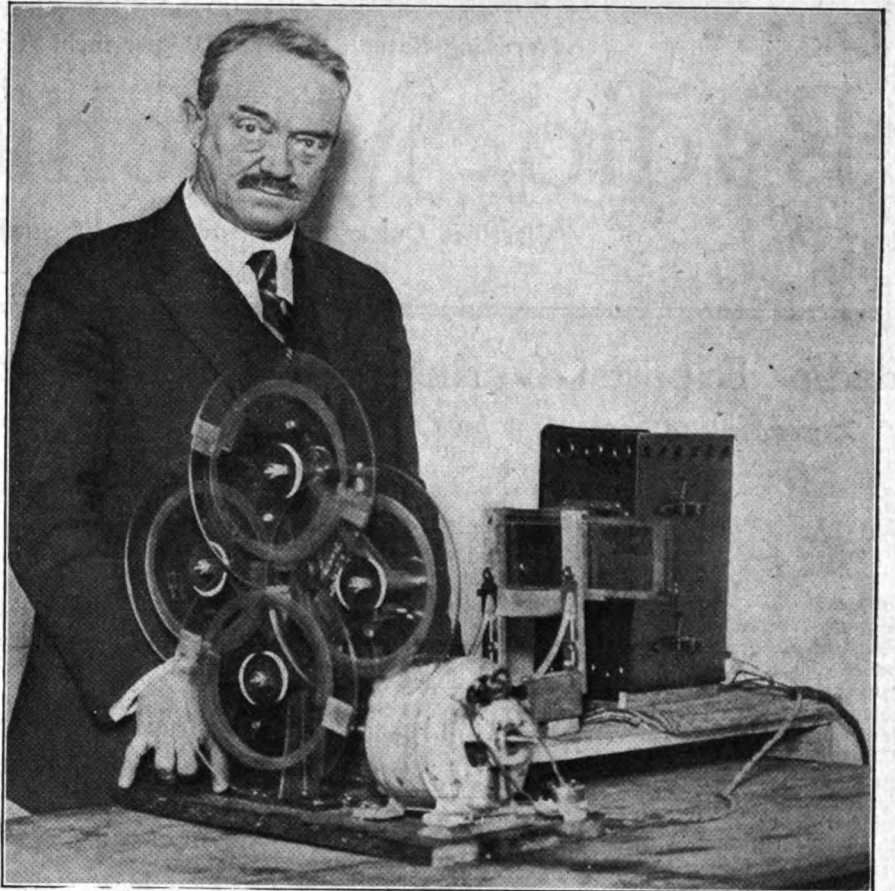
(C. Wo
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(C. Kadel and Herbert)

Photographs Week

C. Francis Jenkins, who is the inventor of this apparatus for transmission of moving pictures via radio. Mr. Jenkins predicts that within the next few years his invention is going to be as popular as the "movies."

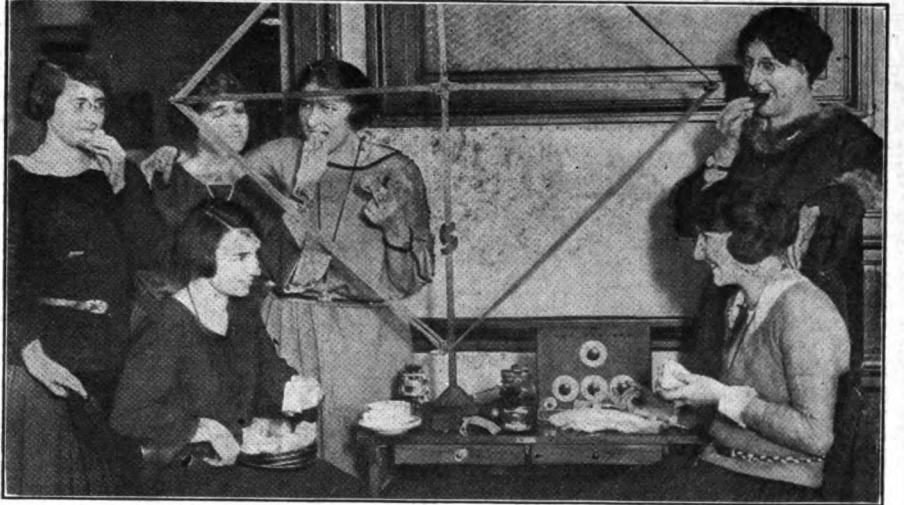


(C. Keystone View Company)



of Jersey Senator, testing the radio set made by himself. The family have become ardent radio fans through his experiments.

Modern stenographers and office girls lunch to the tune of radio instead of going out for their noon walk. The photograph shows how an enterprising employer has installed a radio set in his employees' rest room, for the purpose of entertaining them while they are eating their luncheons.



(C. Kadel and Herbert)



side Photos)
has become popular in St. Paul, hundreds of mothers have
very helpful in keeping their children quiet and amused.



Louis Bamberger, well known merchant of Newark, New Jersey, who sailed on the S.S. Homeric Saturday, has installed a powerful radio receiving outfit in his stateroom, by means of which he will keep in continuous contact with his office through radio station WOR.



(C. Underwood and Underwood)

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

Radio Exports During November, 1922

According to Statement by Department of Commerce

Countries	7181 Radio and wire- less apparatus		7182 Telegraph apparatus		7184 Telephone apparatus including switchboards	
	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars
Belgium	92	891	...	...	201	809
Denmark	...	...	...	...	160	1,361
France	217	1,018	...	...	134	738
Germany	1,700	875	...	...	...	...
Iceland and Faroe Islands	20	88	...	...	...	...
Netherlands	992	1,361	...	...	276	1,188
Norway	24	54	...	...	...	...
Spain	81	93	...	...	110	284
Sweden	201	274	...	...	29	122
England	2,203	6,606	1,687	1,509	71,924	100,501
Canada—Maritime Provinces	419	1,542	7,094	1,484	622	672
Quebec and Ontario	23,214	39,834	10,646	9,474	35,715	47,384
Prairie Provinces	8,690	16,273	92	91	1,782	3,859
Brit. Col. & Yukon	384	627	137	603	737	1,372
Costa Rica	2	32	...	...	...	...
Guatemala	...	...	...	...	26	59
Honduras	...	...	...	...	5,607	4,076
Nicaragua	24	25	...	...	1,492	4,007
Panama	23	125	...	...	136	129
Salvador	...	...	...	...	123	384
Mexico	76,670	12,998	3,692	2,683	7,432	3,352
Miquelon and St. Pierre Is.	...	...	...	...	117	123
Newfoundland and Labrador	...	...	3,555	5,048	1,537	2,477
Bermuda	...	...	...	...	1,011	1,051
Jamaica	...	...	...	...	898	401
Trinidad and Tobago	...	...	...	...	700	466
Other Brit. West Indies	80	325	...	...	35	18
Cuba	11,199	24,586	261	585	17,127	23,008
Dominican Republic	51	48	...	...	221	1,184
Haiti	...	...	...	...	3	6
Virgin Islands of U. S.	...	...	...	...	635	373
Argentina	18,158	71,874	8	15	2,605	12,561
Brazil	753	4,199	546	6,000	7,912	30,140
Chile	788	1,951	...	...	746	1,462
Colombia	...	...	...	...	9,115	8,686
Ecuador	...	...	...	...	587	1,114
Peru	...	...	40	400	2,157	2,973
Uruguay	2,166	12,208	...	...	...	...
Venezuela	...	...	...	...	739	1,341
British India	15	34	...	...	...	...
Straits Settlements	43	81	...	...	...	...
China	86	165	...	...	1,458	1,543
Hongkong	24	130	...	...	60	128
Japan	1,385	6,703	82	342	15,198	37,533
Philippine Islands	3,065	3,476	...	...	...	...
Australia	2,214	5,404	11	204	7,338	19,000
British Oceania	50	45	...	...	...	...
New Zealand	4,886	9,011	11	177	3,788	2,260
British South Africa	40	224	...	...	51	70
Egypt	...	...	...	...	18	121
Total	159,958	223,180	27,862	34,615	200,562	318,336

SHIPMENTS FROM THE UNITED STATES TO NON-CONTIGUOUS TERRITORIES

Non-contiguous territories	Telephones	Dollars
Alaska	...	1,000
Hawaii	...	1,100
Porto Rico	...	55

COMPLETE YOUR FILES OF RADIO WORLD FOR 1922

Back numbers of Radio World are becoming scarcer all the time. We can now furnish you with back numbers from No. 1 to date at fifteen cents a copy. Any seven numbers for one dollar. RADIO WORLD, 1403 Broadway, New York City

New Firms and Corporations

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Goodnow-Gardner Electrical Corporation, care of Good, Kimbrought & Hutchinson, Boulder, Colo.
 John Barstow, Barstow's Radio Shop, Selwitz Block, 10 Pearl street, South Manchester, Conn.
 Clarence L. Carey, Haisley Bldg., Lake Wales, Fla.
 Torrington Electric Company, Orpheum Bldg., Wichita, Kan.
 Case, Manhattan, electrical business, \$20,000; N. L. Case, C. G. A. Weiss. (Attorney, J. M. Detzen, 61 Broadway, New York.)
 Premo Electric Corp., Manhattan, \$10,000; L. M. Fox, M. L. Gilman. (Attorney, B. Lewinson, 119 Nassau street, New York.)
 Vesey Electric Sales Corp., Manhattan, selling electric fixtures, \$25,000; M. Gerst, L. Bailey. (Attorney, N. Bolet, 55 Vesey street, New York.)
 Unit Radio Corp., Manhattan, supplies, \$10,000; B. Katz, M. Julien, A. Zweckly. (Attorney, A. F. Karman, 116 Nassau street, New York.)
 J. C. Harding & Co., Wilmington, Del., electrical contracting, \$20,000. (American Guaranty and Trust Co.)
 Prometheus Electric Corp., Manhattan, \$66,400; H. L. Herrick, F. D. Hagan, J. Van Harder. (Attorneys, Davis, Symmes & Schreiber, 55 Liberty street, New York City.)
 Excello Construction and Electric Co., Manhattan, \$5,000; E. J. Dwyer, L. P. Wilkinson. (Attorney, P. A. Schmitt, 119 West 42d street, New York City.)
 Stuyvesant Electric Co., Manhattan, has increased capital stock from \$10,000 to \$50,000.
 Cosmo Electric Construction Company, Manhattan, \$150,000; P. Aigeldinger, J. Spitzer, C. H. Pond. (Attorney, T. F. McMahon, 1400 Broadway, New York City.)
 Construction Materials Corp., Manhattan, electricians, \$10,000; E. C. and A. M. Sargeant, W. Porter. (Attorney, E. P. Feely, 42 Broadway, New York City.)

Radio Stocks

Curb Market of the week ending January 20. Quotations from New York Times of January 22:

Sales	High	Low	Last
7,300 Dублиer Cond. and Radio	5%	5	5 1/2 + 1/2
300 Prima Radio Co.	.88	.87	.88 - .02
12,300 Radio Co.	3%	3 1/4	3 1/4
13,500 Radio Co. pf.	3%	3 1-16	3 1/4 + 1-16

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and exhibitions. Keep us posted by mailing full information.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

FIRST UNIVERSAL EXPOSITION OF INVENTIONS AND PATENTS, Grand Central Palace, New York City, February 17 to 22, inclusive, 1923.

SOUTH JERSEY'S FIRST RADIO-ELECTRICAL SHOW, Third Regiment Armory, Camden, N. J., February 5 to 10, inclusive.

Western Electric Company Post Gives Theatre Party

THE Broadhurst Theatre in New York City was brought out for the night of January 23 by the Western Electric Company Post of the American Legion. The performance for the evening was "Whispering Wires."

Answers to Readers

GIVE me any information you have on the use of the W-D 11 as a radio-frequency amplifier. I have inquired in several places, but no one seems to have any definite information. Are they inferior or superior to the 6-volt tubes for this purpose?—A. T. Bales, 501 Merchants Exchange, St. Louis.

These tubes cannot be used successfully as radio-frequency amplifiers. The best tubes for this purpose are the ones you mention in your letter or the V-T 2, Western Electric.

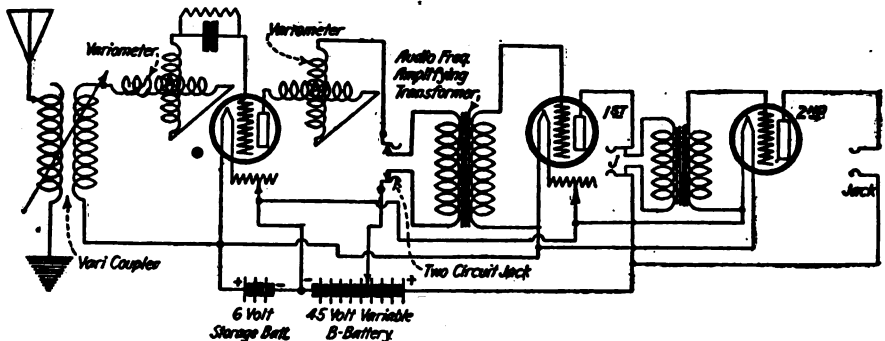
If you will refer to the answer given R. V. Andrews, Perryville, Ohio, under "Answers to Readers" in RADIO WORLD for January 20, you will find two ways of eliminating the hum. In the first, a primary of a 1-inch induction coil should prove efficient. In the second, you will have to wind two coils of 40 turns each on a cardboard core, and arrange the sliders as shown, with preferably a fixed condenser shunting them.

Is the Flewelling circuit practical? Is it superior to the three-unit variometer variocoupler regenerative set?—Morris Dorsey, 604 Woodward Ave., Atlanta, Georgia.

This is a very practical circuit. It is not ethical for us to criticize one circuit in favor of another. Excellent results may be obtained with either, depending upon the way in which the apparatus is handled. Know your circuit and how to work it and you will get excellent results. This applies to a crystal circuit as well as to an Armstrong Superregenerative.

Give me the hook-up necessary for the panel published by Cranby Meyers in RADIO WORLD, No. 42, dated January 13.—J. L. Anorthy, Waynesburg, Pennsylvania.

Hook-up you desire is published herewith. The parts necessary are 2 variometers, 1 vario-coupler, 3 tubes, 3 rheostats, 3 jacks, 3 sockets, 1 grid lead and condenser, 2



Regenerative circuit published in response to query by Mr. Anorthy. The apparatus used is all specified in the hook-up.

amplifying transformers, panel 7 by 18, cabinet, 60-volt B battery with 22½-volt tap (1 22½-volt battery and 1 45-volt will suffice; hook them in series, and tap off for the 22½-volt), a battery, dials, and bus-bar wires.

Can I use De Forest coils (D-L 50 and 75) in the DX receiver described in RADIO WORLD, No. 43, dated January 20, by Ortherus Gordon? How can I shield this panel effectively?—John F. Neary, 5745 Mosholu Ave., Riverdale, New York City.

Yes, you may use these coils. The best way of shielding your panel is to paste either heavy tinfoil or light-gauge copper-foil on the back of the panel with shellac, taking care to leave space surrounding your fastening screws sufficient to clear all the apparatus.

I am using the Armstrong Superregenerator built according to the specifications in RADIO WORLD of September 16. I have a 160-foot outdoor antenna, and everything called for in the article, but I do not get sufficient volume in the received signals. What is my trouble?—Jack Mason, Reading, Pennsylvania.

This circuit is rather critical, and calls

for careful tuning-in. As you seem, by your letter, to be getting quite a distance we fail to understand how the volume can be so low. Most of the regenerative tuning is done with the condenser C1 and the rotor of your coupler. Try using this set on a loop, as that is what it was originally designed for. Remarkable results have been accomplished with this circuit on a loop when properly tuned.

How can I increase the strength of my received signals? I am using the De Forest D. T. 600 crystal set, and wish to cover greater distances.—M. Seibert, Clifton, New Jersey.

You can increase the signal strength by putting one or two stages of audio-frequency amplification on. A suitable diagram appeared in RADIO WORLD for September 2 under "Answers to Readers," in response to an inquiry by H. S. Houston.

1. Can a W-D 11 tube be used in the reflex circuit described by C. White, on page 11 of RADIO WORLD, dated January 20?

2. How high should the B battery voltage be?

3. What kind of transformer is used? 4. What kind of potentiometer is used?—John H. Newton, 482 North Sixth Street, Newark, New Jersey.

1. No, the W-D 11 tube will not function properly in this circuit. It is better to use the regular hard tube such as the U. V. 201.

2. The voltage on the B battery should be 60 volts variable.

3. The transformer is the regular audio-frequency transformer used in regular audio-frequency amplification. One of fairly high ratio is preferable.

Give me the hook-up embodying the following apparatus: 2 variometers, 1 variocoupler, 1 43-plate condenser variable, 1 23-plate variable, 1 detector and 1 amplifier.—George Leaderer, 336 Bryant Ave., Syracuse.

See reply to Mr. Anorthy, and hook-up on this page. You will wire up only the one step, omitting the double-circuit jack in the circuit of the second tube.

1. Can 3 Radiotron U-V 202 tubes be used in the place of the U-V 201 tubes in the Armstrong Superregenerative published in RADIO WORLD, No. 19, dated August 5?

2. What plate voltage should I use on these tubes?

3. Will it be necessary to use different rheostats and transformers if these tubes are used?

4. What other changes will be necessary in this hook-up in order to use these tubes? I wish to use them on a transmitter later.—V. A. Gilbert, 332 Riverside Ave., Spokane.

1 and 2. While these tubes may be used in the circuit you mention, it is not advisable as they are not meant for that purpose. Higher plate-voltages will be required for operation. It is best to use either the 201 or the Western Electric V-T 2. These tubes may be used also in a small, low-power transmitter.

3. It will not be necessary to change any of the transformers, but we think it advisable to use a rheostat that will stand a slightly higher current without any danger of burning out.

4. No other changes are necessary.

Can you give me the address of Dr. H. V. Hillman and Dr. Clarke F. Fletcher, published in RADIO WORLD, No. 42, dated January 13, in connection with their method of locating disease by radio?—F. A. Chapman, Box 526, Wellsburg, West Virginia.

We refer you to the photographers who furnished the illustration, Kadel and Herbert, 153 East 42d street, New York City. They will give you the information, with which we were not supplied.

Publish a regenerative hook-up using the following apparatus: Vario-coupler, 23-plate condenser, W-D 11 tube, batteries, and phones.—Jack Brown, Wenatchee, Washington.

If you will consult RADIO WORLD No. 39, dated December 23, page 19, "With the DX Nite Owls," you will find a hook-up such as you want.

I have a regenerative set, but, owing to the fact that I am located about three blocks from the central power house of the B. R. T., I am bothered with a terrific humming in my receivers. I also have the telephone company almost a half a block away. How can I remedy this, as I can't do any work at all except on very local stations.—Joseph Adams, Ridgewood, New York.

The regular 200-400 ohm potentiometer can be used. We suggest the Bradimeter, which is a carbon unit potentiometer, and gives finer adjustment.

I am building a crystal set, using: 1 variocoupler, 1 condenser, crystal detector, and I should like to know which would be best to use: 1 43-plate condenser, or 2 23-plate condensers.—V. R. Langdown, 18 Chestnut Street, Princeton, New Jersey.

You do not mention where you wish to use the condensers. We advise you to use the 2 23-plate condensers, putting one across the secondary or rotor, and the other in the primary, with a series-parallel switch, so that it will be possible either to shunt it across the primary, thus increasing the wave length of your set, or to put it in series, allowing you to cut down your wave length.

Can the W-D 11 be used in the Reflex Circuit, described by C. White in RADIO WORLD, dated January 20.—Charles Maloney, 36 Preston Street, Hartford, Connecticut.

Not successfully. This tube is primarily a detector, and is not very useful in circuits such as this, although it can be used. We advise the U. V. 201.

With the DX Nite Owls

A Six Months' Fan Sends His
From O. E. Martin, 536 Railway Exchange Building, Kansas City, Missouri

I HAVE been a "radiophan" only six months, and don't claim to know very much about radio in general, or any part of it in particular; but I feel called upon to take issue with Mike Podhorn, of Wood River, Illinois, after reading his rather sarcastic comments in RADIO WORLD No. 42, dated January 13, on the receiving record of Arthur Lindstrom, of Baraboo, Wisconsin, in RADIO WORLD No. 37, dated December 9, 1922. Mr. Podhorn states he has quite an expensive set, has been in the game three years and has never heard music from a western station. This does not, to say the least, speak very well of his ability to operate his set unless there is something radically wrong with its construction. I do not think there is anything so unusual about Mr. Lindstrom's record in hearing from coast to coast and border to border with a set having one step of amplification. I am giving my record, made January 15, which covers practically every point of the compass from Kansas City, the greatest distance being KHJ, Los Angeles, about 1,800 miles. I am using only one tube, no amplification of any kind. Most of the stations heard were while WDAF, the Kansas City "Star," were on the air, which makes me proud of my record, as the "Star" is considered a hard station to tune out when so close to it as I am.

*KDKA, Pittsburgh; WGM, Atlanta; *KSD, St. Louis; *KFAF, Denver; WLAJ, Waco; *WWJ, Detroit; *WAAN, Cedar Rapids; *WAAK, Milwaukee; WAJN, Topeka; *WOC, Davenport; WBAP, Fort Worth; KHJ, Los Angeles; *WLW, Cincinnati; WBAD, Minneapolis; also the Fort Worth "Record," but I did not get their call letters.

I am using a Reinartz tuner, which I constructed myself. The entire set with all accessories from antenna to ground did not cost over \$35. If Mr. Podhorn wants a copy of it, he will find it on page 23 of the same issue in which his letter appeared.

I have experimented with several different kinds of equipment and many different hook-ups, with varying success, and several complete failures, and from my experience I favor the Reinartz over all others.

*Indicates station heard through WDAF.

A List of 13

From Willis E. Gilbert, Jr., Box 1277, Alliance, Nebraska

THIS is a list of the stations I heard on the night of January 16: WAAK, WHAN, WHB, WFAA, WLW, WCH, WBAP, WSD, KUO, KZN, KSD, KDGU, KHJ.

Working at Odd Times

From Ernest A. Dibble, Rockaway, New Jersey

I HAVE a Paragon special and Paragon type DA 2-amplifier, with an antenna about 140 feet long and 35 feet at the highest end. It is a single-wire, and it crosses the canal. I have another antenna, also a single-wire, about 75 feet long and 18 feet from the ground. This I often use as a counterpoise and also a ground on the city water pipe. During the past month I have worked my outfit only at odd times. I have received the following list of stations on a detector tube, and many of them I am able to work in on the vocal loud-speaker, so that they may be heard plainly in different parts of the house. I have worked WOC in especially well on the loud-speaker:

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups from the "DX Nite Owls" who send in records with a view of publishing them.

Send hook-ups of your sets, drawn neatly in black ink, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

KFC, KOP, KSD, KYW, WAAM, WAAS, WBAM, WBAN, WBAP, WBAY, WBS, WBT, WBZ, WCAE, WCM, WCN, WCX, WDAC, WDAF, WDAJ, WDAP, WDAZ, WDAW, WDAF, WEAM, WEAS, WFAJ, WFAK, WGAM, WGAS, WGI, WGM, WGR, WGY, WHA, WHAB, WHAK, WHAM, WHAS, WHAZ, WHB, WHK, WIAC, WIAM, WIAO, WIAZ, WIP, WJAN, WJAX, WJZ, WKB, WKAC, WKAY, WLAD, WLAC, WLAG, WLAH, WLAK, WLAP, WLAW, WLB, WLK, WLW, WMAC, WMAF, WMAJ, WMAK, WMAM, WMAZ, WMAS, WNAC, WNAN, WNO, WOC, WOH, WOO, WOR, WOS, WPI, WRAU, WRL, WRW, WSB, WSL, WWJ, WWL, WWX, WWZ, NOF, WAAZ, 2XI, 2XJ, 2XAI, 3XW, WLAL.

In 15 Minutes

From C. A. Lynch, 424 Bellevue Avenue, Detroit, Michigan

I HAVE been reading RADIO WORLD with much enjoyment since last April. With Frank S. Meyers' hook-ups (No. 3), illustrated in RADIO WORLD, No. 42, dated January 13, I picked up WFAA, Dallas; Kansas City Star, and KDKA, Pittsburgh, all in about fifteen minutes. My set contains a home-made vario-coupler, one 43-plate condenser, one W-D 11 tube and the electric light socket for the antenna.

Does Not Use Amplifiers

From L. D. Minnick, Box 36, Lovilia, Iowa

HERE are some of the stations I have heard with my home-made set, which cost less than \$10. I do not use amplifiers: KYW, CJCB, WOI, KDKA, KSD, WGM, WHB, WYF, WDAP, WMAD, WHAJ, WAQ, WIAC, KFAF, WFAF, WBAP, WFAA, CJCK, WHAF, WLW, WNAN, WWJ, WCX, WHAZ, KHJ, WGL, WLAG, WMAF. All come in well. At times I can remove the head set and hear the music.

A Record from Indianapolis

From Cecil Partner, 624 Lafayette Avenue, Lebanon, Indiana

AS a devoted radio fan and reader of RADIO WORLD I send you my record. My set consists of a detector and two-step audio, and two-step radio-frequency amplifiers. I have the latter for experimental use only. I have heard all stations on the detector and audio-frequency amplifiers.

The farthest distances are: WMAT, Duluth; WBZ, Springfield, Massachusetts; PWX, Havana; WOAI, San Antonio; KLZ, Denver; KHJ, Los Angeles. The total is ten, which vary in distance from 30 to 2,000 miles.

I have just erected two new antennas. One is a four-wire, 75 feet long and 30 feet high. The other is a one-wire, 125 feet long and about 25 feet high. The two

tune practically the same, but I get a little better signal strength on the one-wire.

I should like to hear from any one wishing to purchase a complete set.

A Three Nights' Record

From Clarence Gladstone, 10 Phillip Street, Asheville, North Carolina

I HAVE a one W-D 11 tube set with no amplification, with which I have heard the following stations in three nights distinctly: WGY, Schenectady; WOR, Newark; WHAM, Rochester; WCX, Detroit; WAAK, Milwaukee; WIP, Philadelphia; WOC, Davenport; WEAJ, New York; WCM, Memphis; WWJ and WCX, Detroit; KDKA and WCAE, Pittsburgh; KSD, St. Louis; PWX, Havana; WHB and WDAF, Kansas City; WWI, Dearborn; WDAP, WMAQ and KYW, Chicago; WBAP, Fort Worth; WGM, Atlanta; CFCA, Toronto; WJAX, Cleveland, and WLW, Cincinnati.

I think RADIO WORLD is the best radio magazine on the market, and shall continue to buy it as long as you publish it.

A New York City Record

From Marcel Siz, New York City

AFTER reading the records of many fans I have decided to send my list in:

WDAF and WHB, Kansas City; WSB and WGM, Atlanta; WOH and WLK, Indianapolis; WCAE and KDKA, Pittsburgh; WDAP, WMAQ and KYW, Chicago; WIP, WOO, WFI and WPJ, Philadelphia; WHK and WJAX, Cleveland; WWJ, Detroit; WWI, Dearborn; WBAP, Fort Worth; WHAS, Louisville; WMAB, Oklahoma City; WOC, Davenport; KSD, St. Louis; WLAL, Warren; WLW, Cincinnati; WDAJ, College Park; WGY, Schenectady; WGI, Medford Hillside; WBL, Springfield; WHAM, Rochester; WMAK, Lockport; WNAC, Boston; WMAT, Duluth; WMAF, South Dartmouth; WBT, Charlotte, and 15 nearby stations. Once I tuned in 17 stations.

Did Not Keep Tuning

From E. L. Laudell, Bethany, Illinois

I READ the RADIO WORLD every week, and have been keeping up with the DX night owls for some time. I listened to CFCA, "Daily Star," Toronto, some time ago from 5:30 until 6:15, when they signed off. There are about seven high-powered stations working at this time in my neighborhood, but these did not interfere with CFCA. I did not have to keep tuning to hold them. Among the stations I have heard in the last two weeks are: CJCG, WGY, WWJ, WAAP, WCAS, WCX, WDAF, WEAY, KFAD, CJCG, WHAS, WHB, WJZ, KHJ.

2,200 Miles from Winston-Salem

From Edward Felts, Box 356, Winston-Salem, North Carolina

RECEIVED KFAP, Butte, Montana, with detector and 1 step. I find a 23-plate condenser across the aerial and ground helps tuning. I use a three-wire aerial; fifty feet high and fifty feet long. I have the longest record heard of in Winston-Salem—over 2,200 miles. Among the stations I have heard are: PWX, Havana; KSD, St. Louis; WHD, Kansas City; WFAA, the "News," Dallas; WGY, Schenectady; KDKA, WLK, WHK, WDAE, WJAX, WHAM, WCAE, WEAO, and 49 others.

(Continued on page 26)

Spaghetti Tubing and How It's Made

UP to about ten years ago the common practice of insulating short terminal and connecting wires was by the use of cotton sleeving, or braided tubing, then also known as stockinet; after the apparatus was finished, this sleeving was given a sufficient number of coats of varnish to produce a smooth surface. Where such connections were subjected to moisture or oil, as in motors, dynamos and transformers, the dielectric strength of the varnish gradually weakened and finally broke down; and where high temperatures also prevailed the disintegrating process was so rapid that the insulation afforded only temporary protection.

Some one, possibly preferring a shorter name to "M-R Impregnated Varnished Tubing," says the New York "Mail," and aided by the resemblances of the material itself, dubbed it "macaroni" and the name stuck until the smaller sizes became popular. Since then "spaghetti" has been the designating shop term.

During the war the United States government tested several makes of "spaghetti" and many thousands of feet were used in radio and other work by the various bureaus of our own government, as well as those of foreign countries.

When manufacturers of electrical apparatus took up the production of radio sets they naturally used "spaghetti" on leads of exposed wiring, primarily as a protection against "shorts," although the "dressed up" appearance thus attained was at once recognized as an aid to selling. The three styles of "spaghetti" now on the market may be briefly described as follows:

Base of cotton sleeving impregnated through and through with varnish and baked, then given from eight to ten additional coats, each coat being baked and rubbed down. This is the genuine "macaroni" in the larger diameters and "spaghetti" in the smaller sizes. The wall around the sleeving is thus built up of nearly a dozen layers of varnish, is homogeneous and of tremendously high insulating value. As the final coat is rubbed down the finish is smooth but not brilliant. Dielectric value approximately 7,000 volts. Characteristics already described.

Here the cotton tubing is treated with a dressing or filler, instead of varnish, dried and then dipped five or six times in varnish, each coat being baked dry before the succeeding one is applied. This method produces a tube with a high gloss that is moisture proof, oil resisting and, when properly made, will withstand breakdown tests up to an average of 5,000 volts.

And it is difficult to determine quality by either price or appearance, as some of the most highly polished are built up entirely of collodion, cellulose, or other guncotton compound, to which castor oil is added to retard hardening, and as they contain absolutely no varnish whatever they soon become hard, brittle and crack; then, too, they are highly inflammable.

White or colored cambric cloth is cut in narrow bias strips, rolled lengthwise to form a tube 36 inches long, and covered with an insulating compound resembling (but containing no) rubber. To produce yellow tubing, amber colored compound is used over white cloth, whereas both cloth and compound are of the same color when other shades are made.

In every case the coating is transparent, flexible and will give excellent electrical

The Dead End Effect Explained

END loss in radio inductance coils is of great importance to all amateurs who construct their own sets, says the New York "Globe." It is also a thing that should be guarded against when purchasing a set already completed.

This loss is one which may be so great as completely to prevent reception of signals on a certain wave length. The effect is seldom considered in home-made sets, and at times even manufacturers do not guard against its troublesome effects.

All inductance coils possess more or less distributed capacity, depending upon the dimension of the coil, its insulating properties, and the nature of the supporting form. Capacity is far greater in a coil having more than one layer of wire than in a coil which has but a single layer.

If only a portion of the wire on the coil is used the remainder will have a certain fundamental frequency or wave length due to the inductance of the unused portion and the capacity of the coil as a whole.

If the value of the unused part of the coil has a wave length approximately equal to the wave length at which reception is desired, a great portion of the receiving currents will be absorbed by the unused circuit.

As an experiment connect a small, variable condenser across the terminals of the coil. Vary the condenser and note that at a certain point, if the values of the coil and condensers are the proper ones, the signals will disappear. Now, if the coupling between the test coil and the receiver is very weak these effects will not be noticed. If it is very close—which is a condition when only a part of the winding of a coil is in use—the effects will be more apparent.

Japan Speaks to New York

THE New York "Times" radio station has copied a twenty-two-word message direct from station JAA, near Tokio, thought to be the first time a complete message from Japan has been recorded in New York. It is difficult to tune in the Japanese station from the eastern coast of the United States, because of interference created by the powerful French station, UFT, on the outskirts of Paris, operating on practically the same wave length, 14,600 meters. One morning last week, at 2:07 o'clock, the French transmitter was standing by, as were stations on the Atlantic coast of this country, giving the Japanese dots and dashes opportunity to register in New York with great clearness.

Ordinarily it requires several hours to get a message from Tokio to New York, for it must be sent to Honolulu, then relayed to San Francisco, where it is put on the land telegraph lines and sent across the continent. It takes at least three weeks for a letter to travel from Japan to New York. Radio spans the 9,000 miles across the Pacific and the United States in a fraction of a second.

protection up to 1,000 volts in ordinary apparatus where it does not come in contact with water or oils.

This form of "spaghetti" is ideal for radio instruments inasmuch as it offers insulating protection with a factor of safety many times in excess of that required; its low cost permits of its liberal use and where more than one color is employed to trace out different circuits the result is an improvement in appearance of the home made set.



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Don't—

DROP your bulbs more than once a day. You may dent the glass or, possibly, shake some of the ions off the filament.

Run your aerial across more high-tension lines than you have to. It may not kill you, but you'll never look the same in a wooden overcoat as you do in a Morris chair.

Burn your bulbs up too high. It looks pretty but it puts an awful drain on the battery.

Listen to a beginner's advice—go to someone who knows more about it than yourself.

Try to receive without tuning. Coué never could make a car run by auto-suggestion, and you can't tune in Detroit by just thinking about it.

Try to drive talks into your panel. Machine screws look neater, and there isn't so much chance of denting the panel with the hammer.

Expect the battery to last forever. A man's life is limited to years, a battery's to months. The life of each depends on care.

Make your tubes "blue." You know how it feels to be blue but you don't understand how you make the tube feel. It doesn't work well after a few blue spells. Cut down your B current.

When _____
By Allen Donne

YOU can tune in on any station you want, without being interfered with—

You can fix your own tubes, as easily as you fix the inner tube on a car—

You can walk into a radio store and come out with just what you went in for, and nothing more—

You can get someone to explain the action of your favorite circuit in a way that you can understand—

Someone who has been in radio a month more than you have doesn't try to show you up as a numbskull—

The CQ hound on the next block understands that you don't have to hear him sign 66 times in order to understand him—

YELL "EUREKA" 'cause you've found PARADISE!

Quick Work by a Radio Druggist

A PHYSICIAN in Bayonne, New Jersey, attending a patient suffering from influenza a few days ago, ordered a prescription by radiophone. The druggist, A. C. Nuber, Jr., happened to be at his set, and the prescription was filled and delivered in ten minutes.

A Radio Type Machine

A NEW type-setting machine with an attachment for receiving wireless copy directly is claimed by a French inventor. According to his statement, the machine is so simple that it can be handled by a child.

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5 RADIO-WIRE TABLES, BY FREDERICK J. RUMFORD, E.E., R.E.

These tables, showing the number of feet in a pound and fractions of a pound, were published in RADIO WORLD as follows: No. 1—Enameled Magnet Wire, RADIO WORLD, No. 24, dated Nov. 18. No. 2—Single Cotton-Covered Wire, RADIO WORLD, No. 25, dated Nov. 25. No. 3—Double Cotton-Covered Wire, RADIO WORLD, No. 26, dated Dec. 2. No. 4—Single Silk-Covered Wire, RADIO WORLD, No. 27, dated Dec. 9. No. 5—Double Silk-Covered Wire, RADIO WORLD, No. 49, dated Dec. 30. Sent to any address postpaid at 15 cents a copy, or the complete set of 5 copies for 75 cents. Or start your subscription with any number. Order now. Every amateur builder should have these tables constantly at hand. The supply of back numbers is limited.

RADIO WORLD, 1493 BROADWAY, NEW YORK, N. Y.

How Broadcasting Is Done

FOR those who have given little thought to what takes place at a broadcasting station while they are being entertained and instructed, C. W. Horn, superintendent of Radio Operations of the Westinghouse Electric Company, recently addressed a radio audience from Station KDKA on the subject of broadcasting stations and the conditions confronting those who have their operation in charge. Mr. Horn said in part:

"A broadcasting station consists of certain apparatus so constructed and arranged that it will pick up sound waves, transfer them into electrical energy, amplify them, and then by means of radio transmitters radiate them through the ether.

"The first thing to consider is the transmitter itself, which makes possible the radiation of energy. This transmitter makes use of the well known vacuum tubes which are operated at very high pressure in the Westinghouse Stations at about 2,000 volts. A set of these tubes, known as oscillators, are so connected and arranged in a special circuit that they generate what is called high frequency electricity. The electricity which lights your home travels in waves at the rate of about sixty per second, whereas in this high frequency electricity there may be a million or more waves each second. This high frequency current is transferred to the antenna and radiated through space, acting as the carrier wave for the music or speech which you pick up on your radio receivers. To these oscillators are coupled a number of tubes called modulators, whose function it is to control the radiated energy in such a manner as to reproduce faithfully and without distortion the spoken word or music it is desired to transmit.

"Now let us look at the microphone in the studio. This is an instrument which is designed to pick up sound waves and convert this mechanical energy into electrical energy. Most of you are familiar with this instrument either from actual experience or from having seen photographs of them, but you may be surprised to learn that they are practically the same as the transmitter on your ordinary telephones, with the exception of certain refinements found necessary for radio work. After this energy has been transformed into electrical current it is intensified by means of amplifiers until it has reached sufficient strength to properly control the large modulator tubes on the transmitting set previously described. When it is realized how many times this energy must be transformed from one form to another, it is remarkable that the quality and strength can be maintained without appreciable loss.

"Each tone or note in music consists of a fundamental beat or frequency of vibration, and a number of harmonics or partial vibrations. These harmonics contain different percentages of the total energy in any note. The distribution of the energy

among the harmonics governs the quality of the tone and also make it possible to distinguish one instrument from another. It will, therefore, be seen that it is quite necessary to pick up all the harmonics possible in their true proportion, or the quality of the tone will be destroyed. To do this properly has required considerable study and experimenting. In the first place the studio or room in which the broadcasting is done must be thoroughly protected to prevent the reflection or reverberation of sound energy. This is usually accomplished by lining the walls, ceiling and floor with heavy drapery, and sometimes felt is used. In the new broadcasting studio of Station KDKA at East Pittsburgh, we have gone to considerable pains to secure this freedom from reflection. In this new studio, which was just recently opened, the walls, ceiling and floors have been covered with felt, over which with the exception of the floor, has been spread a sheet of muslin. Over this is hung in heavy folds a covering made of monk cloth. The floor has a covering of thick carpet over the felt. Special effort has been made also to exclude external noises and when one enters this room he is immediately conscious of the intense stillness which prevails.

"In this studio when a musical instrument is sounded the sound waves travel directly to the pick-up, or microphone and are not distorted as they would be if they were reflected from different objects or places about the room.

"There is a kind of broadcasting which the average listener knows very little about, but which he nevertheless enjoys probably to a greater extent than the broadcasting performed in a studio, and that is when the material is picked up from a distant point, such as a theater, opera house, football game, etc. To accomplish this successfully is rather difficult because it is not possible to rebuild the halls or theaters in which the performances take place, and for that reason we must accommodate ourselves as best we can to the conditions existing. One of the greatest drawbacks in this kind of broadcasting is that the microphone picks up echoes, especially in large halls and in churches. Opera is especially hard to pick up, inasmuch as the singing is varied, and takes place at different points on the stage. At Chicago our Station KYW has ten microphones scattered about the auditorium where the Chicago Civic Opera Company renders its selections. An expert sits in the audience with a small switchboard in his lap and cuts in the proper microphone for whatever type of performance is being offered at that instant. He uses a different microphone for a solo than he does when the orchestra is playing, and he must make the change instantly at the beginning of each selection. Needless to say this man knows all the operas by heart."

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Uniform Size—24 in. x 36 in.—Price 25c. Each.
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This chart presents the plan view of a typical six-cylinder chassis of standard design and outlines all important bearing points requiring lubrication, and is a valuable guide to the correct lubrication of any modern car. A practical chart for all interested in motor car maintenance. (24 x 36.) Price, 25 cents

While each of the above three charts is complete, the set covers all maintenance instructions for the entire automobile.

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An enlarged and revised chart showing clear sectional views depicting all portions of the Ford power plant and auxiliary groups. It outlines clearly all parts of the engine, fuel supply systems, ignition group and cooling system, that are apt to give trouble, detailing all derangements that are liable to make an engine lose power, start hard, or work irregularly. This chart simplifies location of all engine faults, and includes instructions for locating Ford electric starter troubles. Size 24 x 36 inches. Price, 25 cents

Location of Motorcycle Troubles Made Easy.
Price, 25 cents

The Six Charts Sent for \$2.00

THE COLUMBIA PRINT

1403 Broadway, New York City

Attention! Fans and Amateurs!

Have you built your own receiver?
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Are you doing any interesting constructive work in radio?

Why not share this knowledge with your thousands of brother fans who read RADIO WORLD every week?

We want pictures of receiving sets with descriptions of how you overcame some difficulty, or of any additional part or unit that you have added to obtain better results. These are the things that, probably, the other fellow is looking for. Send in your information; pictures or whatever you have done to improve the art. Remember the beginner is looking for them.

We intend to print in this paper, each week, pictured information and description of value to radio amateurs. If you have found a newer or better way of doing anything, don't keep the secret but tell it to your thousands of brother fans.

Send in a photograph of your set with or without accompanying diagrams and measurement. State whether you figure in the picture yourself, or not, and without any expense whatsoever to you we will make an engraving and publish it. Be sure to write your name and address plainly on photograph.

Send in your picture at once, or if you have not made a set or done anything else in making radio material, tell the boy next door all about this offer.

Address Technical Editor

RADIO WORLD, 1493 Broadway, New York City, N. Y.

No Free List

RADIO WORLD has no free list. The only copies sent out by the publishers are to fill the ever-increasing orders of the American News Company, the large numbers of subscription orders received at the office of publication, and one voucher copy to each advertiser and advertising agent represented in current issues.

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RADIO BROADCASTING MAP

FOR the benefit of those interested in Radio and those who are becoming interested, Rand McNally & Company have prepared a publication containing a wealth of information of greatest value. It shows in the most comprehensive way, the location of the broadcasting stations, gives their classification, the call letters, wave lengths, ownership, etc., of each.

Everyone who wishes to get the maximum pleasure and enjoyment from Radio should have a Rand McNally Radio Map of United States. It is complete, accurate and up-to-date.

The Rand McNally Radio Map of United States is 28x36 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover.

Price 35c Each

THE COLUMBIA PRINT
1493 BROADWAY NEW YORK CITY

Did You Know That—

THE first Transatlantic signals were "put over" by Marconi on the night of December 11 in 1901, that the sending station was Poldhu in Cornwall, while the receiving station was at St. John's, Newfoundland?

The first radio stunt of any importance in this country was staged by the New York "Herald," when the international boat races between the Shamrock and the Columbia in September and October of 1899 were reported by wireless for that newspaper?

The first "scoop" of this kind, however, occurred in England a year earlier (1898), when the Dublin Daily Express of London had the events of the Kingstown Regatta reported by wireless for publication in its columns?

The first Marconi station in the world was constructed at the Needles, Alum Bay, Isle of Wight in 1897?

The first paid Marconigram—as a radiogram was then called—was radiated from that station in June of 1908? The message was over the signature of Lord Kelvin, and was addressed to his friend, Sir George Stokes?

The first amateur to sit back and really be satisfied with the results he is getting has not yet come forward for recognition?

The first American battleships to be fitted with radio were the New York and the Massachusetts (1899) and at that time signals were exchanged at distances up to 36 miles?

The first visit of the wireless wizard to America was on the occasion of the international races in 1899 and that Marconi has been here eighty-four times since?

The first ocean newspaper appeared on board the S.S. St. Paul in 1899 and was called the "Transatlantic Times"?

The first time a wisacre refused to predict a limit to the progress of radio was just a short year ago?

The first concert is not always the best?
O. G.

Gossip by Radio

CHARLES REED JONES, formerly managing editor of Photoplay Journal and Filmplay, who has assumed direction of the "Stage and Screen" periods of the WHN radiophone station at Ridge-wood, Long Island, promises to give his audience real gossip that could be obtained from no other source. Mr. Jones has recently returned to New York City from Hollywood, where he has spent some time.

Mr. Jones intends to carry forward the

Local QRM

THE true psychology of one phase of radio was expressed the other day when one amateur said to another: "Horace, ya poor fish, why don't you show some originality and try out a new circuit on that outfit of yours just like the other fellows?"

MR. TOM TUTTLE says that there aren't many points of similarity between a violin and a radio, but he knows this: that if he were put in a room with one hundred radio receiving sets bringing in a concert from a near-by station, he could pick out his own. He says his is the only one that would bring in the announcements and then go dead for the duration of the concerts.

SOMETHING had happened to make the toothless centenarian happy. Old, worn and wife-ridden, he had few comforts, but radio was numbered among them and he used it to the fullest advantage.

One evening, when a woman lecturer was talking about household affairs, he asked her in his century-old babble please to keep quiet. She obeyed him not. Then the worn old gentleman experienced the thrill of his long life. He stretched forth his withered hand and pulled the plug. The voice stopped instantly.

He experimented for awhile, and then realized that he had just done what he had tried unsuccessfully to do all the long years. A grin spread over his face.

Now he spends all his time letting a woman lecturer get a good start and then shutting her up just like that. He says he expects to enjoy his second hundred years more than he did his first.

policy of his predecessor, R. C. Reed, in introducing stars of the stage and screen to his radio audiences. Rex Ingram, director and producer of "The Four Horsemen," is one of the leading lights of film-dom who will be heard from WHN shortly.

RADIO MAILING LISTS

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Good Luck and Happiness

I will tell you **FREE** Under which Zodiac Sign were you born? What are your opportunities in life, your future prospects, happiness in marriage, friends, enemies, success in all undertakings and many other vital questions as indicated by ASTROLOGY, the most

ancient and interesting science of history?
Were you born under a lucky star? I will tell you free, the most interesting astrological interpretation of the Zodiac Sign you were born under.
Simply send me the exact date of your birth in your own handwriting. To cover cost of this notice and postage, enclose ten cents in any form and your exact name and address. Your astrological interpretation will be written in plain language and sent to you securely sealed and postpaid. A great surprise awaits you!
Write now—TO-DAY—to the
ASTA STUDIO, 309 (Dept. 9) Fifth Avenue, New York

A B C of Aviation

By CAPT. V. W. PAGE. This book describes the basic principles of aviation, tells how a balloon or dirigible is made and why it floats in the air. Describes how an airplane flies. It shows in detail the different parts of an airplane, what they are and what they do. Describes all types of airplanes and how they differ in construction; as well as detailing the advantages and disadvantages of different types of aircraft. It includes a complete dictionary of aviation terms and clear drawings of landing airplanes. The reader will find simple instructions for unpacking, setting up and rigging airplanes. A full description of airplane control principles is given and methods of flying are glossed at length.

This book answers every question one can ask about modern aircraft, their construction and operation. 275 pages, 126 specially made illustrations with 7 plates. Price, \$2.50

THE COLUMBIA PRINT
1493 Broadway, New York City

Newsdealers Attention

You should keep a good supply of back numbers of RADIO WORLD on hand all the time. It has been the experience of many dealers that a purchaser of RADIO WORLD for the first time will almost immediately want the back numbers, some of which are already out of print and some of which are difficult to get. THE PUBLISHER WILL FURNISH BACK NUMBERS TO DEALERS DIRECT OR THROUGH THE AMERICAN NEWS CO. AND ITS BRANCHES. Dealers should hold their unsold copies for a reasonable length of time. RADIO WORLD of October 28 contained a full page of contents of back numbers to that date. 15 cents per copy; any seven numbers for \$1.00. RADIO WORLD, 1493 Broadway, New York.

RADIO PANELS

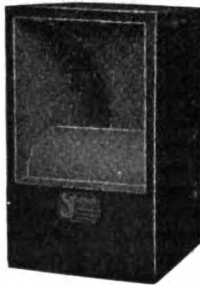
Cut exactly to size and shipped within 12 hours. 1/4 inch thick, 1 1/2 per square inch, 3/16 inch, 1 1/2 per square inch. Made of the highest grade black fibre. This material possesses high dielectric strength, is inexpensive, unbreakable, easy to work and takes a nice finish. Special offer, 6x6x3/4, 50c; 6x12x3/4, \$1.00. Postage paid.

WILEY PANEL CO.
2225 So. Central Park Ave., Chicago, Ill.

Spirola
CONCERT LOUD SPEAKER

Complete with unit and cord. Beautiful cabinet type, wonderful tone. Fully guaranteed. Post-paid (C.O.D.)... \$12.50

L. DONNELL MFG. CO.
Box 79
Ann Arbor, Mich.



Made for All Phones

Ask Your Dealer

THEY ARE GOOD PUT THEM ON YOUR PHONES

Slip out the metal disc and slip in the MICA-PHONE. Result—Clearer, better tone, all noises eliminated. Write for circular. Discounts to dealers and jobbers. MICAPHONES sell fast. Radio Mica Products Co., 156 E. 43d St., New York

RADIPHONO ADAPTER \$2.00



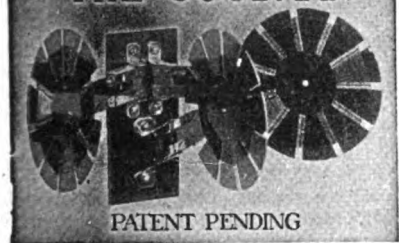
Here is an efficient economical way to use your Victrola, Edison, Brunswick, etc., as a wonderful loud speaker.

This adapter is constructed of molded composition. It eliminates metallic and distorted sounds. Guaranteed to be satisfactory or money refunded.

If your dealer cannot supply you send us \$2.00 and we will mail one by parcel post prepaid.

Industrial Sales Engineering Co.
671 Broad Street, Newark, N. J.
Phone, Market 9023

THE GOODMAN



The Nickest Short Wave Tuner on the Market Only \$8.00 & PP on 1 lb. Send for pamphlet.

L. W. GOODMAN
DREXEL HILL, PA.

Dealer ———, Norristown, Pa., writes: Listening to recently with my GOODMAN, heard a voice, "We are now 30 miles out from San Francisco." Then DENVER came in and sunk the ship.

1923 Will Not Be Complete!

Without a Year's Subscription to

RADIO WORLD

(52 numbers) \$6.00

Add \$1 a year extra for postage to Canada and foreign countries.

1493 Broadway New York, N. Y.

England Hears WGY on Loop Aerial

SINCE December 24 many letters have been received by WGY from English radio fans, who report successful reception of the General Electric Company station. Probably the most remarkable reception was that of Captain Round, of the British Marconi Company, who, on December 24, received WGY on a two-foot loop aerial, and Arthur Brooke, of Liverpool, who, on the same evening, picked up the Schenectady station on a forty-foot indoor aerial. Among those who reported reception were: A. Shaw, Colne Lanes; R. T. Hatton Evans, Penarth, South Wales; W. G. Boothroyd, Southport; J. W. F. Cardell, Cornwall; J. Ashworth, Bolton, Lancashire; T. B. Trott, Plymouth, and Thomas E. Henshelwood, Inverness, Scotland.

The Englishman who picks up an American radio station must be a real enthusiast because most folks across the Atlantic are in bed by the time the American stations are getting into the air. London is five hours later than New York, so a London fan who picks up WGY at the beginning of its program—7:45 p. m.—is listening at 12:45 a. m., his time.

The Mountain Comes to Mahomet

THERE is one angle of radio broadcasting that should be supported by every thinking citizen of the country, says the New York "Globe." Whatever we may think of the usual jazz programmes which are used as a means of entertainment, we are bound to approve the type of radio broadcasting which brings the Sunday church services into the homes of those who are too feeble to attend church in person.

Every Sunday morning there are thousands of people who never go outside their own doors, but who, nevertheless, are in attendance at one of the big churches throughout the country. Perhaps the church is only next door or possibly many hundred miles away, yet the music from its organ and the voice of its pastor penetrate into the homes of people who are unable for some reason or other to attend the church services in person.

It is a modern version of the old story of Mahomet and the mountain. If there are people who cannot go to church then the church must go to them.

The value of church broadcasting was emphasized first when the Rev. Ernest Stires of St. Thomas' Episcopal Church in New York City preached his entire sermon by radio, so that many who could not get to church could have the word of God brought into the home. Encouraged by this attempt, greater power was used thereafter to make it possible to cover the bulk of the shut-ins who are scattered throughout the United States. Reports then came that sets were being constructed for shut-ins, invalids, hospital patients, and others who were denied the privilege of getting outdoors.

Orphanages, homes for old people, and even jails were fitted out with radio receiving sets. In the South it is rumored that a fund is under way to provide sets for 1,000 churches where it has been impossible to get a preacher regularly. Many a small church has fallen off through lack of a regular pastor. Radio is not expected to change all this, but it is hoped to make the country church a civic, educational and cultural centre.

RADIO PANELS

High dielectric resistance.
6"x24" \$1.00
8"x24" 1.25
12"x24" 1.75

Manufacturers' special sizes solicited. Agents wanted.

PAGESON COMPANY

Box 68, Merchants Station, St. Louis, Mo.

WE ARE MANUFACTURERS OF FINE RADIO FURNITURE—CABINETS, TABLES AND ROLL TOP DESKS. Hardwood, hand-rubbed, mahogany and golden oak finish. Postage and Express paid by us. It will pay you to send for prices and description.

THE SOUTHERN TOY COMPANY
Radio Division Hickory, N. C.

De Forest HEADQUARTERS

Complete Stock—All Sets, Parts, Tubes, Accessories.

Reliability—Service—Co-operation

RADIO STORES CORPORATION

Distributors
220 WEST 34TH STREET, N. Y. CITY
Longacre 10110-9219

Why are so many Public Libraries Y. M. C. A's. K. of C's. Y. M. H. A's. Army Posts Social Clubs Industrial Libraries

And others in this subscription group ordering subscriptions for Radio World from all parts of the U. S., Canada and foreign countries?

THE REASON

Because so many Of their members Are interested in Radio That they want to read **RADIO WORLD** every seven days. Ask the Association or Club To which you belong To subscribe for

RADIO WORLD

The Great Illustrated National Weekly
(\$6.00 a Year, 52 Numbers
\$3.00 Six Months; \$1.50 Three Months)

RADIO WORLD

1493 Broadway New York City

That Armstrong Circuit

So much interest has been displayed in the special article, "TESTED INVENTION OF MAJOR ARMSTRONG AMPLIFIES SET 100,000 TIMES," by John Kent, that appeared in RADIO WORLD No. 13, dated June 24, 1922, the publisher decided to put aside a number of copies for those who were not able to get this issue when published. Copies will be sent, postpaid, on receipt of 15c., or send in your subscription, \$6.00 for one year (52 issues), \$3.00 six months, or \$1.50 three months, and subscription will be started with the issue containing the article about Major Armstrong's Amplifier.—RADIO WORLD, 1493 Broadway.

COMPLETE YOUR FILES OF RADIO WORLD FOR 1922

Back numbers of Radio World are becoming scarcer all the time. We can now furnish you with back numbers from No. 1 to date at fifteen cents a copy. Any seven numbers for one dollar.
RADIO WORLD, 1493 Broadway, New York City

(Continued from page 20)

With a Home-Made Set

From Joe McCormack, 1018 Peachtree Street, Gadsden, Ala.

I HAVE received the following stations in less than three months on a single-detector, no amplification, using a honeycomb coil, with tickler feed-back, two .001-variable condensers, (one in primary and the other in secondary) and change-over switch in series. This set is home made. Anyone having a set of this type, please write. I will be pleased to give further information. Here are some of the stations received: WJZ, WWJ, WLW, WMH, WOH, WSB, WAAX, WAAG, WCX, WEAT, WDM, WOK, WKN, WDAF, WWI, WHB, WWZ,

WGAO, WBU, WIAB, WAAP, WEAY, WGM, WHAS, WHAA, WSY, WGY, WHAL, WHAO, WDAJ, WEAK, WOC, WAAC, WEAU, WGAN, WDAE, WOS, WIAG, WOR, WAAW, WAAB, WOI, WFO, WLAB, WCK, WRR, WBAO, WEAF, WBAP, WOO, WMAD, WLK, WOAI, WGF, WFAA, WDAP, WLAG, WMAK, WIP, WCAH, WBL, WGR, WMC, WEAS, PWX, WHK, WBAZ, WHAM, WDAL, WJAK, WAIQ, WBAK, WJD, WAAH, WCAU, WJAX, KYW, KDNA, KSD, KFAF, KHJ, KOF, WQAA, WNAV, WOAF, WFI, WJAJ, WDAV, CFCA, WJAH, WMAF, NOP, WBAP, WJAN, WHAZ, WFAT, WPA, WKAL, WHAH, WNAC, WOAV, 2XD, 9ARU, 4FC, 2XD, 9AJ, 5XA, 2XI, 9DYN, 1XB, 9KP. All of these are radiophone stations. The hook-up is on a separate page.

ondary) 3,000-ohm Manhattan headset and a single wire aerial, 92 feet long and 25 feet high.

KHJ, KWH, KFI, Los Angeles; KUO, San Francisco; WNAC, Boston; WEAF, NYC, WJZ and WOR, Newark; CJCG, Winnipeg; CFCA, Toronto; WHAB, Galveston; WKAL, Orange; PWX, Havana; WKAQ, San Juan.

The total number of stations heard to date is 135.

Ocean Forecast Messages

The following arrangements have been made for issuing warnings of cyclonic disturbances off the coast of Queensland from December to April: By arrangement with the Commonwealth Meteorological Bureau warning of a cyclonic disturbance is dispatched by urgent telegram (Sundays included) to the radio stations and post offices of the ports in the area likely to be affected. Radio stations will broadcast such warnings to all vessels, and, in special cases, the meteorologist will indicate when his next report will issue.

At 4:30 p. m. (local time) daily, except Sundays, radio stations will broadcast an "Ocean Forecast Message," giving the state of the weather, direction and force of the wind, and state of the sea at 3 p. m. along the Queensland coast, followed by a forecast of probable conditions during the ensuing 24 hours. On Saturdays the forecast of probable conditions will be for the ensuing 48 hours.

Heard at the Radio Counter
A Conversation Between Customer and Radio Clerk

Part XIII

"WELL, sir, what can I do for you?"
"I have just recently become interested in radio, and I am thinking of purchasing a radio set. Could you advise me as to just what to do?"

"As you say that you have never operated, I advise that you get an inexpensive crystal set to begin with. If you were to buy a more expensive one to begin with you might have a lot of annoyance by not knowing how to operate it. Not getting the proper results, you would become disgusted with it before you had learnt its advantages."

"That is what I was told, but I have also been told that small sets of this type are inefficient, and therefore troublesome."

"Well, as the advantage of crystal sets lie in their simplicity of manipulation, you can learn more by operating one to begin with, and then after you know something about apparatus, by reference to different text books and magazines, you will naturally want to increase your receiving range, and will buy a tube receiver."

"That is very explicit. Have you any of the crystal sets you mention?"

"Surely, here are five different models, and while the principle on all of them is the same, they differ in workmanship, and the more expensive has of course the best apparatus. I would advise you to buy only the best, because it always gives the best results."

"Is this all that I will need?"

"No, you will need an aerial. We have some antenna sets already made up in boxes. You will attach the wires and insulators. Then you will need a pair of phones, and the same principle applies to these instruments as to the set. The best will naturally give the best results. You will find all the phone sets in the glass cabinet right below."

"Well, if you think that is all I need, I will leave the selection to you, since I don't know one from the other. Will you wrap them up and deliver them to my address? Here is my card."

"Certainly. Just one minute and I will have your change for you."

(To be continued)

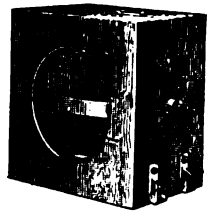
Build Your Own Set

"THE RADIO CONSTRUCTOR"

A book showing twelve prize hook-ups and full details of just how to build your own set saving half its cost.

15

S. NEWMAN & CO., 74 DEY ST., NEW YORK



King Sr.

Variometer

150 to 600 meters.

No outside connecting hardware used—reducing capacity losses.

Rugged—Solid. Size 4 1/2" x 4 1/2" x 3"

Guaranteed by manufacturer direct to user.

Retail price \$2.50

Ask dealer to show same to you.

Aremco Mfg. Co., 30 East 23rd St., N. Y. C.

Results from Bulb Set Nearby

From L. S. Muser, Anderson, Indiana.

I JUST read in Mr. Keating's letter in RADIO WORLD, dated January 20, about the remarkable results he is getting on his crystal set. It seems that he is very much concerned about being told that his results are due to bulb sets near where he has his set.

I have experimented with the crystal set for the past year and have made one that gives the same results. I have tested this in the country four miles from a bulb set and find that I get better results there than I do in town.

My set is 3 inches wide, 7 inches and 2 inches deep. I use a double coil primary and secondary, a 10-point wave length control switch, a crystal detector, a phone condenser and four binding posts, all mounted on a hard rubber panel. I do not use any amplification. I can use two and three sets of phones on this outfit. I get the following stations regularly and very clearly:

WGY, Schenectady; KDKA, Pittsburgh; WWJ and WCX, Detroit; KYW and WAAF, Chicago; WSB and GYM, Atlanta; WHB and WDKF, Kansas City; WOC, Davenport; WSY, Birmingham; WOH and WLK, Indianapolis.

Other stations I have heard are WKAF, Wichita Falls; WFAA, Dallas; KSD, St. Louis; WKY, Oklahoma; WLAG, Minneapolis; WLW, Cincinnati; WCR, Buffalo; WWZ, New York; WOR, Newark; WBAP, Fort Worth; WBAX, WilkesBarre, Pa.; WWX, Washington.

My aerial is 2 wires, 50 feet long, 25 feet high. To get results one must have a good coil, good aerial, the best crystal and good phones.

I know that a crystal set does not have to depend on a nearby bulb set for results. All connection in the aerial and set should be soldered.

* * *

135 Stations Heard

From Edward Coffman, Quincy, Ohio

HERE is a list of DX stations received by me in the last 2 or 3 months which I think will compare favorably with that of B. L. McBride of Winchester, Tennessee, whose record was given in RADIO WORLD of January 6. I use a single detector bulb with a tuning coil (single winding, not sec-

An "Ad" Plan That Hit
Radio Distributing and Auto
Supply Co.TEL. COLUMBUS 8584
64 West 68th StreetRADIO WORLD, 1403 Broadway
New York City.

New York, December 29th, 1922.

Gentlemen:—In starting our business as a retail distributor of radio goods, the writer had placed some advertisements in RADIO WORLD, while connected with another company, and was so impressed with your pulling power as an advertising medium that the suggestion was made that we advertise only in RADIO WORLD.

Our plan has been, as you know, to take a column one week, giving an itemized list of our offerings with prices, and on the following week to take but three- or four-inch space, mentioning but one or possibly two special items.

Although our store has not a particularly good location, our advertising has not only proved highly profitable but has resulted in sufficient mail order business alone to give us a handsome profit from our advertising in RADIO WORLD. Therefore, we take pleasure in telling you that we have found RADIO WORLD to be a most profitable advertising medium.

Very truly yours,

RADIO DISTRIBUTING & AUTO SUPPLY CO.
B. K. OWEN.

WALCON

Radio Frequency Transformers

Brings in distant stations on a loop—perfect reproduction. No distortion.

THE BEST YOU CAN BUY

WALCON Transformers are tested and guaranteed. Particularly adapted for use with W.D.11 tubes.

Four new hook-ups, including a new reflex circuit furnished without charge with each transformer.

Price, \$4.00. We pay postage.

Dealers and jobbers: Write for our attractive sales proposition, backed by national advertising.

Manufactured by

THE RADIO CENTRE, 2 W. Broadway, N.Y., N.Y.

De Forest
HEADQUARTERS
 Complete Stock—All Sets,
 Parts, Tubes, Accessories.
 Reliability—Service—Co-operation
Radio Stores Corporation
 Distributors
 270 W. 34 St., N. Y. City. Longshore 10110-9219



It's the contact that counts

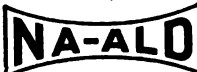
The special phosphor bronze clips of the Na-ald W. D. 11 Socket maintain perfect contact regardless of any variation in tube prongs and bases. Moulded from genuine Condensite, these sockets are made for use with the famous W. D. 11 tubes, operated by a single cell battery.

The Na-ald De Luxe V. T. Socket is of highest quality throughout. Its laminated phosphor bronze strips press firmly with a side wipe action on the contact pins, keeping surface clean and insuring perfect contact.

These sockets retail at 75c each

Send stamp for dial, small-space socket, condenser and R. F. Transformer circulars.

ALDEN-NAPIER CO.
 Dept. L, 32 Willow St.
 Springfield, Mass.



GERMAN SET

With Seibt Condenser, WD 11 Socket, A & B Batteries and Phones. Special\$15.00

This set can be made into Wave Meter for Calibrating, Transmitting or Receiving Set. Diagrams given with set.

AEROPHONE SET

Complete Crystal Receiving Set, with Phones. Coil mounted on base. Special..\$12.35

- Cardwell All Wave Coupler.. 7.00
- WD 11 Sockets35
- WD 11 Adapters60
- U T Sockets, Moulded..... .15
- Pathe Dials, 2"35
- Pathe Dials, 3"50
- Pathe Dials, 4"60
- Variable Condensers, 43-Plate 1.35
- Baldwin Variocouplers 3.75
- Baldwin Variometers 3.50
- Emco Variometers 6.00
- Emco 180-Deg. Variocouplers 5.20
- Columbia Moulded Variometers 3.75
- Back Mounting Inductance Switches75
- Mu Rad Radio Frequency Transformers 3.80
- Jefferson Radio Frequency Transformers 4.20

American Radio Stores

235 Fulton Street (mail orders)
 1927 Broadway New York City

"Setting You Right"

IN RADIO WORLD, dated January 13, page 23, we published a hook-up of the Reinartz circuit, in answer to an inquiry by C. W. Stewart. An error was made in connecting up the first rheostat.

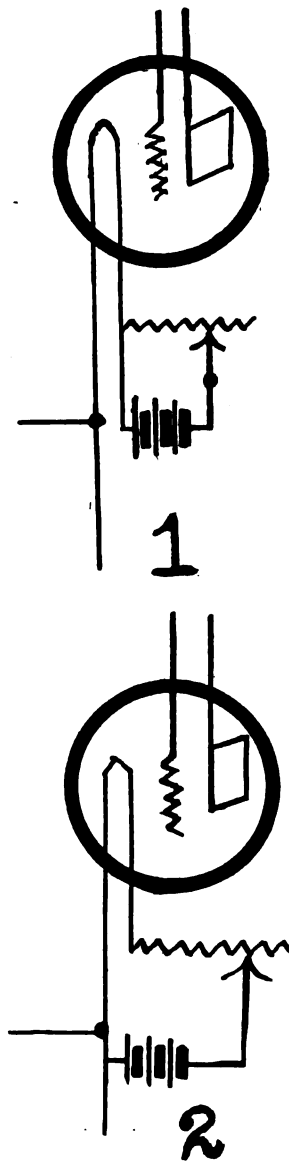


Figure 1 shows how it appeared in the original sketch, which, you will notice, short-circuits the A or filament battery.

Figure 2 illustrates how it should have appeared. Any one hooking up this set as it appeared will undoubtedly have noticed the error.

We Want Your Name

on a postal card. We would like to get the name of every RADIO WORLD reader; as we expect to send out a special message to our readers. It will interest you. Be sure to send us your name on a postal card, and address it GIFT DEPT., RADIO WORLD, 1493 Broadway, N. Y.

PHONES

Western Electric \$15.00 Type, \$9.00
 FEDERAL, \$8.00 type, \$5.00

RADIO DISTRIBUTING & AUTO SUPPLY CO.

64 WEST 66th ST. NEW YORK CITY

Phone Columbus 8584

See Adv. Next Week's RADIO WORLD



CRYSTAL RECTIFIER

MULTIPOINT

(Patent Pending)

A Synthetic CRYSTAL DETECTOR sensitive over its entire surface

Eliminates all detector troubles. Extraordinary clearness and volume. Endorsed by radio experts and press. Sold in sealed packages only. Join the ever-increasing Rusonite fans.

Price, postpaid, mounted 50c

Sensitiveness guaranteed

RUSONITE CATWHISKER

14-Karat Gold Multiple contact. 25c

Supersensitive..... 25c

Order from your dealer or direct from us. Rusonite Products Corp., 21 Park Row, N. Y.

YOU DX HAMS!

Have you seen the hook-up with complete panel layout in full size and all constructional details in RADIO WORLD No. 43, dated Jan. 30?

This hook-up actually goes out and drags the distance in, and lays it at your table.

It's a wonder! Can't be beat!

Even if you never have made a set yourself, you can do it now.

All that is necessary is to lay the full-page diagram of the panel on your own panel and drill and mark your holes. Simple, isn't it?

If you haven't this copy, send 15 cents to Radio World, 1493 Broadway, New York, N. Y., and copy will be mailed you. Or start your subscription with that number.

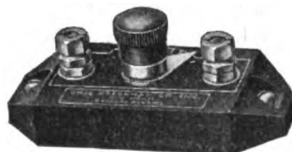
No Free List

To many anxious inquirers: RADIO WORLD has no free list. One copy sent as a voucher to each advertiser advertising agent represented in current issues. All other copies are paid for by subscription or through the news trade.

These FRESHMAN PRODUCTS

Especially adaptable for use in the new

FLEWELLING Super Circuit



VARIABLE GRID LEAK

with .006 mfd. MICON Tested Mica Condenser \$1.00

Without Condenser 75c

CHAS. FRESHMAN COMPANY, Inc.

97 Beekman Street, New York

The Home of MICON and Antennella



MICON
 Tested Mica
 CONDENSER .006

\$1.00

At your dealers—otherwise send purchase price and you will be supplied without further charge.

SEND ME YOUR PHONES
for repairs. All makes. Satisfaction guaranteed. Reasonable charges.
Box, 101 West 42nd St., New York City

Guaranteed Merchandise
6 Volt Detector Tubes.....\$3.00
Amplifiers.....\$3.00
Large Variometers.....\$3.00
Couplers, 14 taps, pigtail conn.....\$1.50
45 Volt "B" Batteries.....\$1.75
55M Volt "B" Batteries.....75c
Cash With Order
STANLEY RADIO SUPPLY CO.
125 East 32nd Street New York

SPECIAL OFFER
For a limited time only.
Fusagon RA-10...\$95 Grobe CR-5.....\$90
Fusagon DA-6... 55 Grobe ROEK.... 65
Price F.O.B. Red Bank, N. J.
A. V. GREGORY
45 Broad Street Red Bank, N. J.

RADIO TOOL SET
Slide Cutting Plier
Long Nose Plier
Two Screw Drivers
Electrician's Knife
Two screw Files
\$4.00 in Bag
With Soldering Iron Kit...\$4.75
With Automatic Torch...\$6.00
Send Money Order
CEB CO., 100 Park Place, New York City

A Set That's a Little Different

EDITOR, RADIO WORLD: Frank S. Myers, in RADIO WORLD, No. 42, dated January 13, requests that the fans tell something about the parts of their sets. Also C. White, consulting engineer, has an article entitled "To the Radio Amateur with Little Money to Spend."

This is an answer to both. My set is a three-circuit regenerative, single tube, vario-coupler and two variometers. These coils are wound on tubes made of blue plasterboard and glue. The wire is of three different sizes, as I used scraps of what I had on hand.

The leads from the rotors come out through copper tubes. This tubing is from the cooling system of an automobile. The knobs are spools from a "Tinker Toy" set. The dials are "Little Wonder" records. The switch blades are made from the case of an old alarm clock. The points on both inductance switches are brass-head tacks, and on the other switches are copper rivets.

I have two variable condensers. One is made from a patent-medicine sign. It has two sets of leaves that intersect with a sliding motion, operated through the panel by a rod from the ever useful "Tinker Toy." The other is of the same type, but is made from old negative plates covered with tin-foil. There is no body capacity to these.

Both have a vernier made of sheet iron and tinfoil.

The by-pass condenser is of mica and foil between two pieces of hard rubber—part of a broken photograph tray. The grid condenser is of waxed paper and foil from a Ford coil. The variable grid leak is of hard rubber from the photograph tray. It consists of a switch lever with hole drilled in end, with short piece of pencil lead inserted. This lever makes its own pencil mark. The rubber base should be sand-papered so it will hold the lead. The leak is connected to a three-point switch, which connects it with the coupler in the usual place, or with the filament or plate. Another switch—four-point—varies the voltage from the B battery. The detector tube is only five inches behind the coupler, and the B battery is on a shelf on the panel, so all these connections are short. Still another switch connects the negative side of the B battery to either the negative or positive side of the A battery.

By connecting the leak to the filament and the B battery minus to plus on A battery, reducing the B voltage, and burning filament very hot, distant stations are brought in with great increase in volume. I got hold of a 12-volt storage battery that had been thrown away, from which I got sufficient plates to make three fairly good cells. It has had no attention, except a little rainwater, in nearly two years. It is charged from a 220-volt D-C line, through 190 ohms resistance. I often use the set while the battery is charging.

My vernier rheostat is wood—one of those little hoops, 5 inches in diameter, which women use for fancy work.

A single German silver or other resistance wire is wound on the outer circumference. The total resistance is about ¼ ohms. It gives a fine adjustment.

The panel is part of the footboard from an old bedstead. It is very large, as I need room to try out different circuits. It is covered with foil on inside and grounded. My aerial is one wire, 130 feet long and about 38 feet high. I frequently use a small loop in plate circuit.

With this set I get about all that is worth hearing east of the Rockies—from the call of the North to PWX; from Denver to Boston. I have never heard from the Pacific Coast, but I never listen in after 11 p. m., Central Time. I once heard some phonograph records from Boise, Idaho.

If I get a station at all I get it with good volume. I have never tried to see how many stations I could get in one night, nor have I kept count of total number received; but it is not less than eighty.

I am claiming no records. I give all credit to our splendid broadcasting stations. I wish I could find words to express my appreciation of them. This may be of help to some beginner with limited means, and who lives where it is hard to get supplies.—F. Onderdonk, Calera, Alabama.

Another Voice for Mr. Lindstrom

EDITOR, RADIO WORLD: I have been in the radio game since Coherer days, or about 1908-1909. As a rule I don't mix in these novice discussions, but happened to notice, in RADIO WORLD, No. 42, dated January 13, the challenge given Arthur Lindstrom, of Baraboo, Wisconsin, by Mike Podhorn, of Wood River, Illinois. I don't

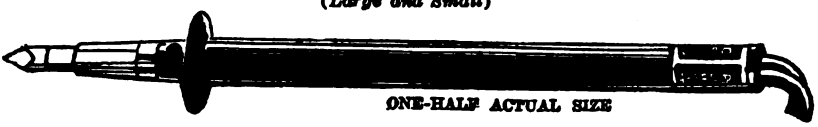
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(Continued from preceding page)

see why Mr. Lindstrom's record should be questioned. I live about 35 miles from Baraboo. And even listeners with single-circuit receiver and detector are only getting phone stations on both coasts and from the Texas stations to Winnipeg and Regina.

I get all the large eastern and southern stations; and, while I don't get Los Angeles and San Francisco every night, still I get them a couple of times a week. I use a three-circuit regenerative, short-wave tuner and also a single-circuit 200-3,000 meter set. I get these results with either receiver hooked to a two-stage amplifier, the only difference being that the three-circuit set is a little more selective. I use an L type, two-wire antenna, 65 feet long, 55 feet high at one end and 35 feet at the other. My hook-ups are standard.

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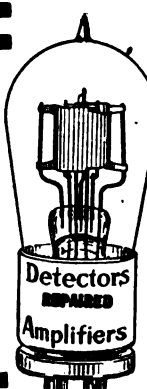
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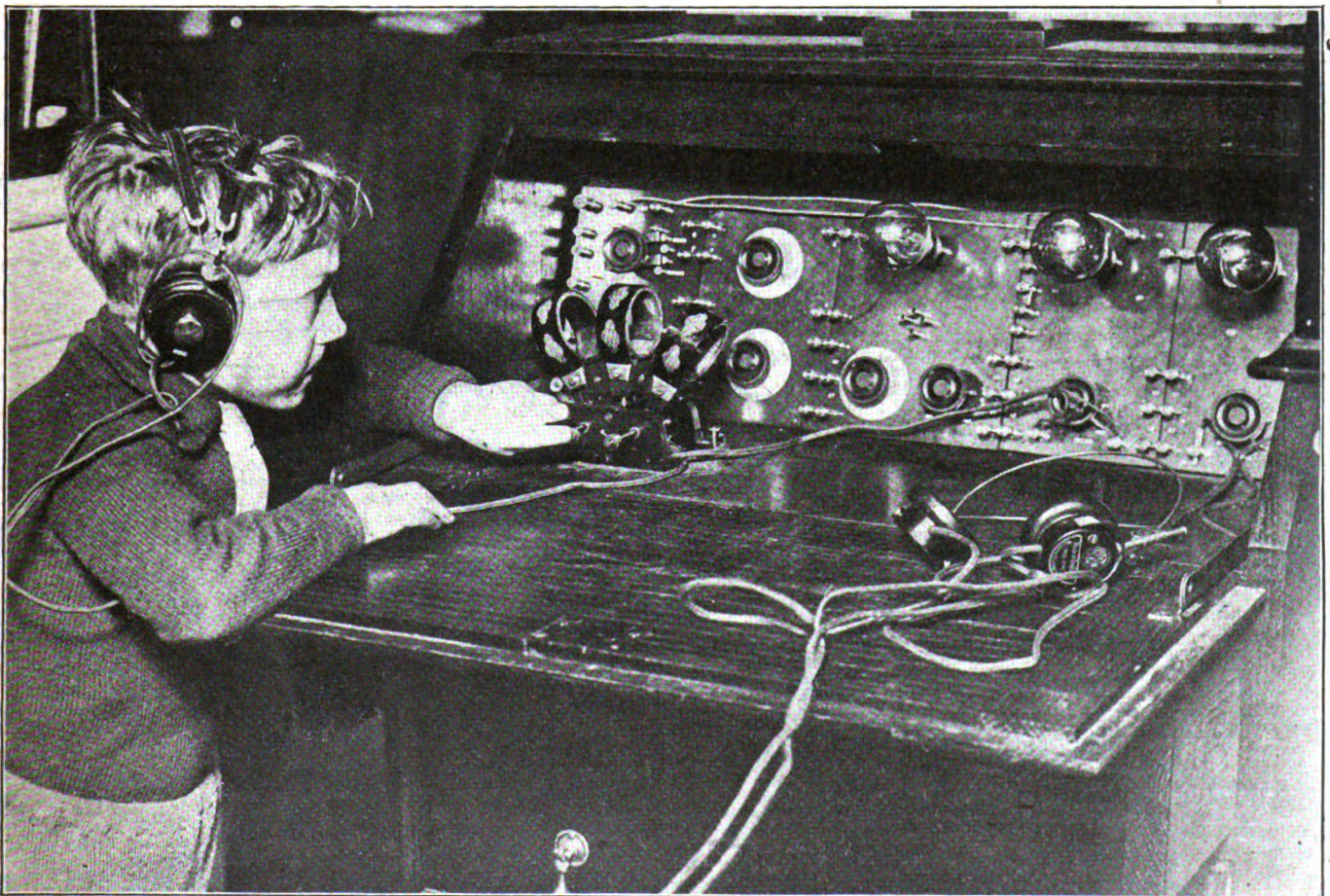
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Wave Length, 150 to 3,000 Meters

DO NOT BE CONFINED to listening in on the nearby stations when the "ALL WAVE" COUPLER in your set will enable you to listen in on broadcasting stations

THOUSANDS OF MILES DISTANT

BE PREPARED FOR THE HIGHER WAVELENGTHS THAT HAVE BEEN AND WILL be allotted to broadcasting stations because of their ever-increasing number.

COMBINES SIMPLICITY OF ASSEMBLY with EFFICIENCY OF RESULT

inasmuch as it eliminates all Variometers, Variocouplers and Loading Coils.

Price \$9.0 Guaranteed with an absolute money back guarantee to operate as advertised.

6 EFFICIENT HOOKUPS SENT UPON RECEIPT OF 10 CENTS TO COVER COST OF MAILING.

Capitol Phonolier Corporation



Patents Granted

60 Lafayette Street
 New York City

SERVICE QUALITY STANDARD RADIO LOW PRICE RELIABILITY

All Goods New, in Original Packages
RELIABLE MERCHANDISE FIRST, THEN PRICE
SOME OF OUR BARGAINS

TUBES

W. D. 11-1½ Volt	\$6.50
U. V. 200 Radiotron	4.00
U. V. 201 Radiotron	5.25
Navy V. T1	6.50
Navy V. T2	7.50
201A	8.50
DeForest	5.75

PHONES

\$16.00 Baldwin Type C 4800 ohms...	\$9.00
8.00 Holtzer Cabbott 2200 ohms.....	4.25
5.00 Murdock 2000 ohms	3.90
8.00 Federal 2200 ohms	4.50
6.00 Bannard 2200 ohms.....	3.75
8.00 Dictograph 3000 ohms	5.25

VARIOMETERS

\$6.00 Baldwin	\$4.50
9.00 "Capitol" All Wave	7.50
8.00 Emco Moulded	5.75
8.00 Helman Moulded	6.00
5.00 Pathe Moulded	3.75
Couplers to Match	

VARIABLE CONDENSERS

\$3.00 23-Plate Plain	\$1.25
5.00 48-Plate, A. B. C.	2.50
4.00 23-Plate, A. B. C.	2.00
6.00 24-Plate Vernier	4.75
7.70 46-Plate Vernier	5.25
.0005 DeForest Balanced	4.75
Others	

RHEOSTATS

\$1.00 Framingham	\$.50
1.25 Ameco .....	.75
1.50 With Dial .....	.75
3.00 Radio Corp.	2.25
1.00 Cutler Hammer .....	.80

LOUD SPEAKERS

\$20.00 Dictograph	\$13.50
25.00 Cleartone	9.59
45.00 Magnavox	34.00
22.50 Baldwin	14.00

Space will not permit us to list all our special values, therefore we will gladly quote special prices on any Radio Parts or sets you may want.

Reliable merchandise first, then price. We will refund, at any time, for Radio material purchased from us which is not up to standard and as represented. No Checks. No C. O. D. Add Parcel Post. Reference: Radio World.

BROOKLYN RADIO SERVICE CO.

577 MYRTLE AVENUE. Phone Prospect 2952-8168. BROOKLYN, N. Y.

Unit System Is Good

Eventually the experimenter will be weaned away from his too-often crudely made set and will have a desire to own an outfit which can be shown with pride to visitors, says the *New York Globe*. One course to follow is to purchase a cabinet set in one or two large sections. The other is the acquisition of units from which a complete receiver may be assembled. The unit system has certain advantages.

With the unit system the purchaser starts with the simple outfit which his purse will afford. It may be only a variocoupler and tube detector. On each unit there are but a few binding posts, usually four. The aerial and ground are connected with two of the posts on the coupler and then the detector is brought into the circuit by neat connectors looping between the two units. Later on, the set can be made regenerative by adding a third unit, comprising a variometer. Another set of "jumpers," or connecting wires, and the alteration is complete. If the units are selected from one make, the cabinets will agree in size, shape and finish, and no matter how many are added the effect is always an agreeable one.

The one objection to this system at first thought would be the space taken up by a string of individual cabinets. But fortunately the units may be piled one upon another to economize space. A very neat and efficient station may be put together by pyramiding the units.

Amateurs Enter Code Speed Contests at Fair

MANUFACTURERS of radio apparatus and amateur wireless fans are attending the Contests at the Permanent Radio Fair, Hotel Imperial, New York City, which are running from January 29 to February 17. These contests are open to amateurs and no entrance fee is charged. Leading manufacturers are giving radio sets and equipment for the prizes in the various classes. There will be first, second and third prizes and additional ones for those receiving honorable mention. The main feature of the competition is the code-speed contest which is held daily from 4:45 to 5 P. M. Radio engineers and experts have been selected as judges of all classes.

An "Ad" Plan That Hit Radio Distributing and Auto Supply Co.

TEL. COLUMBUS 6534
 64 West 66th Street

RADIO WORLD, 1483 Broadway
 New York City.

New York, December 29th, 1922.

Gentlemen:—In starting our business as a retail distributor of radio goods, the writer had placed some advertisements in RADIO WORLD, while connected with another company, and was so impressed with your pulling power as an advertising medium that the suggestion was made that we advertise only in RADIO WORLD.

Our plan has been, as you know, to take a column one week, giving an itemized list of our offerings with prices, and on the following week to take but three- or four-inch space, mentioning but one or possibly two special items.

Although our store has not a particularly good location, our advertising has not only proved highly profitable but has resulted in sufficient mail order business alone to give us a handsome profit from our advertising in RADIO WORLD. Therefore, we take pleasure in telling you that we have found RADIO WORLD to be a most profitable advertising medium.

Very truly yours,

RADIO DISTRIBUTING & AUTO SUPPLY CO.
 B. K. OWEN.

VOLUME TWO OF
RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879.]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

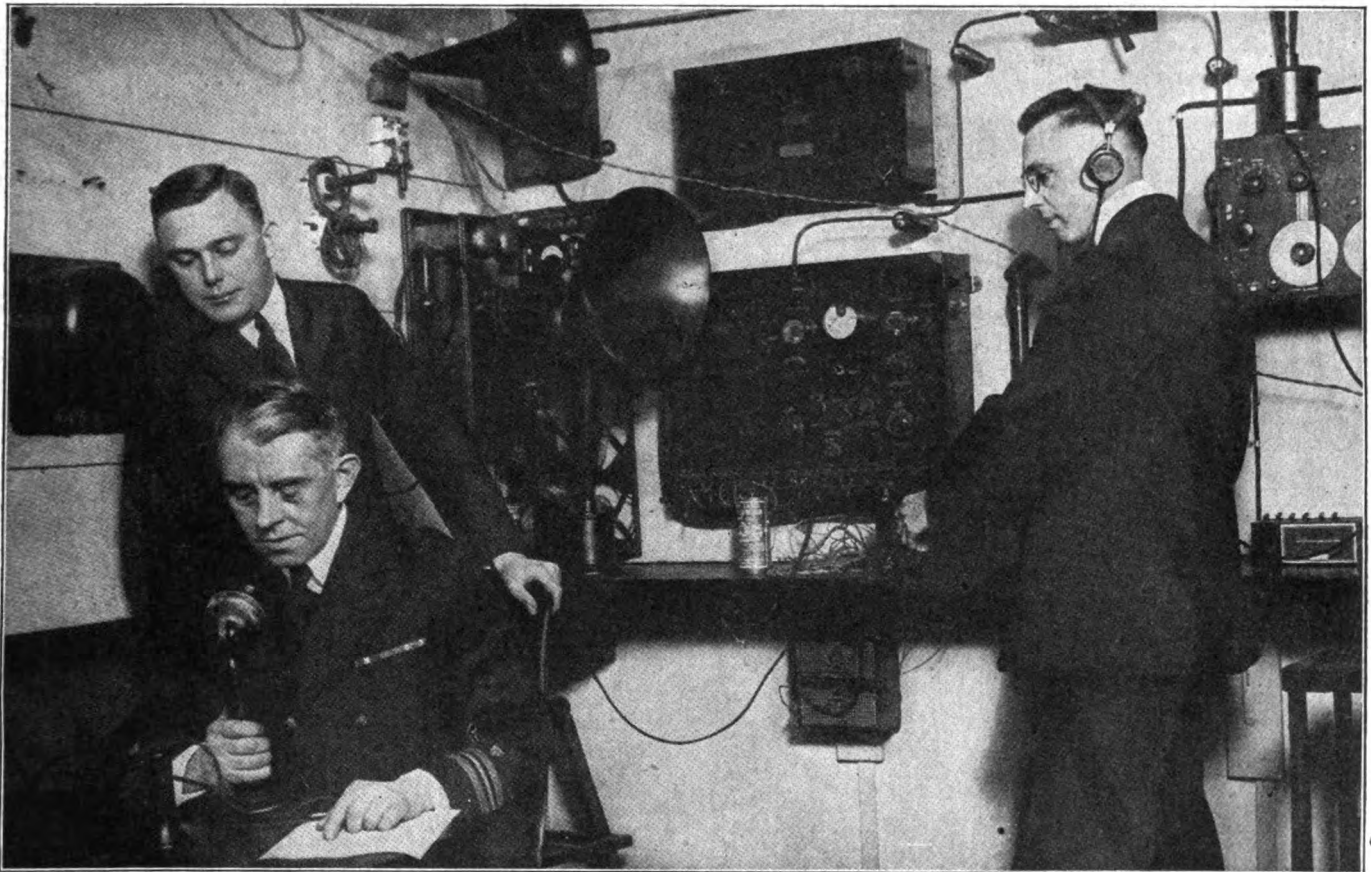
Vol. II, No. 20. Whole No. 46

February 10, 1923

15c per copy, \$6.00 a year

Coast Guard Uses Radio to Keep in Touch with Headquarters

By Harold Day



(C. Harris & Ewing)

Bootleggers and smugglers beware! The U. S. Coast Guard now get orders direct from naval headquarters in that zone by means of broadcasting stations. This photograph illustrates a typical installation used to relay the broadcast.

THE headquarters of the U. S. Coast Guard is using a unique method for distributing news of its service by means of radio. The tales of heroic rescues at sea by the world famous U. S. cutters are broadcast by means of the ordinary telephone connected through the Naval Air Stations at the various naval bases throughout the United States. The method pursued in this is as follows:

In the radio room at headquarters, there is an operator who is always

listening in, and any news of the Guards is thereby immediately broadcast direct from the base. The photo illustration on this page shows Captain F. C. Billard, aide to the Commandant, broadcasting, while Lieutenant F. A. Zensler is getting the news right off the ship making the rescue, or chasing the pirate, whichever the case might be.

As there is considerable difference in both the wave length of the station broadcasting and that on which the news is received from the

cutters, there is no interference. The method of broadcasting is much the same as that used when a concert is to be broadcast from a concert hall. A special land wire is connected to the larger station, and the operator at the receiving end, through the agency of a regular telephone, broadcasts the message.

This also allows the department to keep in constant touch with the various cutters lying off the coast and to give orders direct from naval bases to fleet commanders.

A New and Novel Spider-Web Tuner

By Arthur S. Gordon

ON the whole, spider-web tuners are not as popular with the radio amateur as they ought to be. Perhaps this unpopularity is due to the reluctance of the amateur to desert the easily made single layer solenoid coil, but the fact remains that while the solenoid coil is easy to wind, it does not do the work as it should. Seeking

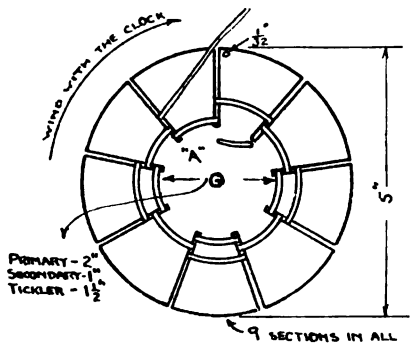


Fig. 1—Sketch and dimensions of the discs needed for the construction of this tuner. Also an indication of how to begin the winding.

for more compact forms of inductance with the maximum of efficiency, experimenters evolved the honeycomb, the bank-wound, stagger-wound and "spider-web" coils. Waiving discussion of the others, this article confines itself to the construction of a "spider-web" tuner, one that has been adapted to the needs and purposes of even the "fussiest" radio enthusiast.

Two novel and original features distinguish this tuner. These features add heaps to the efficiency of the coils without adding to their constructional difficulties. Having the necessary three coils, for example, all containing widely different numbers of turns, wound on the same size form is an improvement which will appeal to any one who has discarded spider-web tuners on

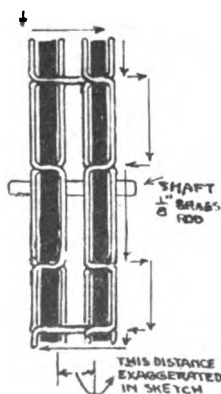


Fig. 2—This new "duo-vertical" winding is easy to follow and works as good as it looks.

account of the great size of the largest coil. This is one feature. The other is the universal motion of the movable coils, that is to say, they not only move toward and away from the stationary coil, but they also swing to and fro in front of it, like the pendulum of a clock.

Spider-web coils are sometimes called pancake coils, because they are wound in circular lines on a flat form. Sometimes the forms themselves are called pancakes. In the tuner described herewith, four pancakes are needed, one for the primary coil of 35 turns, one for the secondary of 50 turns and the other two for the specially wound tickler coil, containing 80 full turns.

These pancakes are made preferably of hard rubber, bakelite, formica, radion, or any good composition sheet. The thickness is not particular, but should be more than 1/8 inch. Heavily shellacked cardboard, while not the best material in the world, will serve. The four discs should be cut 5 inches in diameter and each drilled in the center with a 1/8-inch hole. Mark the primary disc "A," the secondary "B" and the ticklers "C" and "D." Each form is to be divided in nine sections, separated by saw-cuts as shown in Figure 1.

In the case of disc "A," the center is to be 2 inches in diameter; in "B," the center is to be 1 inch in diameter, while in "C" and "D," the tickler coils, the centers are to be 1 1/2 inches. These dimensions have been carefully worked out so that each disc will take just the number of turns it is designed for.

Using No. 22 S. C. C. copper wire, wind 35 complete turns on form "A." Holding the disc so that the mark is facing you, wind in a clockwise direction, that is, from left to right, or with the figures of a clock. Weave the wire in front of and behind the cut out sections alternately, as in Figure 1. To help in beginning and ending the winding, drill or punch two small holes in the form, suitably placed. For 35 turns of this disc there will be required 29 linear feet of wire.

Disc "B" is also wound in a clockwise motion, with the mark on the form facing you. Because the inside diameter is an inch smaller, fifty turns can fit on this disc with ease. Forty-four linear feet of wire are needed.

If the 80 turns required in the tickler coil were wound on a single

form, the disc needed would measure 7 1/2 inches in diameter. To avoid having such a coil, experiments were conducted with "duo-vertical" or co-wound coils, with the result that such a winding was found to be utterly practical and highly efficient. It not only cuts down the

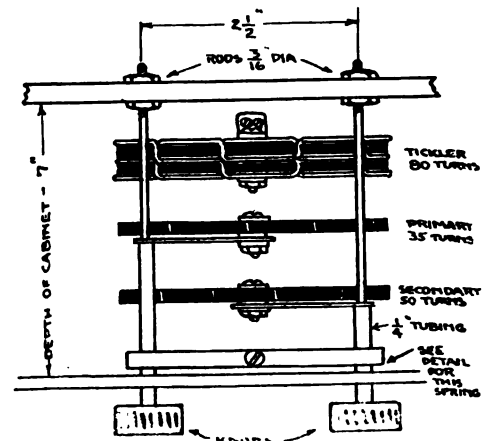


Fig. 3—The top view of the variocoupler, illustrating the method of mounting so that universal motion for the coils is obtained.

size of the coil and increases the ability of the tuner, but it also opens up a new field for amateur endeavor by opening the path to better and better tuning devices in our radio receivers.

Take discs "C" and "D," put them side by side on a temporary shaft so that the marks are facing you, and insert a 1/4-inch washer between them for spacing. Begin winding as before on the disc nearest to you and make one complete turn. Then, instead of continuing on that disc for the second turn, cross over to the other form and make one complete turn. (Continued on next page)

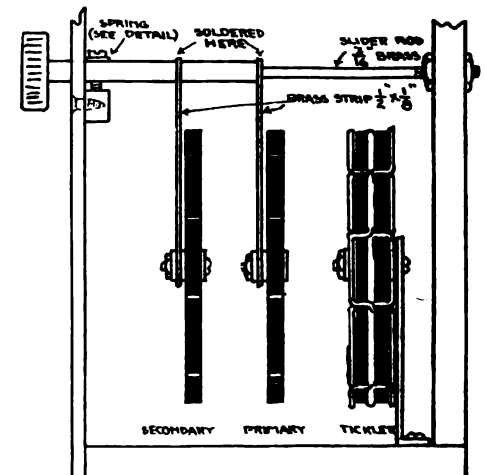


Fig. 4—Side view of the coupler showing manner in which it is mounted on the panel. The tickler is stationary, being fastened to the base.

Latest Additions to Dry Cell Tube Family

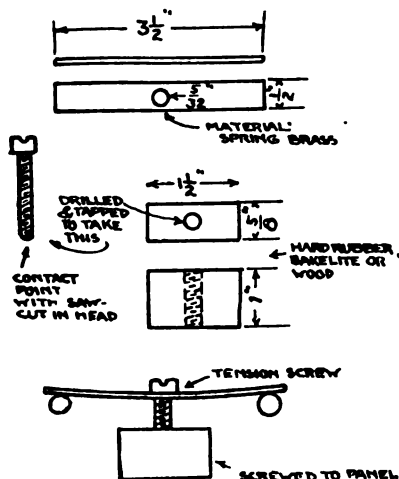


Fig. 5—Details of the tension spring, which is used in the tuner described in the article, to keep the coils in place and prevent their jamming.

(Continued from preceding page)
plete turn on it, still keeping the marks facing you and winding in a clockwise direction. Then come back to the first disc, make a second turn, return to the other form and so on until eighty turns, or 70 feet of wire, have been wound on the double form. (See Figure 2.)

In buying wire to make this tuner, 1/2 lb. of No. 22 S. C. C. will be enough and to spare.

This duo-vertical winding described above is easy. The only point about which to be careful is to see that if the wire crosses in front of a section on one turn, it crosses in back on the next. In other words, keep the spider-web idea firmly in mind. What you are doing in this new form of winding is merely making two spider-webs side by side.

Soak the three coils in hot paraffine. Then turn your attention to the cabinet and to the suggested means of mounting the coils so as to form an efficient tuner.

I believe that I am not alone in thinking that the movable coils in a vario-coupler should move in more planes than one. In other words, the coils should be mounted so that they can not only swing to and fro in front of the stationary coil, but also toward and away from it at the same time.

The simplest and easiest way to affect this universal movement is shown in Figures 3 and 4. Figure 3 looks down on the assembled tuner from the top of the cabinet, while Figure 4 gives a side view. It is seen at once that the heaviest coil, which would manifestly be the hardest to handle on a knob and shaft, is stationary and placed well near the back of the cabinet to make room for the other coils. This heaviest coil is the "tickler" and it is so mounted that the marks "C" and "D" are facing the panel.



(C. Kadel & Herbert)

Two new vacuum tubes that can be used equally well as detectors or amplifiers and that operate on one dry cell are the latest radio development. They are the most economical tubes for current consumption. On the left is seen the ordinary U. V. 201, an amplifier. Next is the U. V. 201A, a dry cell tube that consumes very little current. Next is the U. V. 199, which consumes but one-tenth of the current of the 6-volt tube.

In fact, all three coils are facing the panel when the tuner is finished. Being careful in this regard insures that all the turns are going in the same direction.

The primary (coil "A" of 35 turns) is next in line. It is fastened to a brass tube by means of a heavy brass strip, 1/2 inch wide. This brass tube fits over and slides on a brass rod, which reaches from a little in front of the panel to the back of the cabinet, where it is bolted to keep it in place. At the end of the tube is a knob. By turning this knob, the primary coil is made to swing; by pulling or pushing on it, the coil is made to approach or retreat from the tickler. That's the way to mount a tuner, what?

The secondary is mounted the same way, the brass rod which

serves as a slider being 2 1/2 inches away from the similar rod for the primary. Here again we have the universal motion.

It is evident, however, that without a pressure of some sort to keep the coils in place, they would hang vertically from their respective rods. Such pressure is provided by a tension spring, details of which are shown in Figure 5. It needs no further explanation, excepting to say that spring brass isn't absolutely necessary, although desirable. A good heavy piece of plate brass will do. The spring is mounted, as shown in Figures 3 and 4.

In using a three-element tuner for the first time, place all the coils in line about an inch apart and turn on the filament of the tube until regeneration sets in. Then adjust the variable condenser until you hear the carrier wave of a CW transmitter, code or phone, as the case might be. Then move or swing the coils—first the secondary and then the tickler, until the maximum strength and volume of signal are reached. Then clear out the interference with the rheostat or variable and the code or speech ought to come through loud and clear.

This tuner may be used in a great variety of hook-ups, and in connection with either the six volt or the volt and one-half tube. For the convenience of the amateur, two suitable regenerative hook-ups are given in Figure 6.

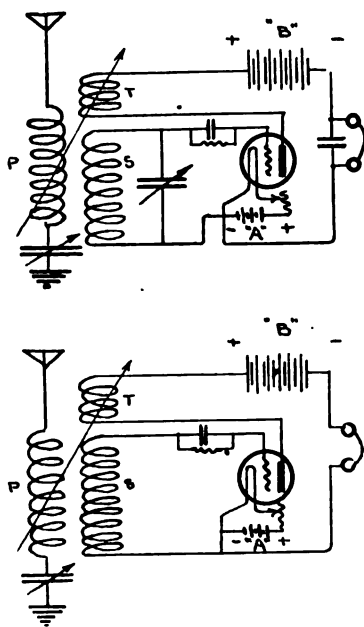


Fig. 6—Two hookups with which the three element spider-web tuner may be employed. Both are regenerative hookups and are standard.

Radio World, 52 issues, \$6.00.

Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

National Radio Chamber of Commerce Plans Nation-Wide Campaign

SWEEPING reorganization of the National Radio Chamber of Commerce, linking up, as active workers in a nationwide plan to wipe out the evils of broadcasting and to solve other radio problems, every major interest of the radio industry and the public, is announced by President William H. Davis following a meeting of the Board of Governors at the Chamber's headquarters, 165 Broadway, New York City.

The governors adopted a new constitution providing for the admission to membership, either directly or through regional chambers of commerce, of individuals, including the audience or the listener, manufacturers, jobbers, dealers, broadcasters, amateurs, the press, and organizations and institutions interested in radio, comprising educational, scientific, religious, civic, political and other bodies.

"Interference and the broadcasting of the trivial and the valueless have injured the business and unless remedied may ruin it," it was declared in a report of a special committee appointed to conduct a survey of the radio situation and to recommend changes in the organic structure of the chamber, whose membership at the outset consisted of manufacturers.

The committee was composed of Henry T. Hunt, general counsel of the chamber and late member of the Railroad Labor Board; George Lewis, secretary of the chamber; and Ralph C. Watrous, former Lieutenant-Governor of Rhode Island. Support and improvement of broadcasting in co-operation with the United States Government and other agencies were said to be the main object of the chamber.

"The Government of the United States is interested in radio from the standpoint

of national defense and public welfare," said the report. "Furthermore, radio is a public utility of interstate commerce.

"Congress has before it the White bill which gives the Secretary of Commerce power to make regulations controlling broadcasting. This bill may be enacted into law within six months. When the secretary shall have placed proper regulations in effect, interference will doubtless be reduced. However, neither the bill nor the regulations contemplated provide any support for broadcasting or any measure to improve its quality."

The committee found that there were many classes of activity in the radio industry. Broadcasters were ranged "between the profit seekers and users and belonging partly to both" in the report, which added:

"The broadcasting class comprises manufacturing companies broadcasting to support and extend their sales of apparatus, department stores broadcasting for advertisement, newspapers broadcasting for advertising and news purposes, schools, colleges and universities broadcasting for educational purposes, churches, co-operating with broadcasting stations, individuals broadcasting for their own amusement, and the broadcasting activities of the American Telephone and Telegraph Company carried on primarily as research and in preparation for whatever the future may develop.

"There are at present ineffective organizations of broadcasters, ostensibly national in scope, but not including the principal broadcasters, as, for example, the Radio Broadcasting Society of America, which includes some thirteen or more small broadcasters. In this field some

sort of cooperation is compulsory in the nature of things. Further cooperation has been brought about by the Department of Commerce."

Under the new constitution, both the membership and the aims of the chamber, now organized to function as a great central force in radio control and regulation, are broadened, according to a statement issued through President Davis, which said:

"It must be obvious that radio is to become a public service of the highest importance to the nation, both in peace and war. Therefore, an organization designed to further its development and coordination should be democratic, inclusive of all branches and representative of each section of the United States."

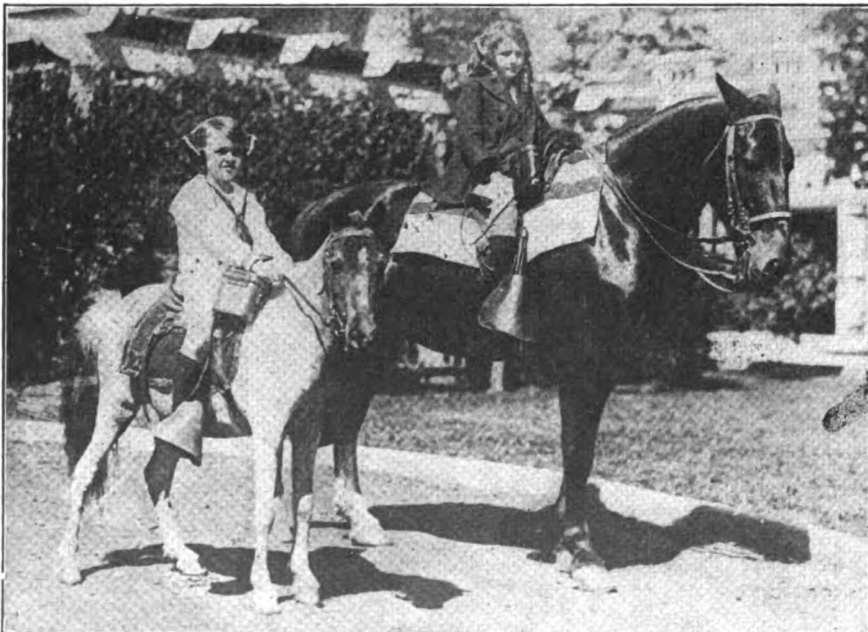
A vital element in the chamber's plans is the establishment of regional radio chambers of commerce in the principal cities of the countries to be coordinated with the national chamber in New York and with local chambers.

Kenneth P. Gregg, one of the engineers and managers of the chamber, reported that steps had already been taken to organize chambers in the middle west and that local interest in national radio organization was developed, particularly in Chicago, Milwaukee, Minneapolis and St. Louis. Many groups interested in radio, including colleges and universities and the churches, he said, were studying plans for cooperation with the chamber, which, he asserted, "is destined to be a tremendous force in promoting the general welfare of the radio industry and through it that of the radio public."

The chamber, Mr. Gregg said, was co-operating closely with Secretary Hoover in the Department of Commerce efforts to nationalize the radio industry and with the movement sponsored by the Conference on Radio Standardization.

Broadcasting map, 15c. That is, a complete broadcasting map appeared in RADIO WORLD, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

Never Out of Hearing Now



(C. Underwood and Underwood)

It is not necessary for dad and mother to worry, when Sally Sovereign and "Cyclone Billy" Sovereign, of Bay City, Mich., go on an afternoon's canter. When they are wanted at home, rather just picks up the transmitter, and calls them, by means of the compact receiving sets with which they are equipped. Dad, by the way, is an ardent fan.

Secretary Week's Defense of Harbord Is Endorsed

Secretary Weeks' defense of General Harbord, recently retired and made president of the Radio Corporation, has been endorsed by many officials. General Harbord's services to the Government as head of the American commercial radio service in the event of war would be invaluable; and the Government should not begrudge him his retirement pay, which some Congressman would cut off.

As amended, the Army appropriation bill provides that no officer, retired or in active service, employed by an organization doing business with the Government shall receive any of the funds it carries. General Harbord, as well as many officers in similar circumstances, would, if the amendment passes, receive no retired pay.

A study of the business conducted between the Signal Corps and the Radio Corporation reveals the fact that scarcely any business has been transacted for several months. Since the war it was not more than \$300,000 worth, when this organization was the only bidder. Today, however, the Signal Corps deals directly with the General Electrical, Westinghouse and other manufacturing companies, although the corporation reserves the right to bid. During the calendar year the Signal Corps purchased electrical equipment valued at \$1,475,000.

Radio Instruction for Army Now Fully Standardized

By Carl H. Butman

WASHINGTON, D. C., Jan. 29.—Radio has a very important part in the education of Army officers in communication, instruction in which important subject has recently been standardized.

A definite program of instruction in radio, as part of the schooling of all Signal Corps officers and other officers assigned for training from the Regular Army, National Guard, Reserve Corps and Civilian Military Training Camps, has been laid down by a Board of Army Officers.

The board, headed by Col. H. B. Fiske, and including Major S. M. Walmsley, Signal Corps, recently filed its report on Army Service Schools, including the Signal School at Camp Vail, N. J. Three communication courses are prescribed: The company officers' course, an advanced tactical and administrative course and an advanced technical course, all of which include the subjects of wireless and "wired-wireless."

The course for company officers includes approximately 1,309 hours of study for Signal Officers and 1,285 hours for officers of other arms. Courses extend over a period of nine months, commencing in September. Radio telegraphy and telephony covers a period of 180 hours and includes theoretical and practical instruction in fundamental electrical principles, spark sets, thermionic vacuum tubes, continuous wave sets, antenna systems, wave meters and other auxiliary apparatus, with special attention to Army radio sets. Tactical radio procedure is studied during 20 hours. This includes the principles governing the organization and operation of tactical radio nets for all arms, and the procedure essential to successful net operation. Other subjects pursued by the student officers include codes and ciphers, combat orders, electricity and magnetism, wire communication, code practice, message centers, etc.

Advanced studies in radio are prescribed in the tactical and administrative course for signal officers assigned to units larger than divisions. This is also a nine months course and covers study and instruction periods totaling 1,235 hours. The subject requiring the greatest time is the development of signal equipment, which

covers 300 hours. Radio systems of divisions and larger units requires 150 hours, and includes instruction on the tactical uses of the various radio sets furnished to Army combat units, the organization of such sets into nets and their operation. Instruction in the preparation of orders to signal officers of divisions, corps and armies such as the allotment of wave-lengths, call letters, and special sets is also given. Fifty hours is designated for the study of codes and ciphers, their design and solution.

Communication engineering, technique, equipment, design and development, is taught in the advanced technical course. During a total of 1,300 hours, divided into eight subjects, these technical officers receive instruction in vacuum tube theory, design of radio, equipment and other apparatus as affected by military conditions in the theatre of operations, construction and installation of radio systems for large units, and specific technical communication problems.

Fifty-six officers and 200 enlisted men are now studying radio at Camp Vail. Thirty-five are officers from various corps, 15 Signal Corps students, two Marine Corps, two Philippine Scouts and two Cuban officers. The enlisted men are studying to become operators and electricians.

After a year's operation, the Army Radio Service has now reached the point where it is operating on a paying basis, giving good service on all official communications in and out of Washington. While perhaps not comparable to commercial radio traffic systems, the Signal Corps radio traffic curve, the plotting of which began in January, 1921, has risen by about a thousand dollars a month. In December it reached the value of \$6,200 for the month. This is solely on official War and other departmental radio traffic between stations of the Army Radio Net; the Army handles no commercial or naval messages.

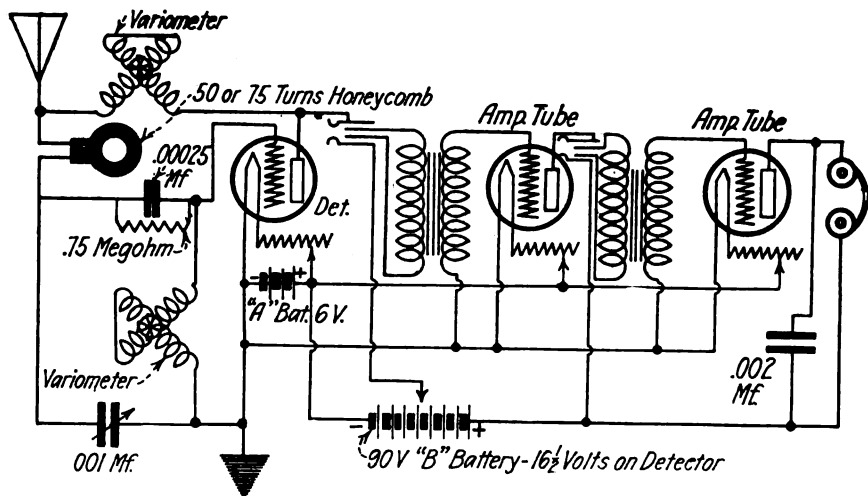
During December the returns for traffic handled, when figured at commercial rates, exceeded the costs for personnel and maintenance of the whole net, including sixty stations.

From Another Angle

From W. G. Caffrey, E. E., 78 Washington St., Reno, Nevada.

IN your issue of Jan. 6, 1923, you describe and illustrate a hook-up by C. White. I have been using a hook-up very little different from this almost continually for the last few months with splendid results. I get San Francisco, Los Angeles, Portland, Vancouver, Seattle, Calgary, Regina, Salt Lake City, Denver and Phoenix almost any evening. Several nights ago I got Minneapolis. Get local stations without aerial. My aerial is 4 wires, 120 feet long, 70 feet high; radius of reception, 1,000 miles; elevation of Reno, 4,500 feet; tuning done with .001 variable condenser, using a receiver, which is absolutely necessary. Variometer in plate circuit regulates loudness.

Enclosed is a sketch of my hook-up, using two stages audio-amplifiers. This in connection with a 14-inch Magnavox, fills the house with music.



Hookup with which Mr. Caffrey has obtained splendid results. Note stations heard by Mr. Caffrey with this circuit.

The Design of an Inexpensive Wave Meter

By C. White, Consulting Engineer

SCIENCE cannot advance any faster than the progress made in the perfection of its measuring instruments. It is very good to calculate, but it is essential that check measurements can be made to verify these calculations. In the field of radio measurements the wave meter stands supreme. Its uses are many, and the amateur who has one can constantly be performing many interesting experiments with his set. Along with the wave meter is the high frequency buzzer as an exciter. The two should be in the possession of every amateur who wishes to perfect his set in every detail. There are as many types and designs of wave meters as there are voltmeters and ammeters. The heterodyne or "zero beat note" method of measuring wave-length is looked up to as the most accurate and is used extensively in radio laboratories. For the average amateur the completion of such an outfit in his own home would be a difficult task, but the construction of one of the more elementary types is within the skill of all.

Next to the joy of actually making the wave meter comes the pleasure and satisfaction of being the designer of your own outfit. I shall endeavor to give a few outlines first

as to the method of design. As shown in Figure 1, the wave meter is nothing more than a tuning circuit containing an inductance in the form of a single layer solenoid, and a variable air condenser shunted across it. The crystal detector serves as a rectifier for the high-frequency waves, while the phones act as audible indicators. When the wave meter is in resonance with the circuit, the wave-length of which is to be measured, the maximum signal will be heard in the phones. Of course, if the meter is used to measure natural wave-lengths of circuits a buzzer will be necessary to excite the circuit, as shown later on in this article. The tuning inductance is fixed. The first thing to determine is the size of this inductance. Wind about forty or fifty turns of No. 22 D. C. C. magnet wire on a three-inch tube made of some good insulating fiber, taking care to keep the turns as close together as possible. After the coil is made one can actually determine by measurement and count the number of turns of wire per inch of length, which quantity we shall designate by the term N . Next, one can also measure the length of the winding in inches, which we shall call L . The diameter, D , is three inches, since we chose to wind on a three-inch

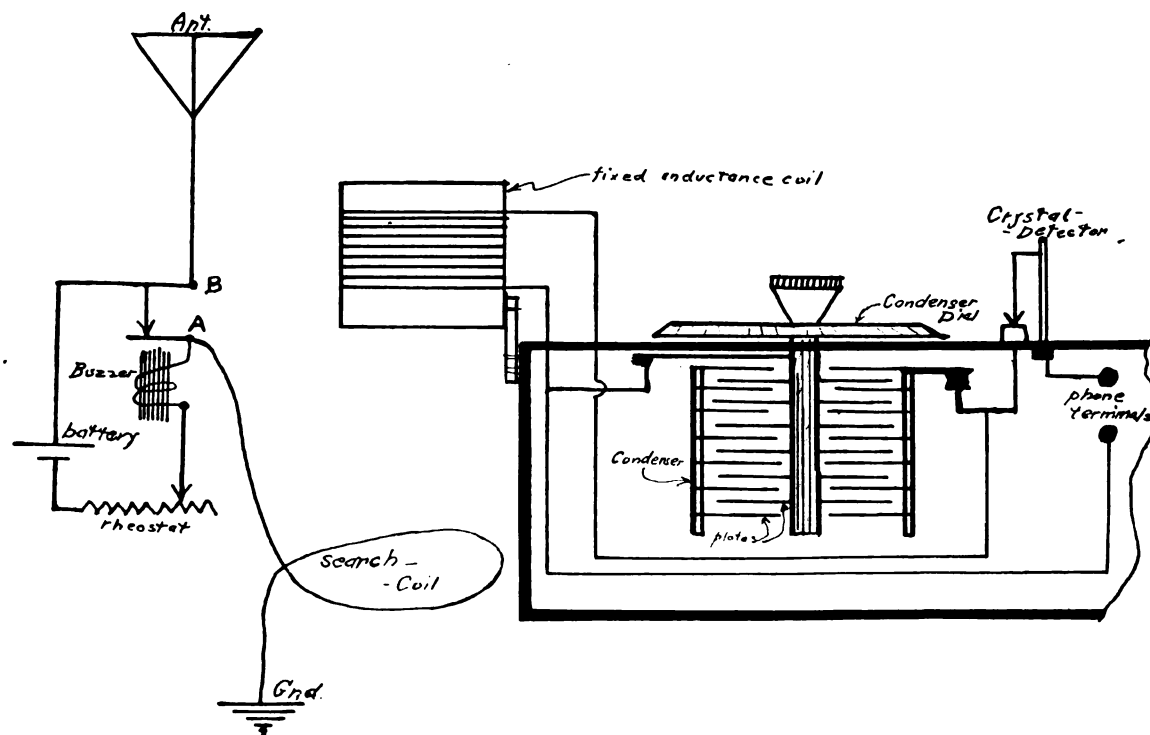
tube in the first place. The ratio of D/L in our formula shall determine the constant K , the value of which we can easily get from the table below, since both D and L have been previously determined.

Ratio: D/L	K
1/20 (.05) or less.....	25
1/2 (.5).....	21
1/1 (1.0).....	17
3/2 (1.5).....	15
2/1 (2.0).....	13
3/1 (3.0).....	11
4/1 (4.0).....	9

If the ratio of D/L should lie between two of the values given in the table it is a simple matter to estimate. Say, for instance, that the ratio was 1.25. This value lies half way between 1.0, for which K is 17, and 1.5, for which K is listed as 15, therefore for 1.25 it would be close enough to assume K as 16. Now, with everything known or previously calculated, the value of the inductance (I) in micro-henries is found from substituting in the formula:

$$I = \frac{K \times D^2 \times N^2 \times L}{1,000}$$

After the fixed inductance has been constructed and its exact value in micro-henries has been calculated from the formula, the amateur should obtain an air variable con-
(Continued on page 9)



Schematic drawing of the wave meter as described in the accompanying article. In order that the constructor may have as little trouble as possible in the making of the wave meter, the inductances have been worked out for him in the article, and fixed inductances are used. This simple wave meter can also be used as a small receiving set, as it is complete in every way. Take care that the leads are not loose. Solder every one that is possible. If care is taken in the construction of this instrument, it will function with surprising accuracy. Many people think that the calibration of a wave meter is a very technical job, but by following the simple instructions in this article, it will not be found so hard, if the person can read equations.

(Continued from preceding page)
 denser that has a maximum capacity of .0005 micro-farads. Purchase the ordinary air variable condenser with circular plates that mesh circularly. By that I mean a variable condenser whose capacity is directly proportional to the reading on the scale indicating the coupling of the plates. For example, when the plates are half meshed the capacity is half the maximum capacity, or .00025 micro-farads. Previously, the inductance has been calculated, and the capacity is directly proportional to the reading of the scale of the condenser, provided the 100 mark on the dial indicates the maximum or full coupling of the plates. If W is used to designate the wave-length and C is the reading on the condenser scale, the wave-length can be calculated from this formula below:

$$W=4.21\sqrt{IxC}$$

The best way is to make a table of reading on the condenser scale (C) in one column and W in the other. It is not a hard matter to do this and I would suggest that a special type of condenser be used. There are now several makes on the market that have their plates so meshed that scale reading varies the capacity as the square root of the maximum instead of directly as the maximum capacity. The advantage is apparent from the formula. It will not be necessary to take the square root of the scale reading. It can be used directly in the formula. Since the square root of the inductance is constant in value and is known we can simplify the formula under this special condition to include just a constant number times the scale reading of the condenser C .

The wave meter can be used as a measure of the natural wave-length of tuning circuits and antennae. The illustration shows the finished wave-meter hooked up to an aerial circuit. A buzzer is used as an exciter for the aerial circuit. The condenser dial is turned until the response in the phones is at a maximum. The reading on the dial is noted and the wave-length can be calculated from the wave-length formula. The wave-length of the aerial should measure up less than that of the desired signal wave-length. The wave meter will easily tell whether this is true and by experimenting with the length of the aerial and with several other types, it is an easy matter to get one that will have a natural wave-length just a little less than that of the desired station. The wave-length of a tuning circuit could be measured up in a similar manner by connecting the output terminals of the buzzer (AB) to the Ant.-Gnd. connections on the tuner.

Londoner Gets WGY on Two-Foot Loop

THE challenge palm for the reception of long-distance broadcasting undoubtedly belongs for the time being to Captain H. J. Round, of the Marconi Company, for his performance on Christmas Eve, says E. Blake, A. M. I. E. E., in the 'London Daily Mail.' "Using a six-valve Marconi-phone plus two 'note magnifiers' (i. e., low frequency amplifiers), Captain Round received music and speech from several United States stations. A pianoforte solo broadcast from WGY (Schenectady) was received at his house at Muswell Hill, N., fairly uniform in strength and of about the same audibility as the Manchester Broadcasting Station, also received at the same place.

"Two facts in particular render this result remarkable. First, the aerial employed was a frame 2 feet square; that is quite a moderate size for a frame aerial, even for amateur use, and I wish Captain Round would measure the electromotive force it acquires from the Schenectady generator, for it must be easier to measure than to imagine. Also I should like to know whether he elected to sit up to the small hours with that pathetic little frame out of pure optimism or because he had

what Schenectady would term a 'hunch.'

"Much trouble was experienced as the result of jamming by harmonics from Leafield, Oxfordshire and Northolt, Middlesex, which stations are evidently competing keenly with each other in the 'jam' trade. Hence, amateurs will do well to give further study to the possibilities of frame aerials, for these will enable them to escape a certain amount of interference.

"The other interesting fact about Captain Round's Christmas Eve-Christmas Morning vigil is that there was no mere 'pig's whisper,' but a loud-speaker in full blast. Now one needs quite a respectable volume of sound to make a loud-speaker shout about the house, so that although eight valves were at work the result is really surprising and should give a fine fillip to amateur endeavor. I may mention, for the benefit of those who wish to repeat the experiment, that the wave-length on which WGY was sending was about midway between those of the Manchester (385 metres) and Birmingham (425 metres) broadcasting stations, and that the signals were heard before 2:00 a. m. (Greenwich)."



Wife's voice—"Hiram Simpkins! And you layin' off work for a week on account of rheumatiz! I see where you start working again tomorrow.

Don't Try to Reclaim Dry Cells

By Arthur S. Gordon

A SEARCH for practical and useful information concerning the 1½ volt, No. 6 dry cell, now used by radio amateurs in lighting the filament of the DeForest dry-cell tube or the W D 11, resulted in some interesting but disappointing "dope." The person who made the inquiries wanted to know, first, if anything could be done to prolong the natural life of a dry cell, and, second, whether suitable dry cells could be made at home by a radio amateur in average circumstances.

To give the answers to these questions, the inquirer interviewed the men behind the radio counters in big stores, electricians, mechanics, engineers and tradesmen—in fact, everybody within a ten-mile radius who knew, or who was supposed to know, anything at all about dry cells.

The men behind the radio counters slumped visibly when questioned on dry cell construction and practical operation. They just "handled" the batteries. But they knew what was expected of the batteries in the way of voltage, and were willing to put them to a short-circuit test with a voltmeter. Most of them were advised that a radio amateur insists on this being done. "Wise clerks," they said, "will do it without being asked—merely for their own protection."

Occasionally a dry battery that has never been used fails to register a current. All of them are marked with a "shelf limit" date, which is generally set for about four months after manufacture. After the shelf limit has expired, the makers of the dry cell will not guarantee its performance. Radio clerks usually inform amateurs of this fact, and may even point with pride to the distant hour of expiration on the batteries they are offering for sale.

Other salesmen, however, may not be quite so sympathetic. Dishonest stores often cover up an expired shelf limit date with a brazen trade sticker telling the customers to "come again." When buying your batteries, then, make it a point to notice the date upon which they technically become shopworn.

When a dry cell is idle, that is to say, when it is not electrically connected in a complete circuit, there continues a chemical reaction inside the cell proper, which gradually decomposes the necessary elements for the generation of energy. Such a reaction is slow, of course, but it is there and it is constant. A dry cell has no storage capacity. Whatever energy generated by a cell while slowly deteriorating is dissipated at once. This internal action continues long after the battery has been discarded as dead. The zinc covering breaks open and the "mix" bulges out. The battery slowly eats itself away to nothing.

In action, a dry cell will not give continuous results satisfactorily. It serves best when used intermittently. While operating, chemical action causes, within the cell, a layer of hydrogen gas to collect on the surface of the zinc electrode. Hydrogen gas is not a conductor of electricity. Therefore, the coating on the zinc raises the internal resistance of the cell to such a high value that almost all the energy developed is used in forcing the current through the cell, leaving but a negligible current for the outside circuit. When the terminal voltage is thus affected the cell is said to be "polarized."

In the mixture of the ordinary No. 6 dry cell, there is what is called a "depolarizing agent." This is black oxide of manganese. It is supposed to clear the zinc of the deadening hydrogen bubbles, but it cannot work fast enough to do its work under strenuous operation. This is why dry cells recuperate with rest—that is, to a certain limited extent (not as much as wet cells, for instance). The "de-

polarizing agent" has a chance to do what it is designed to do.

The modern dry cell is an improvement on the old Casner-Leclanche type, but it is not all that it could be. The battery which has the zinc electrode outside is not as efficient as one that has it inside. It is the zinc which is the fuel supplying the electrical energy, and it becomes thinner as it is used and finally is eaten in holes. The carbon stick, on the other hand, does not deteriorate. It is a mere collector of energy. When a No. 6 dry cell becomes useless, the remaining zinc becomes waste product. In the flat type of battery, now used for searchlights and sometimes for "B" batteries, the zinc may be wholly eaten up, and the battery will discharge energy right up to the disintegration of the last ounce.

But it often happens that a battery goes dead when its zinc covering seems to be in perfect condition. The fault seems to be with the mixture, which is not strong enough to produce energy right up to the limit.

"What can be done with such batteries?"

"Nothing," answered one electrician, who had been replacing batteries for ignition purposes on Fords. "Tear off the binding posts if you want them, and dig out the carbon rod in the center if it is of any use to you. But throw the rest of the battery away. It has lived its life, and it's through."

"Well," answered an automobile engineer, "I never had to practice economy in that direction, but I suppose you could clean them out and fill them up with a new mixture. The only difficulty would be in clearing away the old mix from the zinc. If you have ever opened a dry cell, you know how that stuff sticks. What do I advise? Throw 'em away, and buy new ones. They're selling cheap enough!"

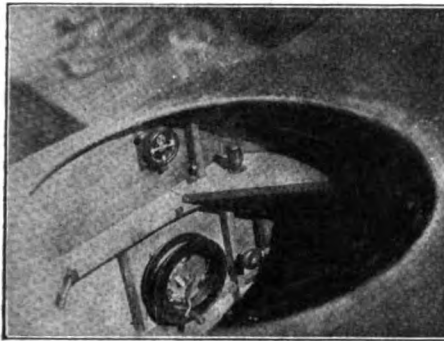
Nothing very enthusiastic about their comments. But on second thought, it is a sensible attitude to take. As electrician after electrician voiced the same views, the radio inquirer adopted the conclusion that an old battery is no good for anything. It cannot even be connected in series or in parallel with a new battery, for instead of contributing its own "wee" current to the combined effect, it actually takes some away from it. The best procedure is to rip the battery apart, take out the carbon stick intact, rescue the binding post from the half-eaten zinc and "dump" what is left.

Then, if you have an itch for making things, or if you like to think yourself independent of the dry cell market, you might buy the following articles: a piece of zinc, 6 by 9½ in.; a half-pint of asphaltum varnish; an ounce of either nitrate of mercury or bichloride of mercury dissolved in a quart of hot water; a quantity of heavy blotting paper; 1½ pounds of pebble or crushed carbon; ½ pound of black oxide of manganese; ½ pound of granulated chloride of ammonium (sal ammoniac); and ¼ pound of whitewood or willow sawdust. With these necessary materials assembled at a cost of about 75 cents, go ahead and make a dry cell all by yourself, using the carbon you rescued from the old battery—but you can see right off that it can't be done profitably unless one is going into the business on a big scale.

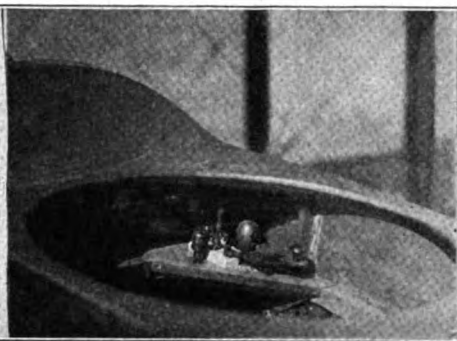
No, making a dry cell so that it would save money can't be done. The advice not to try it is given reluctantly, but it is only fair that the new user of dry cells know the worst at once. So much material goes into the manufacture of an ordinary No. 6 cell that only quantity production makes the market price as it stands today even reasonable.

Using Two Generators for One Airplane Radio Set

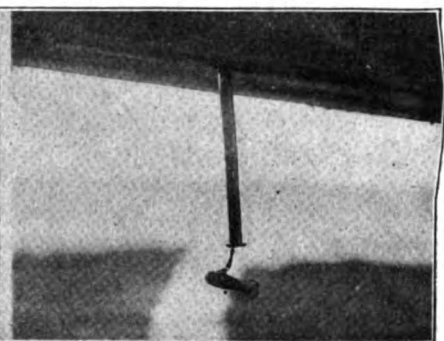
By S. R. Winters



Rear cockpit, showing the reel upon which is wound the antenna. When in the air, the wire is unwound and, by means of a weight, drops downward. The meter directly above shows the length of wire that is being used. This gives the operator an actual check on his instruments.



Installation of transmitting controls in D. H. 4 B 'plane. Notice the flame proof key, which is now universally used in work of this type. The double throw single bladed switch controls the current from the two generators. On account of the small amount of available space, all controls are made as simple as possible.



Fibre fairlead, type F. 5, mounted through bottom of 'plane through which trailing antenna is run. The lead weight is used to prevent the wire from flying back and entangling itself in the controls, which, if it did, would endanger the lives of both the aviators and those on the ground.

IN the far western States, where radio and aircraft have formed a coalition as an agency in combating forest fires, a departure was made recently in the wireless installations. Contemplating the possibility of a breakdown of the device for generating electricity for radio purposes, a duplex system of generators was affixed on airplanes subject to long patrols during the fire-fighting season.

Each of these fan-driven generators has a capacity of 4,500 revolutions a minute. This special inductor design alternator is rated from 116 to 125 volts on open circuit, and is a 900-cycle, 200-watt generator. The stator is composed of four direct-current poles, four slots being cut into each of these so that the high-frequency current windings may be placed therein. The rotor has an even dozen teeth and serves as an inductor. The slots between the teeth offer space for placing the direct-current windings for exciting the field. The commutator on one end of the rotor delivers the direct current to the field coils, one side of this circuit being carried to a distributing block to facilitate the connecting in of a field switch and a dry battery. The latter are auxiliary agents for exciting the electric field. The twelve teeth in the rotor, when rotating, pass the alternating-current windings and vary the flux through a dozen cycles for each revolution.

As the term implies, each of the two generators installed on this fire-fighting aircraft is driven by a two-blade air-fan. The speed at which these fans operate is constant, despite wide variations in air and wind velocities. Immunity from the influence of air current is accom-



Double installation of fan-driven generators on 'plane. This double installation is made on 'planes making long patrols and trips, where communication is imperative, especially when the 'plane is used for fire patrol work.

plished by use of a centrifugal governor mounted at the center of the fan inside the housing of the generator. This governing device varies the pitch of the air-fan blades to correspond with variations in the velocities of the upper atmosphere. This centrifugal governor is so effective as to maintain the speed of the generator within plus or minus four per cent of 4,500 revolutions a minute, despite a variation in wind velocity ranging from 50 to 175 miles an hour.

The alteration of the pitch of the

two blades on the air-fan, the driving force of the generator, is accomplished by use of two weights, one attached to each blade arm. Their positions are influenced by centrifugal force. Such force of the weights is counteracted by compression springs, the result being that when the spring reaction and the weight on the arms are correctly adjusted, the position of the equilibrium between these two opposing forces will be such as to insure a constant speed of 4,500 revolutions a minute, irrespective of the wind velocity.

NEEDED BY ALL AMATEURS

5 RADIO-WIRE TABLES, BY FREDERICK J. RUMFORD, E.E., R.E.

These tables, showing the number of feet in a pound and fractions of a pound, were published in RADIO WORLD as follows: No. 1—Bamsted Magnet Wire, RADIO WORLD, No. 24, dated Nov. 12. No. 2—Single Cotton-Covered Wire, RADIO WORLD, No. 28, dated Nov. 26. No. 3—Double Cotton-Covered Wire, RADIO WORLD, No. 30, dated Dec. 2. No. 4—Single Silk-Covered Wire, RADIO WORLD, No. 33, dated Dec. 10. No. 5—Double Silk-Covered Wire, RADIO WORLD, No. 40, dated Dec. 20. Sent to any address postpaid at 15 cents a copy, or the complete set of 5 copies for 75 cents. Or start your subscription with any number Order now. Every amateur builder should have these tables constantly at hand. The supply of back numbers is limited.

RADIO WORLD, 1495 BROADWAY, NEW YORK, N. Y.

Wave Length and Interference

By *B. R. Cummings*
Radio Engineer of General Electric Co.

IN the adjustment of radio receivers, we know that we can "tune-in" different stations which are transmitting on different wave-lengths by an adjustment of the control or controls provided in the receiver for this purpose. We know that, even though a number of stations are transmitting simultaneously, if their wave-lengths are sufficiently different we can tune one station out and another in.

In order that the term "wave-length" may have somewhat more meaning than that of an arbitrary term, it may be explained that the energy which actuates a radio receiver and which is transmitted through space from the transmitting station, is transmitted in a series of pulses. These pulses are so frequent that they cannot be individually detected by the ear, and they generate an electric current in the receiving antenna, their nature being such that each pulse generates a current in the opposite direction from that generated by the preceding pulse. If we can mentally picture these pulses in space at a given instant, between the transmitting and the receiving station, the distance in meters between one pulse and the second pulse ahead of or behind it, is known as the wave-length of the transmitted signal. The majority of broadcasting stations are operating on wave-lengths between 350 and 400 meters, which is very nearly one-quarter of a mile. For long distance commercial radio work, the wave-length is frequently as long as 20,000 meters, or approximately

12½ miles. The speed of transmission is so great, however, that, even at this wave-length, approximately 30,000 pulses are picked up at the receiving station each second.

For an analogy of what takes place in a radio receiver when it is tuned to a particular wave-length, let us picture a swing suspended from a branch of a tree, say, and that two people, one at each end of the swing's travel, are alternately pushing the swing and keeping it in motion. Their pushes are timed to the natural period of the swing, so that each push is delivered at a time when it will add to the motion of the swing. In this case the energy given to the swing by the two people alternately pushing it is analogous to the energy put into the radio receiver by an incoming signal, and the motion of the swing is analogous to the current flowing in the receiver, flowing first in one direction and then in the other. If, however, the people pushing the swing do not time their push so that it matches up with the natural period of one swing, the amplitude of the swing will decrease more and more as the pushes become more and more out of step.

We know that the shorter the length of the swing, the quicker it will swing back and forth, and that as it is made longer the time required for it to travel back and forth is increased. In the case of a radio signal we have no control at the receiving station over the frequency of the pushes or pulses of energy, the frequency being established at

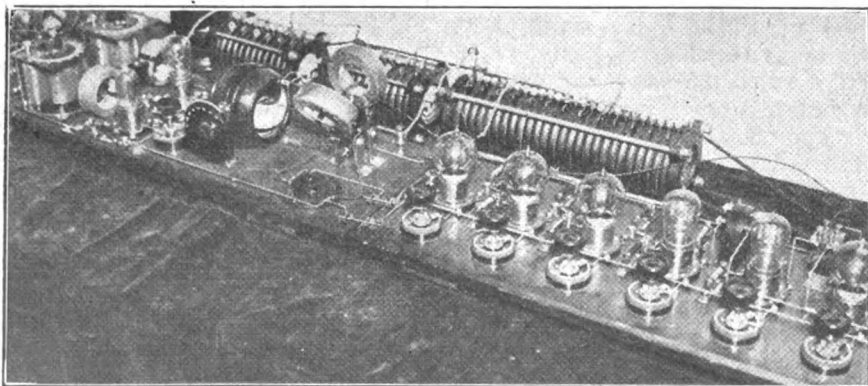
the transmitting station, but we must tune our receiver so that the flow of current in the receiver will be a maximum. When we tune the receiver, it is analogous to shortening or lengthening the swing so that it will have a natural period which will match up with the frequency of the pulses transferred to it, under which conditions the travel of the swing and likewise the current in the radio receiver will be a maximum. Since all radio signals, regardless of their wave-length, travel through space at the same speed, the shorter the wave-length the greater will be the number of pulses received per second.

The fact that a great number of transmitting stations can transmit simultaneously on different wave-lengths and that any one of these stations can be received without interference from the others, providing the wave-lengths are sufficiently separated, is one of the most interesting phenomena encountered in radio. The signals from all of these stations exist in space simultaneously, but none of them is affected by the others, each communication retaining its individual characteristics. Although very incomplete, a simple analogy to this condition can be made by dropping two stones simultaneously in a still body of water, at a separation of several feet. Waves in concentric circles will emanate from both points at which the stones enter the water. These waves will increase in diameter and the waves set up by one stone will cross those set up by the other, but after they have crossed they will emerge intact and neither one will be distorted or changed in form by having come in contact with the other.

In the foregoing it has been carefully stated that stations can be received without interference from other stations "providing there is a sufficient difference in wave length between the station received and other stations." This condition exists usually in commercial work, and did exist until recently in radio broadcasting work. With the increasing number of broadcasting stations, however, and the comparatively narrow band of wave-lengths which have been allotted by the Government for broadcasting work, it is not possible for all stations to

(Continued on next page)

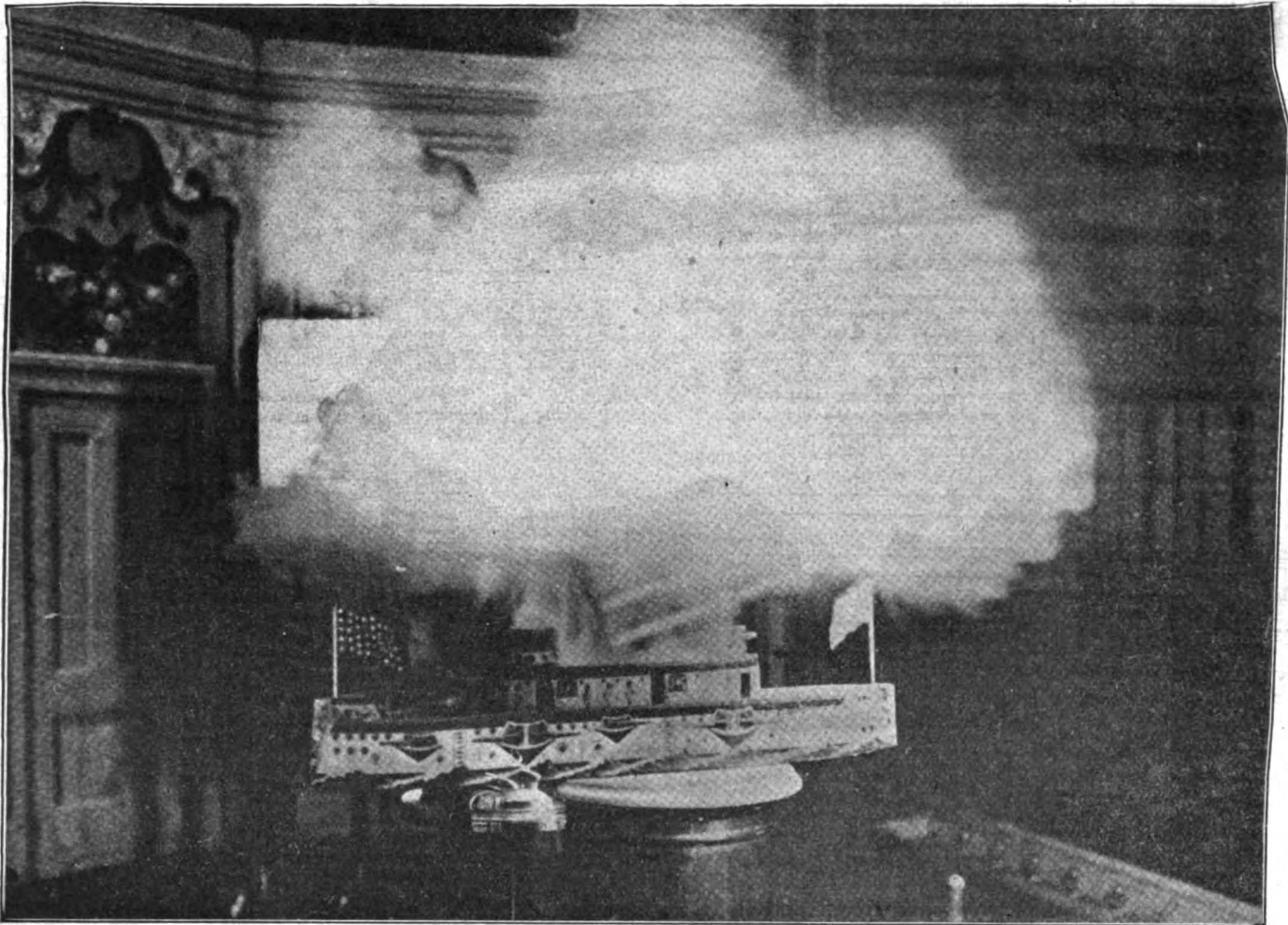
The Rolls-Royce of Radio Receivers



(C. International Newsreel Photos)

The super-heterodyne receiver illustrated here has been termed by its inventor, "The Rolls-Royce of All Radio Apparatus." It is a most efficient apparatus of its kind, and like its name it is most certainly not the apparatus for the man with a "flivver" pocketbook.

Blowing Up a Battleship By Means of Radio



(C. Kadel & Herbert)

One of the latest developments of radio is the invention of a special radio wave, discovered by Bernays Johnson, which will allow a bomb to be exploded at a distance. The special bomb is not dangerous, as it can only be set off by a person having the proper apparatus for generating the wave. Photo shows a demonstration in blowing up a miniature battleship.

(Continued from preceding page)
work on a wave-length sufficiently different from those of other stations to permit its reception without at the same time hearing one or more of the other stations. A study of this condition has recently been made, and in one town, which is typical of a great number of the small towns in the eastern part of the United States, a total of thirty-nine broadcasting stations were picked up, in one evening, all operating on wave-lengths between 350 and 400 meters. In many cases two stations were found to be working on exactly the same wave-length, so that, even with the most refined receiving equipment, it was not possible to differentiate between them.

Until this condition is improved, those who listen to radio broadcasting are subjected to considerable disappointment, for we frequently find instead of selecting the particular program which we wish to hear, we are obliged to accept one which we can get without interference

from other stations, this one usually being the station located closest to the receiving station.

Superimposed upon this condition is interference caused by static disturbances and by receiving equipment in the hands of people not cautious in its manipulation. It should be remembered that, whenever a vacuum tube receiver is allowed to oscillate, it itself becomes a low power radio transmitter and causes interference with reception being carried on in the immediate vicinity. In receiving telephone signals, it is not necessary to have the receiver oscillate at any time, and any operator who carelessly permits his receiver to oscillate is increasing the difficulty of obtaining satisfactory broadcasting reception.

The elimination of static interference is, at the present stage of radio development, beyond the hope of the average receiving station and must, therefore, be accepted as an unavoidable evil. Interference caused by other stations will, we

hope, be reduced in the near future by the allotment of a wider band of wave-lengths for broadcasting purposes. This development has been under consideration by the United States Department of Commerce for some time and we must expect a ruling from them which will alleviate this condition. Until such modifications are made, however, interference caused by other stations is also an unavoidable evil for the average receiving station. More refined receiving equipment can be built which will increase considerably the selectivity of radio receiving equipment, but such equipment is comparatively expensive.

This condition will doubtless be remedied in the near future. Until that time we must be content in the knowledge that every effort is being made to improve this situation and that any apparent delay in accomplishing such improvement is merely an indication of the difficulties which are being met in making it.

Radiation

By Washington R. Service

OPERATORS of broadcasting stations are warned by the Radio Section of the Department of Commerce not to communicate with other stations by either telegraphy or telephony as broadcasting licenses do not permit direct communication. Some stations have been guilty of acknowledging letters, telegrams and telephone calls, which, the Department points out, is direct communication. The suspension or revocation of the operator's license is the penalty for infractions of this rule. Owners are also cautioned to observe the rules laid down by law else their station licenses may be endangered.

The Navy Department has begun the publication of the Communication Bulletin, issued in the interests of increasing the efficiency of Naval Communications, especially through greater rapidity and accuracy in handling messages by radio. "Keep the Fleet Mobile" is its motto, based upon the theory that efficient and uninterrupted communication between all units of the Navy makes for mobility of our sea defense.

Radio has found its way into a college curriculum, according to a report from Philadelphia, which states that the University of Pennsylvania plans courses in Radio this Spring. Tulane University, WAAC, is now broadcasting the Commerce reports at 7.05 Central time on Fridays.

Despite the general use of radio and the millions of fans informed as to the reception of broadcasts, some remain ignorant of possibilities: The other day in the National Press Club, one member suggested that the set be "speeded up," saying the music coming in was "too slow."

Bathing by radio is one of the last broadcasts from the Public Health Service, but whether ether waves were recommended was not made known.

"Have they arranged to send money by radio yet?" asked a fan.

"Probably not," replied his wife, "too many people would 'pick it up.'"

An admiral of the navy, in objecting to the suggested licensing of all service radio operators under commercial regulations, said it would be as sensible to require that he and some 6,000 other navigators in the navy take the Department of Commerce's examination for a master's license before they would be permitted to carry any passengers on naval vessels or transports. Which seems to be a good argument.

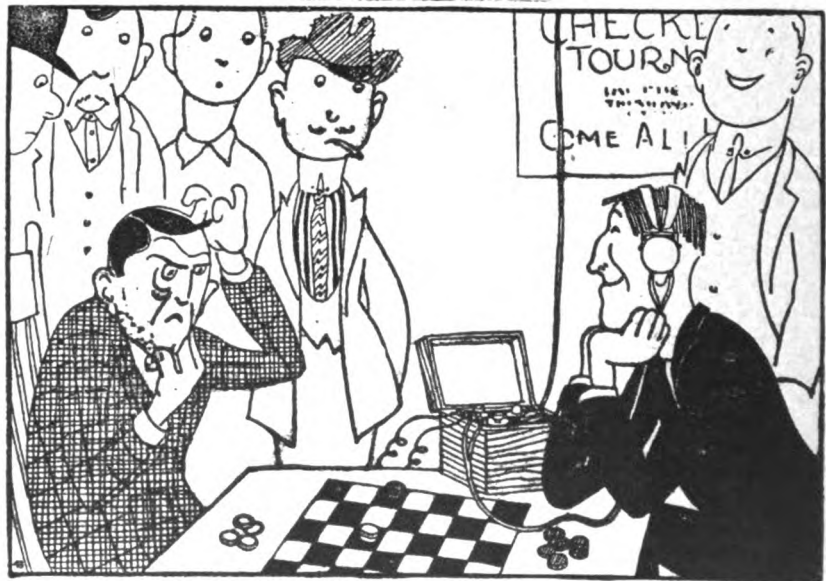
Someone has suggested the name of "Radioowners" for those of us who have sets and listen in. Certainly it is better than most of the awkward terms in use today. "Listeners-in" is too long, "Radiophans" or "Radiofans" sounds like the name of an instrument, and we could hardly designate them as "receivers."

Secretary Hoover says he doesn't care who contro's radio and is willing to turn it over to the Interstate Commerce Commission, if Congress so decides, but he does insist that some regulations be enacted into law and that some one be put in charge to relieve the interference, handle licenses, and assign the waves.

Broadcast Bill's Radiolays

By William E. Douglas

JIM KATER, better known as "Slat's," remarked the other day that when it come to checkers he wuz "there" in every way. He talked so much about it that the fellers at the store got so they 'most believed him, all he said an' maybe more. Sez he, "Look! what I done last year; I'm champeen of the county, fer didn't I beat 'em, everyone, an' romp home with the bounty!" The checker tournament this year wuz held in Brussels Sprouts an' endin' yesterday it caused excitement hereabouts. Today there's sadness in their hearts—I 'spose that some are achin', the boys had picked "Slat's" Kater thinkin' he'd bring home the bacon. Last year with forty entries I beat all of 'em but one. "Slat's" Kater took me over but he had to work like fun. Before the game I figered I could win as sure as shootin' but when we started playin' all the boys begun their rootin'. "That's the ticket, 'Slat's,' old boy, you've got him goin' now." I guess it must of rattled me er somethin' anyhow he got the best two out of three an' so I said this year I'd stuff my ears with cotton to make sure I couldn't hear the rootin' that them fellers did when "Slat's" pulled off his plays. An' then I had an idee which beat that one forty ways. You know I'm fond of list'nin' on this wireless set of mine, so I thought with those earmuffs on why wouldn't it be fine. I'd hear the sweetest music of some military band an' then they couldn't rattle me. I guess you undeerstand. Well, it worked out just like I



"There's no doubt in my mind Radio's what did the trick."

thought, friend "Slat's" an' I were tied, so we were matched together, an', folks, that wuz when I tried the scheme which I just mentioned. Say it worked out purty slick an' there's no doubt in my mind Radio's what did the trick. I set there chewin' "Spearmint" with "Slat's" rooters all about

an' listened calm an' peaceful fer I couldn't hear 'em shout. Then when I got him cornered, gosh I laughed at them big bums. Meanwhile the band wuz playin' "Hail the Conquering Hero Comes."

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Radiograms

The Latest Important Radio News Briefly Told for the Growing Army of Radio Fans

FOR the first time in the history of radio, an interchange of messages will be tried between American and French amateurs, without the request for "quiet air." This has been suggested, because of the fact that so many American amateurs were heard in the recent trans-Atlantic tests. If the tests are successful, a new point in low power transmission over long distance will be reached, because it is infinitely harder on the receiver to listen through and successfully get a message when the "air" is full of other stations sending.

* * *

An address entitled "Police Work" was made recently from station WOR, by Commissioner Enright, head of the Greater New York Police Department, and President of the International Police Conference. As every large police headquarters in the entire United States is now equipped with the most up-to-date radio apparatus, this lecture created a great interest in police circles. Commissioner Enright is the recognized authority on police work and matters pertaining to it. Special arrangements were made whereby loud speakers were installed, thus allowing hundreds of thousands to listen in to the address.

* * *

In an address before the Baptist Social Union at the Hotel Astor, in New York City, last week, Roger W. Babson declared that the churches of the country must be included in five or six great groups to be affected by radio broadcasting. He advised church members "to control for all time in the interests of righteousness the greatest single force for good or evil that is known today."

"A hundred thousand churches in this country and their millions of members little realize how their institutions are to be changed by radio broadcasting," said Mr. Babson. "People, like water, travel along the lines of least resistance. If they can hear, at home, by the fireside, on the radio the same service that they would other-

wise have to go out and hear they are apt to remain at home and use the radio."

* * *

The general call signal KFZZ has been assigned for all vessels the radio stations of which are operated and controlled by the I. W. T. Co. This general call will be used by I. W. T. Co. ship or coast stations desiring to ascertain whether there is an I. W. T. Co. vessel within range, and any I. W. T. Co. vessel hearing another ship or coast station calling KFZZ should answer. This call signal also will be used in broadcasting general instructions to I. W. T. Co. ships.

* * *

Porto Rico, which began broadcasting late last summer, has been plainly heard at points 2,000 miles distant. Cuba, which has a station of 400-watt capacity, sends out a 400-watt meter wave with a message of 2,400 miles.

* * *

Radio Regulation Bill is Passed by the House.—The Federal Radio Control bill, which vests in the Department of Commerce the power of regulating all the wave lengths to be used, as well as the direct supervision of all phases of wireless telegraph and telephone communication, was passed in Washington on Jan. 31, 1923. The purpose of the bill is to eliminate the interference that is so prevalent now. Licenses will be required from all operators, with the exception of Government stations and operators handling government work. The power of assigning the different wavelengths and licenses is in direct charge of the Secretary of Commerce. The bill provides for an advisory committee of men appointed by the department heads, and will be the most eminent radio experts and radio men in the country. Amateur receiving stations will not be affected by the bill, and amateur transmitters will have a special series of wavelengths assigned to them.

Radio and the Woman

By Crystal D. Tector

I HAVE at least found IT. Or rather we found it, I should say, for I had the help of a friend. We refer to a person who neither knows anything about radio or professes to care. We met her at a social given by the church, and, after a while, the talk turned to radio. "Oh, that silly thing," she exclaimed. "I never thought that normal women would take the least interest in it. My time is all taken up minding the house and children, and seeing that Jack has a warm dinner waiting for him every evening." Well, that certainly was nice. As though I ever fed F. H. on cold cuts, or let the children run around like orphans.

* * *

ONE of the local theatres in our town has been running a moving picture in which the heroine is saved several times by means of radio. (Of course, she fell in love with the handsome operator of the station, and married him later.) The owner of the theatre, in order to increase his patronage during the run of the picture, advertised an amateur set contest. The winner was to have his choice of a season pass, or a trip through a modern moving picture laboratory. The only conditions were that no one over eighteen years of age could compete, they must have made the apparatus, and must be willing to allow it to remain on exhibition for a full week before the performance. A young man seventeen years of age won the prize, and chose the season pass.

* * *

THE fact that radio is really important to a woman who has to stay at home and attend to house duties, was illustrated to both F. H. and myself when we were visiting one night last week. The hostess, during the evening, confided to us the fact that since her husband has bought a Radio set, she doesn't go to nearly as many matinees or afternoon teas but, instead, stays at home, and then is able to keep him in good humor, by having a nice hot meal for hubby when he gets in. "And I've noticed

the number of sick friends that he used to spend the evening with are all better. He never goes out now to play the part of nurse to some other man. And do you know that if I didn't have that radio set, I think I would go to just as many matinees and teas as I used to, and Jack would be just as grumpy, when he has to stand for delicatessen food, as he was formerly."

* * *

THE minister of our church gave us a little talk the other evening at the meeting of the Ladies' Society, on the way in which Radio has helped the human race in general. After the meeting our pastor appealed to me, asking me if he had made his point strong enough or if I thought it was too strong I thought it was just wonderful, as did all the others. You simply cannot make anything that relates to radio too strong.

* * *

FRRIEND HUSBAND, through a friend, heard the news that the concert we heard broadcast from PWX on January 6 was heard in Douglas, Alaska. "Why, they even heard her name, and the piano strike the first chord." The song he was referring to was "Mother Machree," sung by Miss Harriet Williams, of the American Consul General's Staff in Havana.

* * *

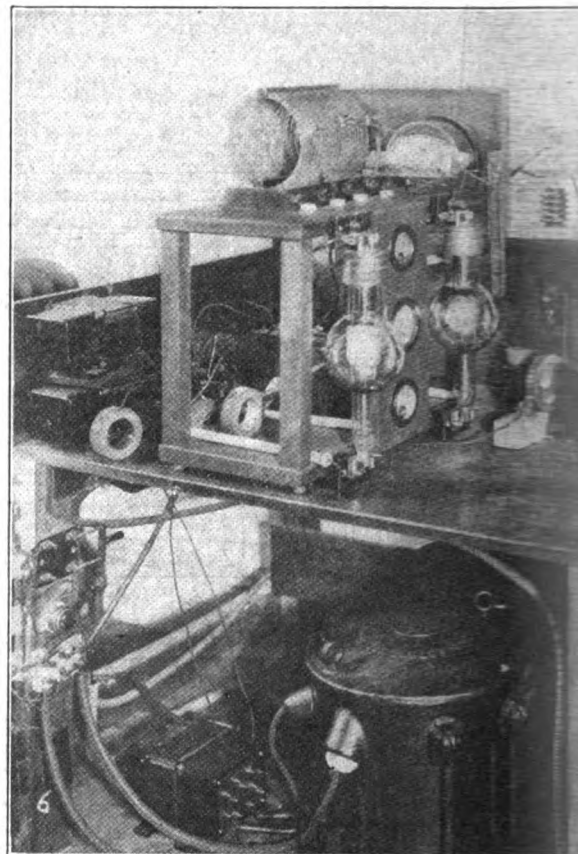
I HAVE just received an invitation to take a trip to England and listen in on the great trans-Atlantic test that is to be tried out next month. A friend of ours who owns a large yacht, tried to entice me by telling me that he would install a private set in my stateroom, so that I could keep "up to the minute" on all the latest radio stunts. No thanks, everything is happening too rapidly over here for me to think of going abroad, especially during the roughest part of the winter. One trip abroad, when we were first married, convinced me that I never was meant to be a sailor. I'll never forget that trip as long as I live. Neither will F. H.

News of Radio



(C. Underwood and Underwood)

Dr. R. S. Piper, Chicago surgeon, and his single tube radio set which contains the only existing patented coupling transformer, which enables the set to receive extremely long distances without amplifiers. The tube used is the popular 1 1/4 volt tube, and the tuning is all done by means of the single control on the side of the cabinet, and the filament adjustment which is shown. The binding posts on the bottom of the cabinet are for the various battery connections.



(C. Kadel and Herbert)



(C. Photonews)

Radio music as an aid to dancing is the latest use to which radio has been put by Helen Lynch, noted actress and dancer. She keeps in trim for her stage dances by practicing to the tunes sent out by the various broadcasting stations. Since the larger stations have been enabled to broadcast the music of some of the larger dance orchestras, many new enthusiasts have joined the army of dancers.



(C. Keystone View Co.)

Viscountess Maitland, cousin of the King of England, having her character read by radio in New York City. Mme. Radora claims to sense the vibrations of her subject by radio, through the agency of the apparatus shown. The small pedestal has no connection with the apparatus used, and is used to hold the transmitter into which the questions asked are answered. As everything is secret, there is no chance of any one's hearing what is said except the one who is wearing the phones.

(C. Underwood and Underwood)
The only family much troubled because of such an inside of a

o via Camera



*Captions by
John Kent*



500-watt, continuous wave transmitting set used in the recent transatlantic tests at the amateur radio station 2ZL, owned by J. O. Smith, Valley Stream, Long Island. Two 250-watt tubes are used with alternating current to light the filament, and also to supply the necessary plate voltage, a self-rectifying circuit being used to eliminate troublesome noises. For interrupted continuous waves, the chopper, seen in the center of the photograph next to the last tube, is used. This allows the signals to be heard on either straight crystal or audion. As can be seen, it consists of a small high-speed motor with a disc attached which is alternate pieces of insulating material and brass. A piece of brass or springy metal presses against the wheel, and when in motion it interrupts the current and allows the signals to be heard.



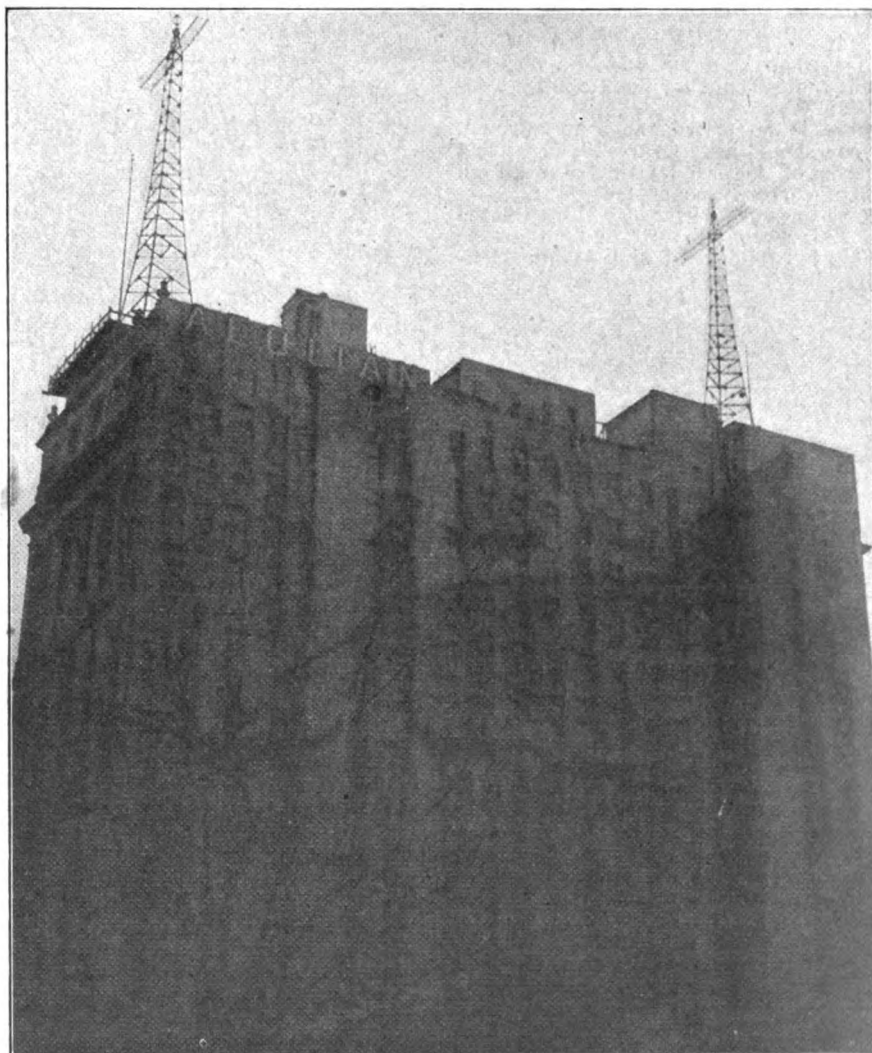
(C. International Newareel)

By means of a portable loop and a loud speaker, radio music was recently heard on a subway train moving under the East River in New York. Messages broadcast by the Kansas City "Star" were picked up at the 86th Street station of the Interborough Subway, New York City. John C. Davidson, the inventor, is sitting next to the radio apparatus.



(C. Underwood)

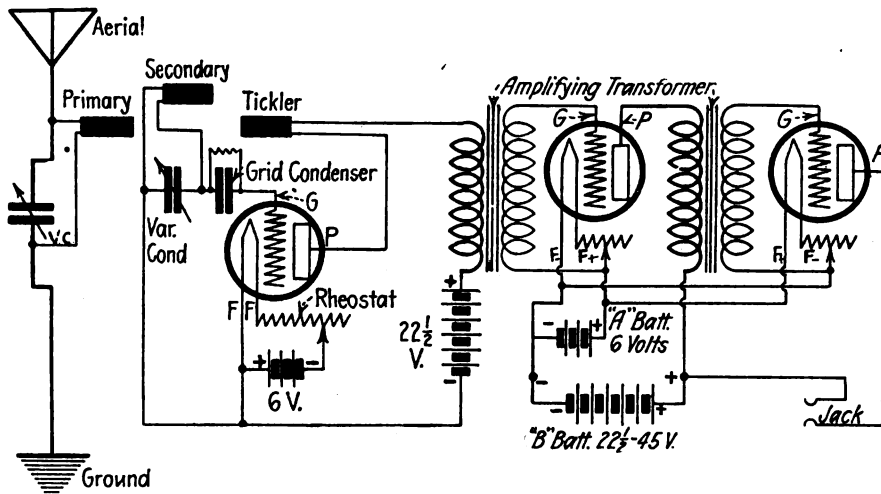
so that little brother gets to listen in these days is when at supper. The owner of this station, no doubt, has had a keeping little brother away from the transmitting set, even like to fool with things forbidden. Radio has taken a great place in the life of today that an expert predicts that in a few years the old-fashioned games of marbles, one o' cat and kindred games will be extinct.



(C. Photonews)

The two towers of the new station on top the Aeolian Building, New York City, have just been completed, and will soon be ready for use in connection with the new super-broadcasting station WJZ. These towers are immense in size, weighing 12 tons each.

Answers to Readers



Regenerative receiver using three honeycomb coils, with detector and two steps of amplification, as requested by Mr. Le Croice. (See letter on this page.)

PUBLISH hook-up using the following materials: 3W-D 11 tubes, B batteries, 2 variometers, 1 vario-coupler, condensers, socket rheostats, etc. What would be the range of the set? Show how I could use two panels—one for the radio frequency, one for the detector and audio frequency.—Charles Scheer, 300 Clifford Street, Philadelphia, Pa.

Refer to RADIO WORLD dated Dec. 9, page 4, where you will find two very excellent radio-frequency hook-ups by Donald Van Wyck.

There is no stated range to any set, but you should have no trouble in getting upwards of 1,000 miles out of such an outfit if correctly connected.

Refer to page 13 of RADIO WORLD dated Dec. 23, where you will find an article on this by John Kent and Arthur Hennesly.

1. Your hook-up published by Mr. Gordon in the January 20 issue of RADIO WORLD, states that a 50-turn coil and a 75-turn coil is used, yet the drawing shows them the same size.

2. Also, the way in which Mr. Gordon has the panel laid out, makes it impossible to rotate the upper coil, because of its proximity to the lower one, which allows only a very slight movement before they hit. Is this as it is supposed to be?

3. Will regular unmounted honeycomb coils of like number of turns do for this purpose in this circuit?—C. Z. Hoffman, 1415 Vine Street, Philadelphia, Pennsylvania.

1 and 2. As the exact difference in the coils themselves is so slight it was not shown in the drawing. We left it to the readers to realize that the working drawings meant the respective coils as described in the article. This was an error not realized at the time of writing, but can be remedied by having sufficient play in the bearing of the upper coil to allow you to turn the entire coil. It calls for some little extra work but the results gained will repay you many times in receiving.

3. Regular unmounted honeycomb or duolateral coils will answer the purpose if the correct coils are used—namely the 50 DL and 75 DL.

Publish diagram of a three-circuit

regenerative receiver using the following apparatus:

1. Honeycomb coils, separate batteries for detector and amplifier, and two-step amplifier with jack at the end of the second step. Primary circuit to have condenser in parallel for long waves.

2. What meter range is possible with such a set?

3. Can I use it for 360-meter waves as well as others?

4. What kind of transformers are necessary?

5. What kind of tubes should I use?

6. What should the voltage on the amplifier be?

7. Can I use a loud-speaker with such a set, the loud-speaker to be in the adjacent room, which would necessitate a lead of wire 40 feet in length? Would this harm the signals in any way?—Jack Le Croice, 254 Studman Place, Montreal, Canada.

1. Hook-up you request is herewith published.

2. You can get from 150 to 25,000 meters with such a set. The wave range depends on your coils.

3. You can use it for 360.

4. Any audio frequency transformer on the market is O. K. We advise a high ratio transformer for the first tube so as to get the maximum transfer of current from the detector through the first stage.

5. A W-D 11 can be used with this hook-up, as a detector (the detector battery being separate from the amplifier). Hard tubes of the U. V. 201 type should be used for the amplifiers.

6. The voltage is marked on the drawing.

7. You can do as you suggest if care is taken to make the wires no longer than absolutely necessary. Good results can be had by using twisted lamp cord. No harm is done to the signals, but they might be slightly weaker, due to the resistance of the extra length of cord.

1. Can the Meyers' tubes be used in the set described in your issue of RADIO WORLD dated January 20 by Mr. Ortherus Gordon?

2. Can I use the Meyers' Audio Choke coil for one stage of amplification in connection with the foregoing?

3. In winding the honeycomb is it neces-

sary to wind it as lattice or can straight winding be used?

4. Can I use the standard honeycomb or D-L coils with this hook-up?—William H. Morihouse, Thomaston, Conn.

1. These tubes can be used only as amplifiers. They cannot be used as detectors.

2. Yes, you can do this.

3 and 4. We advise the regular honeycomb coil unless you desire to wind your own. The fact that all honeycomb coils are wound latticewise is to save space, as fifty turns on a tube would take up more space and have more distributed capacity than if it were wound latticewise.

1. Kindly tell me what is the best type of receiving set to enable me to hear concerts up to 1,500 miles.

2. I wish to use an inside antenna. Is it as efficient as one on the outside?

3. What would the probable cost be, and where could it be purchased?

4. Name a good book for the beginner in radio.—Thomas Ross, 34 Brook Street, Sanford, Me.

1. We advise a receiver incorporating both radio frequency, a detector and one or two stages of audio frequency. There are numerous sets of this type on the market, and as it is against the ethics of RADIO WORLD to discuss competitive types of apparatus now being sold in the open market, we advise you to allow someone who has handled this apparatus on the outside to give his opinion.

2. The outside antenna is granted to be most efficient, so far as received signal strength is concerned, but the loop antenna has also the advantage of being less trouble as far as static is concerned. For really long distance reception we advise you to try the outside antenna.

3. We cannot quote prices through this column. See advertisements.

4. See inside front cover of February 3 issue of RADIO WORLD for both reference books and experimenters' handbooks.

I am using a two-variometer regenerative set, but would like to know if there is a set that will give me better results. I have heard PWX several times.—Fred Johnson, Keystone, Neb.

You seem to be getting good results from your set. If you wish to change, we advise you to try two steps of radio frequency, either crystal or tube detector, and one or two steps of audio frequency. A hookup for such a set was described in RADIO WORLD, dated December 9.

Kindly publish the wiring diagram of the set illustrated on pages 4 and 5 of RADIO WORLD dated January 20.—H. B. Clough, 9 Exeter street, Portland, Me.

If you will refer to page 6 of the same issue you will find the diagram at the bottom of column 2. The B battery is connected wrong in the diagram. The plus (+) should go to the plate, not to the filament as shown.

1. Would vernier condenser (43 plate) in the antenna circuit be of any advantage in the set described by Ortherus Gordon in RADIO WORLD dated January 20, or would a regular 43 plate condenser suffice?

2. Is the B battery connected right in this hookup? I notice that the plus goes to the filament.

3. Would a potentiometer be of any use in this circuit, and if so, how is it connected? (Continued on next page)

500 Miles without Aerial

By E. M. Pace

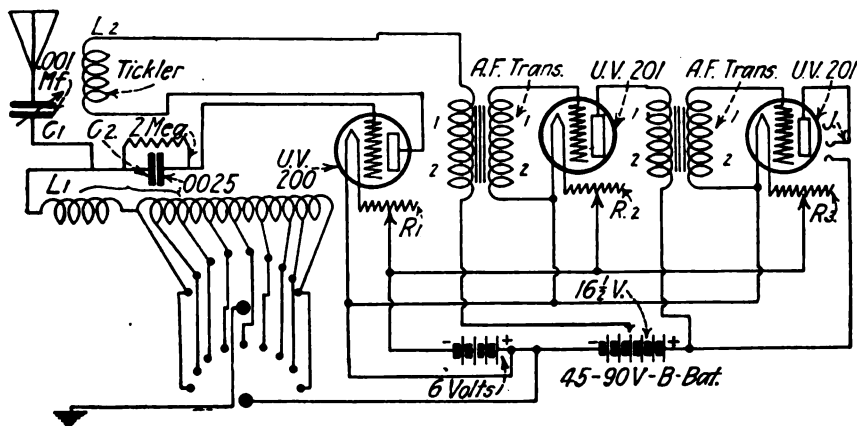


Fig. 1—Hookup of receiver described below, with which Mr. Pace has done some excellent work.

I AM sending you herewith a wiring diagram of my receiving set and I hope that you will be able to use it, as I have found it to be one of the best receivers that I have ever used. Here are a few ideas as to the building of the set.

The entire set is conveniently and neatly mounted on a panel 12 by 14 inches in the following manner: The panel is divided in two parts by the insertion of a base for the mounting of the tubes, transformers, etc., 7 inches from the bottom of the panel. The base for the inductances is mounted on the bottom of the panel. On the lower half of the panel is mounted: the inductance, the switches, and the condenser; in the lower left-hand corner the ground binding post, and on the right-hand side the B battery connections. On the upper half of the panel is mounted: The Bradleystat, two rheostats, and in the upper left-hand corner a binding post for the antenna connection, while the A battery connections are in the lower right-hand corner, and the phone jack in the upper right-hand corner. As to the material used I will specify the following: A Bradleystat on the detector is necessary, and two model A Rhamstine transformers are suggested. A heavy condenser is also very necessary and a vernier attachment will help out very much.

With my set, I have logged over 62 radiophone stations, the longest distances being: KHJ, of Los Angeles on the west; WMAT at Duluth on the north; WJZ at Newark on the east and PWX at Havana on the south. Without the use of an outside aerial, and using no aerial at all I have logged KDKA and ten other stations, all over 500 miles distant. I have abandoned the outside aerial

now, having moved to a location where I couldn't get one up, but am getting excellent results from the lighting circuit by plugging in at the lamp socket.

My connection to the light socket is by inductance only, as I am using a length of the ordinary lamp cord (twisted pair). One wire is connected to the inside connection of the light socket, the other end of this same wire is taped securely to prevent a contact with the set. The other wire connects to the antenna connection. The free end of this wire is taped so that no connection can accidentally be made. I find that with this arrangement that my set is almost noiseless and that stations that heretofore came in weak now come in loud and clear. This arrangement is not recommended unless the light wires are all overhead. The current is always turned "on" when tuning in. Another important feature is the shielding of the set. This I have done with a fine mesh copper wire screen cloth, and I find that practically all body capacity is eliminated. Care must be taken that none

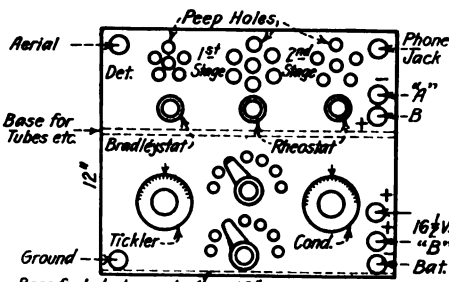


Fig. 2—Plan of panel showing the arrangement of controls.

of the parts touch the screen, and that it is well grounded, and preferably to a separate ground, although this is not necessary. I also wish to say here that my set is at present located under a tin roof, and with this roof being used as an aerial I have got good results, but not as good as with the light wire.

If there is any further information desired in connection with the building of this set I will gladly give it. The cost is small, and I urge any one contemplating the building of a receiver to give this one a trial.

Latest broadcasting map, 15c. That is, a complete broadcasting map appeared in RADIO WORLD, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, New York City.

(Continued from preceding page)

needed?—E. W. Johnson, 1441 Wilton street, Denver, Colorado.

1. You could use a vernier in this circuit very nicely. It would give you much finer tuning, although it is not absolutely necessary.

2. The B battery is connected incorrectly. The plus as you state should go to the plate, and not the filament. The way in which it is connected will not work.

3. A potentiometer is of little value in this circuit, as you have only 22½ volts on the plate, and the advantage, if any, would be so slight that it would not be of any value to bother with it.

MAGNAVOX is "news"

THE constant allusions to Magnavox Radio equipment in the public press, and the numerous illustrations of Magnavox Reproducer in operation, show how profoundly the radio world has been influenced by the Magnavox electro-dynamic principle of sound amplification.

R-2 Magnavox Radio with 18-inch horn



THIS instrument is intended for those who wish the utmost in amplifying power: for large audiences, dance halls, etc., but requires only .6 of an ampere for the field.

R-3 Magnavox Radio with 14-inch horn

SAME in principle and construction throughout as Type R-2.

Is ideal for use in homes, offices, amateur stations, etc.

Requires one ampere field current from your filament battery.



Magnavox Power Amplifier—Model C

CAN be used with any "B" Battery voltage which the power tube may require for best amplification.

AC-2-C, 2-Stage and AC-3-C, 3-Stage

The facilities and experience back of each piece of equipment bearing the Magnavox trade mark are unrivalled anywhere in the world.

Magnavox products may be had of good dealers everywhere.

Write to us for illustrated booklet

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Oakland, California

New York Office: 370 Seventh Ave.

Latest from the DX Nite Owls

Page Mr. Smith Again

From F. B. Meanor, Coraopolis, Pa.

KINDLY page Mr. Kenneth Smith. I am using a double slide tuning coil, six inches long and four in diameter, home-made, a crystal detector and condenser. Dictagraph phones are used. My aerial is V-shaped, about 50 feet high and 150 feet long.

Here's my record, not including the nearby stations: **WLK, WDAP, WOC, WHAZ, WHAS, WBT, WDAJ, WLW, WJZ, WGY, WCE.** As you will notice, these are stations listed in Charlotte N. C.; Chicago, Ill.; Davenport, Iowa; Minneapolis, Minn., besides Atlanta, Georgia, and closer ones. When you look you will see I live only 15 miles from Pittsburgh, and I think you will agree with me that this is some crystal record. I also heard a station in Omaha, Neb., but missed the call letters. Will be glad to hear from anyone interested in my record.

Hears PWX Regularly

From Frank Edel, DuQuoin, Illinois.

I AM enclosing both my records for DX crystal detector and also V. T. detector work. Following is my list of stations heard using a crystal detector without amplification of any sort:

KSD, St. Louis "Post-Dispatch," St. Louis, both night and day.

Other stations heard at night only are: **WCK, WHB, WDAF, WOC, WBAP, WGM, WSB, WDAJ, WGY, WDAJ, WWJ, WCK, WLW and WOH.** I do not consider it anything out of the ordinary to receive distant stations with a crystal set if time and care are taken in construction of the set. I can duplicate a good many of the stations any night that the conditions permit. I do not refer to static and other natural conditions, but to interference from the local arc system which at times causes trouble to such a degree that it is impossible to hear anything at all. My V. T. reception record I consider fairly good. I made this record using a home-made single circuit regenerative receiver without amplification. I can receive nearly all of these stations every night: **KSD, KHJ, KDKA, KFAF, KLZ, KOP, KZN, KYW, KFDE, KOB, PWX, NOF, CKCK, CFCA, CFCN, CJCG, WEW, WCK, WMAV, WIAR, WOH, WLK, WSB, WGM, WGY, WOR, WJZ, WHAS, WWJ, WOAL, WCX, WBAP, WEAK, WDAJ, WDAF, WOS, WOC, WMAB, WJD, WDAL, WHB, WLW, WBT, WOAL, WLAG, WFAA, WEAY, WPA, WDAP, WMAQ, WOQ, WOI, WMAU, WNAL, WAAV, WTAW, WJAX, WQAA, WMAT, WKN, WFAF, WMAK, WNAD, WNAV, WBL, WLAQ, WEAO, WHK, WFAV, WAAP, WOAG, WIAU, NAS, WSY, WIAP, WCAV, WGF, WPAC, WJAN, WKY, WMAH, WIAO, WCAE, WGR, WJAD, WLAJ, WAAW, WMAF, WMH, WAAB, WHAM, WLAL, WAAC, WEAB, WPAL, WMAJ, WMAV, WKAL, WOAA, WBZ, WDAE, WOAN, WWAC, WWI, WAAH, WCAV, WGAS, WNAS, WDAO, WNAC, WAAF, WQAO, WOAC, WAAL, WOO, WBAV, WCAZ, WHAZ, WIAB, WRAM, 2XB, 5OI, 5RH, 5WA, 5XY, 5ZA, 5UU, 5XAY, 8XI, 8XJ, 9XU, 9XD, 9BWI, 9XAQ, 9DTF and 9YAF.**

My hours of listening in are from about 5 P. M. to 1 or 2 A. M. While this list of stations looks big, it is nothing very great as it has nearly been duplicated by three other people in DuQuoin using a hook-up similar to mine. I receive **PWX** and **KHJ**, my two best DX's, regularly;

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

PWX on Wednesday and Saturday, and **KHJ** nearly every night. Any one desiring hook-ups of either set may have them by writing to me for them. I also invite investigation of either set and also the record. I am using a pair of Federal 2200 ohm headsets, a 21 plate variable condenser, bought "knocked down" and assembled myself, a variocoupler with taps taken off every 10 turns up to 90 turns. My rheostat is a Howard Vernier and my tube a Cunningham detector. The hook-up while simple and very easy to understand, is very effective. Further information concerning set may be had by writing to me.

Code from Colon, Panama

From Burdette Bowman, 616 S. McClure St., Marion, Indiana.

I SAW in RADIO WORLD for January 13 that you were interested in unusual hook-ups. Using a variometer, two home-made honeycomb coils, a 23-plate condenser and phone and grid condenser and the W-D 11, I have heard **KYJ, Los Angeles Examiner**, a distance of 2,223 miles; **KDYY, Denver**, a distance of about 1,600 miles. I receive music from Schenectady, Kansas City, Chicago, Toronto, New York City, Atlanta, New Orleans—at a distance of 300 to 700 miles—every night.

Any night Fort Worth is sending I can get it or any other station within a thousand miles. On January 11 I received music and lectures from **WWJ, WLK, WJAF, WOH, WOR, KDKA**, a station at Albany, **WGY, WMAV, WHB, WOC, WBC, WFAF, WFAA, KYW, WDAP**, and **WGY's** late program.

If any of the readers are interested in the way I have my set hooked up I will gladly forward information.

DX New York to Los Angeles

From Howard A. Chinn, Member of Hudson Radio Club, Inc., and Radio XCEG, 210 West 182d Street, New York City.

BESIDES listening to amateur DX I sometimes listen in to broadcast DX. I have heard practically all the stations within a 1,500-mile radius, which many others have reported, so I won't bother to enumerate them. The best broadcast DX that I have done is **KHJ, Los Angeles**. I heard them several times during the early part of January. Have received a letter of acknowledgment from them. This was done on a single tube and with ordinary regeneration; no amplification or super-regeneration. I think this is a record, as I haven't seen its equal in print as yet. Considering the fact that I live in the heart of New York City, surrounded by high apartment houses, I think this isn't bad for one tube. I maintain that if you can't hear it on detector, audio-frequency amplification won't help because you can't amplify what you don't detect.

From Iowa State University

From Harold E. Pratt, Member of WSB Radiowis, 316 S. Capitol St., Iowa City, Iowa.

AM a student here at the State University of Iowa and during my spare time I built a detector and one-stage regenerative set. I might add that owing to the conditions here I was unable to put up an outside wire, but am using my light fixture (and without any plug). Just wrapped a piece of lamp cord around the center of the three light fixture in my room, and got the following: **WOC, Davenport; KSD, St. Louis; WHAS, Louisville; WWJ, Detroit; WDAP, Drake Hotel, Chicago; WGY, Schenectady; 2XI, Schenectady; KYW, Chicago; WBAP, Fort Worth; WHB, Sweeney Auto School; KSAS, Denver; DN4, Denver; KLZ, Denver; WGM, Atlanta Constitution; WSB, Atlanta Journal; KHJ, Los Angeles Times; WLAG, Minneapolis; WFAA, Dallas; WDAF, Kansas City; WEAE, Fort Dodge; WJZ, Newark; WNAV, Knoxville; WLW, Cincinnati; WDAJ, College Park, Georgia; WOI, Ames, Iowa; KDKA, Pittsburgh; KDYS, Great Falls; WGF, Des Moines; WFAT, Sioux Falls; CFAC, Calgary, Canada; also stations at Okmulgee, Okla., and Birmingham, Ala.**

Heard Ship Alaskan

From E. G. Barnes, Mt. Vernon, Ohio.

I AM not a DX Nite-Owl, but I have had my feet wet, as H. J. Hall says. I have a home-made set consisting of 3 pancake coils, 1 tube, 1 grid con. and leap, 1 phone condenser socket and 2 home-made variable condensers, no aerial. The ground is wrapped around a water pipe in the cellar; not one drop of solder in the outfit. My tube is U. V. 200. This set was set up November 26, not 60 days ago; but I have had musical numbers from 81 different stations and 5 ships. Twenty-seven states are on my list. One Sunday evening I had Drake's Hotel at Chicago for two hours clearly, without touching a knob or dial. On January 15 from 4 P. M. to 10:30 P. M. I had 27 stations of which 12 were new ones, every one clear and loud. My farthest points were Boston, Hartford, Quebec, Portland, Oregon; Los Angeles, Austin, New Orleans, West Palm Beach, and back to New York City, and 72 others. Also had **WKG** on ship Alaskan. I should be glad to know the route of this ship.

Boys, have I had my feet wet? If not, get in. Do you take the Radio World. If not, get it. It's good. Will be glad to hear from any of you. This hook-up will be furnished on application.

In Less Than Three Months

From Cyril Cornwell, Osage, Iowa.

ON Friday night, January 19, I heard the following stations: **KDKA, WGM, WDAP, WPA, WCX, WFAF, KYW, CJCG, WOC, WAAP, WWJ, KSD, WDAF, WCAZ, WFAA, WMC, KHJ, WOAN, KLZ, WOS, CKCK, WAAH, KFAF, CFCA, KFBB, WGY, WLW, WBAP, KDZQ, WSB, WDAJ, CFCN and KNJ.** I listened in from 7:30 p. m. to 1:00 a. m. Besides these broadcast stations 143 amateur telegraph stations were copied, making a total of 176 stations in 5½ hours. With my receiver I have heard 132 stations in the United States, one in Havana, and 7 in Canada—a total of 140—all since November 5, 1922.

(Continued on page 31)

RADIO SUPPLIES ALWAYS AT SENSIBLE PRICES

All Wave Coupler, 160-300 Meters, with Free Hook-Up \$4.00
 1½ Volt Tubes 4.00
 6 Volt Detector Tubes 2.00
 6 Volt Amplifier Tubes 2.25
 3 Inch Dials25

WHITE'S
 (Formerly Stanley Radio Supply Co.)
 123 EAST 23RD ST., NEW YORK CITY
 Cash with Order. Allow Postage.



King Sr.
Variometer
 150 to 600 meters.

No outside connecting hardware used—reducing capacity losses.

Rugged—Solid. Size 4¼"x4¼"x2"
 Guaranteed by manufacturer direct to user.
 Retail price \$2.50
 Ask dealer to show same to you.

Aremco Mfg. Co., 30 East 23rd St., N. Y. C.



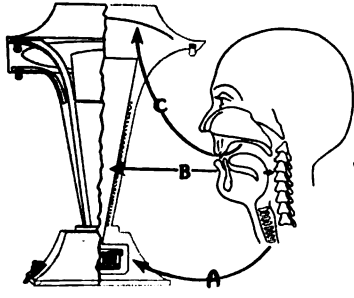
THE GOODMAN
 PATENT PENDING

The Niftiest Short Wave Tuner on the Market
 Only \$2.00 & PP on 1 lb. Send for pamphlet.

L. W. GOODMAN
 DREXEL HILL, PA.

Dealer: _____, Norristown, Pa., writes: Listening in recently with my **GOODMAN**, heard a voice, "We are now 90 miles out from San Francisco." Then **DENVER** came in and sank the ship.

THE ACOUSTICAL AMPLIFIER—
BEL-CANTO
 TRADE MARK
LOUD SPEAKER



It follows the natural functions of the human throat. The receiver is the vocal cord (A); the long tapering inner horn is the throat (B); and the "sounding-board" at the top is the roof of the mouth (C). A guarantee of superb tone.

Is adjusted for regenerative two stages of amplification, also five tube radio and audio frequency.

Special phone, cord and plug, price \$30.00
 F. O. B. New York.
 If dealer can't supply, we can.
 Full line of radio parts.

At your dealer or direct from maker.

Bel-Canto Corporation
 417 East 34th Street, New York City

RADIO WORLD

TELEPHONE, BRYANT 4796
 PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
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TECHNICAL EDITOR
 Robert L. Dougherty

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 Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 23, 1923, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE
 While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

Radio and the Churches

Not only does radio bring the church into the home, but it brings church services into other churches, says "The Radio Dealer."

The story is told of a church out West that lost its pastor. No substitute clergyman was available and it looked as if there would be no services on the Sabbath. A radio enthusiast saved the day. He rigged up a receiving set with a loud speaker. When the congregation assembled on Sunday morning it was surprised to see a mechanical device on the rostrum instead of a clergyman.

Soon the contraption on the rostrum prayed, sang, talked and preached. The sermon was said to be a good one. It was probably better than the congregation was in the habit of hearing, for it was a poor church and had little money.

No one knows what unexpected influences may be exerted by radio on church affairs. It may make possible the elimination of a certain number of clergymen. It may develop a new class—ecclesiastical orators—who will specialize in broadcasting and will leave the pastoral work to be done by others.

A recent survey shows that the broadcasting in this country of Sunday church and religious services covers 65.2 the area of the United States—surely enough for most people.

Some large churches are now broadcasting their own services to those who stay at home. Others will doubtless do this soon. Churches that aim to serve as "community centers" have receiving sets for the benefit of the church clubs and organizations seeking sociability and pleasure in the church-house.

Let Radio Radiate Your Home



List	Our Price
\$8.00 Eisemann Phones.....	\$5.25
16.00 Western Electric Phones extra ear caps and mufflers	7.50
25.00 Federal Jr. Crystal Sets.....	12.50
5.00 Fisher Variometers and Couplers	2.75
1.50 Klossner Vernier Rheostats .....	.95
5.50 Workrite Bakelite Degree Coupler.....	3.50
1.00 Paragon Bakelite Socket.....	.60
1.75 Bright Star "B" Batteries	1.15
8.00 Federal Phones	6.25
60.00 Cutting Washington Regenerative Tube Set.....	27.50

Write for free catalogue
 Perfection Pays Parcel Post

Perfection Radio Corp.
 of America
 119 WEST 23RD STREET, NEW YORK

RADIO At Cut Prices

Just a Partial List of the Many Bargains Offered

\$5.50 Murdock Double head sets.....	\$3.49
\$5.00 Acme Transformer, Radio and Audio	3.45
\$18.50 "Homcharger" De Luxe.....	13.95
\$5.50-180 Variocoupler on bakelite silk wound wire	2.45
\$15.00 Western Electric Phones.....	7.45
\$6.00 Genuine "Tuska" molded variometer with dial	2.95
Ammeter for Testing "B" Batteries..	.40
Hydrometers for Testing Storage Batteries .....	.39
\$2.50 Phonograph Attachment	1.15
\$2.50 Socostats	1.25
\$5.00 43-Plate Condenser	1.95
\$4.00 23-Plate Condenser	1.55
Framingham Rheostats .....	.45
2-inch Bakelite Dials .....	.25
4-inch Electro Dials .....	.75
3-inch Bakelite Dials .....	.35
W. D. 12 Transformer for W. D. 11 Tube	4.95
\$1.00 Freshman Variable Grid Leak and Condenser Combined .....	.80
100 ft. 7-Strand Aerial Wire.....	.55
Genuine All-Wave Coupler	7.90
50c Single Pole Switch.....	.20
75c Double Pole Switch .....	.35
½-lb. Annunciator Wire .....	.20
Bus Bar Wire Per Foot.....	.02
\$10.00-3000 Meter Coupler	4.95

Modell's
 ESTABLISHED 1889

RADIO STORES
 Dept. E, 191 Fulton Street, N. Y. C.
 Pay Postman C. O. D. plus postal charges, or send your remittance with order.
 MODELL'S—The Greatest Radio Mail Order House.

1923 Will Not Be Complete!

Without a Year's Subscription to

RADIO WORLD
 (52 numbers) \$6.00

Add \$1 a year extra for postage to Canada and foreign countries.

1493 Broadway New York, N. Y.

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

Orders by Radio Goods Advertised in Radio World

Jean Bonner, of 6009-A Horton Place, St. Louis, Mo., recently saw in RADIO WORLD an advertisement of the Sunbeam Electric Company, New York City. Mr. Bonner sent a message by radio to a friend in New York City ordering him to purchase radio apparatus for him, as per advertisement in RADIO WORLD, and to have it sent to him P.P. collect. The order was filled and sent immediately.

This illustrates how radio can be used efficiently and expeditiously in ordering goods. If Mr. Bonner had written the order, it would have taken it three days to reach New York, and then it would have had to go through the usual mail order routine.

Who will establish himself as the first Radio Buyer for the trade and for fans?

And how's this as a testimonial for RADIO WORLD as an advertising medium of quick results,

White Cement for Amateurs Who Make Their Own Coils



A cement recently put on the market by the White Radio Co., of 123 East 23rd street, New York City, will probably meet with widespread acclaim by radio amateurs who construct their own coils. It is a colorless liquid, which is put on the wound coils much the same as shellac but does not have the drawback of shellac; namely, it does not create distributed capacity, as does shellac. By means of this liquid self-supporting coils can be made. It is only necessary to wind the coils on a core, over either paper or a layer of string, then coat the coil with the liquid, allow it to dry and, after another coat, remove the string or paper, and the coil will be found to be self-supporting. It is a chemical composition, embodying ether much the same as collodion, and therefore, when dry, has a whitish appearance,

but by the addition of another chemical, it forms a very hard base which is not flexible, as is collodion.

No More "B" Battery Trouble

A new battery manufactured by Sidbened Radio Co., 1663 Jerome Ave., Bronx, N. Y. C.

A small "B" battery manufactured by these people has recently been put to rigorous tests, and found to be ideal for every purpose in a receiving circuit. The battery consists of a small molded rubber case with 10 divisions. Each division holds a positive and negative plate such as is found on the larger batteries used to light the filament. The construction is such that the entire cover can be removed and the elements exposed for inspection. The battery is charged on a C. current through a simple rectifier consisting of a strip of aluminum and lead in a solution of borax, with a 60-watt lamp in series. A load was put on this battery equivalent to 300 hours' service, and very little depreciation was noticed at the end of that time, outside of water needed due to evaporation. It is of rigid construction and will outlast many of the dry cell type.

How Radio Helped an Employer to Hold His Employees

IN this busy world, there is always a demand for something that will relieve the monotony of the daily grind. This was proved by one of the largest manufacturers of knit goods during the past few weeks, in an experiment, which was as follows: This manufacturer had allowed the girls to have five minutes out of every hour for recreation or rest, arguing that they could work better and pay more attention after a few minutes' rest. Having a small son at home who was interested in radio, he tried the experiment of installing a small set in the girls' rest room in lieu of a phonograph. He noticed that a very great interest was taken in the concerts and goings on over the radio, and therefore thought that the girls might overstay their rest periods and shirk. But by careful observation, he found the opposite to be the case. Being interested in the new-found diversion, they worked hard, to pass the time, and did not waste time as was usual, by lagging, but hurried back to work to discuss the different things they had heard during their five minutes' rest.

As a result, the girls, instead of growing dissatisfied and leaving, stayed and seemed happy, and the news spread far and wide that none of the girls in his employ were leaving, and he could get any number of girls if he wanted them.

New Radio Firms

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Brotherhood of Electric Workers, Local No. 3, Manhattan, realty, \$5,000; R. L. O'Hara, C. Dubourg, G. W. Whitford. (Attorneys, McCall & O'Leary, 51 Chambers St.)
New Bath Co., Brooklyn, electric, \$25,000; E. A. Levin, B. O. Jackson, J. L. Filan. (Attorney, A. A. Levin, 215 Montague St., Brooklyn.)
Radio Clearing House, Manhattan, \$20,000; W. Scadron, B. E. Simmons, J. E. Onorata. (Attorney, L. Scadron, 149 Broadway.)
Dabarton Corp., Manhattan, electrical supplies, \$50,000; W. homashower, S. Snyder. (Attorney, A. A. Arafan, 140 Nassau St.)
A. MacIntyre Electric Co., Albany, \$7,500; A. and E. MacIntyre, J. S. Sanford. (Attorney, H. W. Williams, Albany.)
Artglo Electric Corp., Manhattan, \$15,000; J. R. Lundy, W. G. Lenz, T. F. Lee. (Attorney, J. Schultz, 1 Madison Av.)

RADIO STOCKS

(Quotations as of January 31, 1923, furnished by Frank T. Stanton & Co., 35 Broad Street, New York City, Wireless Stock Specialists.)

Stock	Bid	Asked
American Marconi Unstamped	\$5	\$7
American Marconi Stamped	5c	20c
American Tel. & Tel.	121 $\frac{7}{8}$	122 $\frac{1}{2}$
Canadian Marconi	2 $\frac{1}{2}$	3
De Forest Radio	7	10
Dubelier Condenser	6	6 $\frac{1}{2}$
English Marconi com.	11	14
English Marconi pfd.	11	14
Federal Tel. Co. Calif.	6 $\frac{1}{2}$	7 $\frac{1}{2}$
General Electric	182	183
Mackay Co. com.	103	107
Manhattan Elec. Supply	53	54
Marconi Int. Marine	8	10
Radio Corp. com.	3 $\frac{3}{8}$	3 $\frac{1}{2}$
Radio Corp. pfd.	3	3 $\frac{1}{2}$
Spanish Marconi	1	3
Western Union	112	113
Westinghouse E. & M.	61 $\frac{1}{2}$	62 $\frac{1}{4}$

List of Stations Free

A neat, attractive and handy booklet showing a complete list of broadcasting stations has been prepared by Modell's distribution through the radio departments of their New York stores. Readers of Radio World will receive the complete list free, if they will send their name and address together with a two-cent stamp to cover postage, to Modell's, 58 Church Street, New York.

A Regular Job!

The Director of Radio, or whatever his title may be, will have his hands full controlling the waves, it is pointed out by one fiend on history, who recalls that Old King Canute got into difficulties some years ago and wet his feet terribly trying to do the same thing.

SEND ME YOUR PHONES

for repairs. All makes. Satisfaction guaranteed. Reasonable charges.
Roy, 101 West 42nd St., New York City

Big Hotel Uses Radio In Important Way

The following telegram to RADIO WORLD explains itself:

14NYWA840AM 87 NL
MC CHICAGO ILLS JAN 31 1923
RADIO WORLD
1493 BWAY NY

WIRELESS TELEPHONIC COMMUNICATION BY AN INLAND STATION ON A PREARRANGED SCHEDULE IS BEING CONDUCTED BY US FOR THE FIRST TIME WITH AN OCEAN LINER THE BERENGARIA SAILED JANUARY THIRTIETH FOR FRANCE PASSENGER MISS

FLORENCE MCDONALD OF SYRACUSE NEW YORK THROUGH COURTESY OF THE CUNARD COMPANY HAS IN HER CABIN A ZENITH RADIO RECEIVING SET AND THIS MORNING WIRELESSED BACK REPEATING OUR MESSAGE TO HER PROVING RECEPTION WE ARE SENDING EACH MORNING THIS WEEK AT ONE AM TO THE BERENGARIA WE WELCOME OBSERVERS IF YOU CARE TO SEND ONE
DRAKE HOTEL BROAD
CASTING STATION

Latest Radio Broadcasting Stations

(Latest official additions to the List of Radio Stations of the United States.)

Stations broadcasting market or weather reports (485 meters) and music, concerts, lectures, etc. (360 and 400 meters), alphabetically by call letters.

Call signal	Station operated and controlled by—	Location of station.	Wave lengths.
KFAZ	C. H. Weatherill.....	Redley, Calif., 1348 Z Street.....	360
KFCM	Richmond Radio Shop.....	Richmond, Calif.....	360
KFDH	University of Arizona.....	Tucson, Ariz.....	360
KFDJ	Oregon Agricultural College.....	Corvallis, Oreg.....	360
KFDL	Knight-Campbell Music Co.....	Denver, Colo.....	360
KFEP	Radio Equipment Co.....	Denver, Colo.....	360
KFHJ	Fallon Co.....	Santa Barbara, Calif.....	360
WOAS	Bailey's Radio Shop.....	Middletown, Conn.....	360
WOAT	Boyd M. Hamp.....	Wilmington, Del., 215 Market Street...	360
WOAU	Sowder Bolling Piano Co.....	Evansville, Ind.....	360
WOAX	Franklyn J. Wolf (Monument Pottery Co.)...	Trenton, N. J.....	360
WOAY	John M. Wilder.....	Birmingham, Ala., 2017 First Avenue South.	360
WPAH	Wisconsin Department of Markets.....	Waupaca, Wis.....	485
WPAJ	Doolittle Radio Corp.....	New Haven, Conn.....	360
WPAK	North Dakota Agricultural College.....	Agricultural College, North Dakota.....	360, 485
WPAF	Theodore D. Phillips.....	Winchester, Ky.....	360
WPAQ	General Sales & Engineering Co.....	Frostburg, Md.....	360
WPAR	R. A. Ward.....	Beloit, Kans.....	360
WPAS	J. & M. Electric Co.....	Amsterdam, N. Y.....	360
WPAT	St. Patricks Cathedral.....	El Paso, Tex.....	360
WPAU	Concordia College.....	Moorhead, Minn.....	360, 485
WPAV	Paul Tinetti & Sons.....	Laurium, Mich.....	360
WPAW	Radio Installation Co.....	Wilmington, Del.....	360
WPAX	S. W. Radio Co. (J. R. Shumate, jr.).....	Thomasville, Ga.....	360
WOAB	Southwest Missouri State Teachers College.....	Springfield, Mo.....	360
WOAC	E. B. Gish.....	Amarillo, Tex.....	360
WOAE	Moore Radio News Station (Edmund B. Moore).....	Springfield, Vt.....	360
WOAK	Appel-Higley Electric Co.....	Dubuque, Iowa.....	360
WOAL	Coates County Telephone & Telegraph Co.....	Mattoon, Ill.....	360
WOAY	Gaston Music & Furniture Co.....	Hastings, Nebr.....	360
WRAN	Black Hawk Electrical Co.....	Waterloo, Iowa.....	360
WSAT	Plainview Electric Co.....	Plainview, Tex.....	360
WWAI	Wright & Wright (Inc.).....	Philadelphia, Pa.....	360

Several Senators, Congressmen and Governors on WJZ'S Program

The radio audiences that have been favored recently by the activities of WJZ, the Radio-Corp.-Westinghouse Station, broadcasting direct from the grand ballrooms of the big New York hotels, thus enabling the invisible audience to hear the addresses of some of the world's foremost men, has the opportunity of hearing during the evening of Feb. 1 addresses of U. S. Senator William H. King of Utah, Congressman James A. Frear of Wisconsin, and Thomas W. Sisson of Mississippi, Bishop Wm. Manning of New York, Governor Al. Smith of New York and ex-Governor Charles S. Whitman of New York, the latter of whom was the presiding officer at the annual banquet of the New York Society of Military and Naval Officers of the World War, held in the grand ballroom of the Hotel Plaza. This association is composed of several hundred socially prominent Army and Navy officers who reside

in New York State. Ex-Governor Charles S. Whitman of New York is the president of the association. Col. Herman A. Metz, former Comptroller of New York City, was chairman of the dinner committee. The long list of vice-presidents include Brigadier Generals Oliver B. Bridgman, James Rabb and George Wingate. The broadcasting of the addresses began at 9:30 P. M.

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and exhibitions. Keep us posted by mailing full information.

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2 and 3, 1923.

FIRST UNIVERSAL EXPOSITION OF INVENTIONS AND PATENTS, Grand Central Palace, New York City, February 17 to 22, inclusive, 1923.

SOUTH JERSEY'S FIRST RADIO-ELECTRICAL SHOW, Third Regiment Armory, Camden, N. J., February 5 to 10, inclusive.

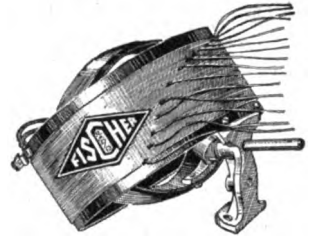
D-X-

(DISTANCE)

The Ambition of Every Fan

D-X-RADIO COMPANY specializes in Radio instruments designed for DX (Distance) Work. To receive distant stations your instrument must be built with proper equipment. And that means the D-X-Radio Company—particularly since we offer highest quality radio parts at lowest prices.

SPECIAL GENUINE FISCHER 180° VARIOCOUPLER



14 TAPS, SEVEN IN UNITS
SOLDERED LEADS READY TO USE
REGULAR PRICE...\$5.00
SPECIAL PRICE...\$2.25

Remittance must accompany all Orders. Checks or stamps not accepted. Merchandise shipped post paid east of Mississippi.

FREE CATALOGUE ON REQUEST

D-X-Radio Co.

123 Liberty Street New York City

REAL RADIO BARGAINS

- 23 Plate Var. Cond.....\$1.10
- 43 Plate Var. Con..... 1.45
- The New Bull Dog Grip
- W. D. 11 Socket..... .65
- Variable Grid. Leaks.... .69
- Rheostats—Acme69
- Murdock Crystal Sets
- Complete with 3000 ohm
- Phone, Aerial, etc..... 6.98
- Acme 2 Step Amplifier
- (List \$35.00).....17.50
- Murdock 3000 ohm
- Phones 3.98
- 3 inch Dials..... .19

Paragon, Cardwell, Acme and all Standard Apparatus on hand at Lowest Prices.

ECLIPSE RADIO CO.

414-W-42 ST. N.Y.C.

D X Records

are easily made with

6000 Ohm

N & K Phones

at your dealer's or send check or money order and I will mail you, postpaid, a pair of these famous \$14.50 phones for

Special Sale Price \$7.75

A higher ohmage than any other phone.

Ernest Walker Sawyer

Room 604

16 East 43d Street New York

Money refunded if phones are not satisfactory and are returned within five days.

RADIO PANELS

Cut exactly to size and shipped within 12 hours. 1/4 inch thick, 1 1/4 per square inch, 3/16 inch, 1 1/4 per square inch. Made of the highest grade black fibre. This material possesses high dielectric strength, is inexpensive, unbreakable, easy to work and takes a nice finish. Special offer, 6x6x1/4, 50c; 6x 12x1/4, \$1.00. Postage paid.

WILEY PANEL CO.
2323 So. Central Park Ave., Chicago, Ill.



RADIO TOOL SET

- Side Cutting Plier
- Long Nose Plier
- Two Screw Drivers
- Electrician's Knives
- Two screw drivers

\$4.00 in Bag

With Soldering Iron Kit, \$4.75
With Automatic Torch, \$6.00
Send Money Order

CEB CO., 100 Park Place, New York City

\$25 A DAY
Selling Shirts

Large shirt manufacturer wants agents to sell complete line of shirts, pajamas, and nightshirts direct to wearer. Advertised brand—exclusive patterns—easy to sell. No experience or capital required. Entirely new proposition. Write for free samples. Madison Shirt Co., 503 Broadway, N.Y.C.

FREE

SHELSTONE LOUD SPEAKER

With every pair of Original Nathaniel Baldwin Complete Type O Headset

At \$12.00

This Loud-Speaker recognized by experts as the best for true tone, clearness and design.
Cash with order or C. O. D.

WALTER SCOTT
10 St. Luke's Place Upper Montclair, New Jersey

Why are so many
Public Libraries
Y. M. C. A's.
K. of C's.
Y. M. H. A's.
Army Posts
Social Clubs
Industrial Libraries

And others in this subscription group ordering subscriptions for **RADIO WORLD** from all parts of the U. S., Canada and foreign countries?

THE REASON

Because so many
Of their members
Are interested in Radio
That they want to read
RADIO WORLD every seven days.
Ask the Association or Club
To which you belong
To subscribe for

RADIO WORLD
The Great Illustrated National Weekly
(\$6.00, a Year, 52 Numbers
\$3.00 Six Months; \$1.50 Three Months)

RADIO WORLD
1483 Broadway New York City

Opera by Wireless

Broadcasting opera, which has been done in Chicago for the past two seasons, has at last reached London, says an editorial in the New York "Globe." Excerpts from the British National Opera Company's performances at Covent Garden have been transmitted with such success that broadcasting has been adopted as a nightly procedure in London and plans are being made to continue the procedure when the opera company moves to Manchester.

In Chicago an arrangement was made between the opera company and the Westinghouse Electric Company by means of which microphones were placed in the Auditorium, and through these the sounds are conveyed over telephone wires to the broadcasting stations. Opera was thus made audible for a thousand miles about the city. Fifty years ago, when Matthew Arnold visited the metropolis of the Mississippi Valley, local patriots admitted that their city was short on culture, but they said that when they got around to it Chicago would make culture hum. A city which distributes grand opera through the air to points as far distant as Denver and New York can be fairly said to have made good the boast.

According to reports from the west, the broadcasting experiment has been profitable to the opera company as well as to the sellers of electrical devices. The wireless has stimulated an interest in opera and increased the patronage of the Chicago company. This is a natural development and a wholesome one. It is, of course, impossible to overestimate the importance of an undertaking of this kind, since the great problem of the modern world is to distribute justly the amenities of life, and among these the opportunity to hear good music is not the least. The comfort and the pleasure which the transmission of grand opera from Chicago must give to the music-loving inhabitants of villages and farms remote from any great centre are very great. Life for uncounted thousands is thereby enriched.

According to the "Manchester Guardian," the social effects of the British experiment have been highly interesting. The London correspondent of the paper described the excitement of his charwoman, whose family had spent an hour and a half listening to a Mozart programme through a receiving set made by her son, an engineer's apprentice. The episode could undoubtedly be multiplied many times by the testimony of Americans to whom new opportunities had been opened by the radio.

It would be exceedingly interesting to have the Metropolitan Opera Company broadcast its programmes. Although the profit in such a venture would not be immediate and direct, distributing music through the air would probably be like bread upon the waters, and indirectly here, as in Chicago, the paid attendance would be increased. Is not the experiment worth while?

It Can't Be Done!

Some Congressmen seem to think that radio can be laid out like pastures or grazing lands with neat wire fences which would keep the broadcasts and messages within the confines of a state. Two of them actually believe that State rights are involved in the bill before the House and want local radio control left with the state governments. "DX's," take notice!

Fully Descriptive

"I call my new maid 'The Wireless Wonder.'"
"Why?"
"Because she's always 'listening-in'!"—
London Mail.

RADIO PANELS

High dielectric resistance.

6"x24"	.....	\$1.00
8"x24"	1.25
12"x24"	1.75

Manufacturers' special sizes solicited.
Agents wanted.

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FOR the benefit of those interested in Radio and those who are becoming interested, Rand McNally & Company have prepared a publication containing a wealth of information of greatest value. It shows in the most comprehensive way, the location of the broadcasting stations, gives their classification, the call letters, wave lengths, ownership, etc., of each.

Everyone who wishes to get the maximum pleasure and enjoyment from Radio should have a Rand McNally Radio Map of United States. It is complete, accurate and up-to-date.

The Rand McNally Radio Map of United States is 28x30 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover.

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As Binns Tells It

During the two weeks' period of the third annual amateur trans-Atlantic wireless telegraph tests amateur operators in England, France and Switzerland succeeded in receiving signals from 316 American amateur stations, says Jack Binns in the New York "Tribune." For the first time European amateurs transmitted to this country, and two stations in England and one in France were heard by a few amateurs on this side.

While the tests were completely successful far beyond expectations, they clearly show that the American amateur is far ahead of his European colleague in handling transmitting apparatus, but the latter exceeds the American in operation of receiving equipment.

As a result of the success the American Radio Relay League of Hartford, Conn., under whose auspices the tests were held, announces that a new series of tests will be shortly undertaken. These will consist of using certain chosen stations on both sides of the Atlantic to transmit complete messages across the Atlantic both ways. This is the most ambitious undertaking yet attempted.

Hiram Percy Maxim, president of the American Relay League, says:

"The news that has been received during the last two or three days is only a fraction of what really is the case, because when the mail has had time to come in from remote places we shall find that people in Iceland, Alaska, Africa, South America, Australia and some of the remote little islands in the South Pacific have been in on this thing also. We know that they are listening, because we know of them and their work, and it is a certainty that several of them must have connected up in these recent tests. Porto Rico and the Hawaiian Islands are already among our intimates, for we communicate nightly. One of us, George E. Cannon, of New Rochelle, N. Y., has actually had his spoken word reported in both England and France, and it must be borne in mind that Mr. Cannon's radio-telephone is purely an amateur one, located in his home residence in New Rochelle.

"Another very important thing about these tests which is tremendously impressive to any thinking person is the fact that this whole business has been worked up and actually accomplished by young American amateurs, with absolutely no help from any outside their own number. Not only have they invented, constructed and operated transoceanic short-wave radio communication, but they have secured the liberation of their fellow amateurs in several of the European countries by the force of their energy and their example. The laws of Canada, Great Britain, France and Switzerland have actually been changed by the influence brought to bear by these vigorous young Americans."

Newsdealers Attention

You should keep a good supply of back numbers of RADIO WORLD on hand all the time. It has been the experience of many dealers that a purchaser of RADIO WORLD for the first time will almost immediately want the back numbers, some of which are already out of print and some of which are difficult to get. THE PUBLISHER WILL FURNISH BACK NUMBERS TO DEALERS DIRECT OR THROUGH THE AMERICAN NEWS CO. AND ITS BRANCHES. Dealers should hold their unsold copies for a reasonable length of time. RADIO WORLD of October 28 contained a full page of contents of back numbers to that date. 15 cents per copy; any seven numbers for \$1.00. RADIO WORLD, 1493 Broadway, New York.

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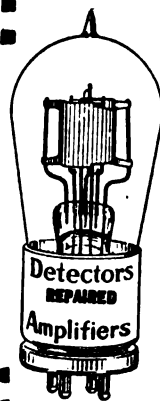
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Back numbers of Radio World are becoming scarcer all the time. We can now furnish you with back numbers from No. 1 to date at fifteen cents a copy. Any seven numbers for one dollar. RADIO WORLD, 1493 Broadway, New York City

The Radio Primer

A Weekly A. B. C. of Radio for the Beginner, in which Elementary Facts and Principles Are Fully and Tersely Explained and all Words and Terms Used by Amateurs and Experts Defined

The Beginner's Catechism—By Lynn Brooks

WHAT is meant by an open circuit as applied to a radio set? The open circuit is that part comprising the aerial, the tuning inductance, condenser and ground. In all it is the primary circuit, and is termed open because there is no direct line where the current can travel. An open circuit in line telegraph is generally a break.

* * *

What is meant by—the closed circuit—as applied to radio?

The closed circuit is that part comprising an inductance generally shunted by a condenser. The frequency at which either of these two circuits oscillate depends on the amount of inductance and capacity in both circuits. In other words, both the open and closed circuits will oscillate when the inductance and capacity of each is alike.

* * *

What is the easiest way of placing a condenser in the primary (open circuit) of a receiving set in such a way that it may be either in series or parallel?

By placing a series parallel switch in the circuit which allows the condenser to either be in series with the primary inductance or in parallel.

* * *

What is the effect of placing the condenser in series?

The effect of placing a condenser in series with the primary coil of a radio circuit is to cut down (decrease) the wave length.

* * *

What is the effect of placing a condenser in parallel with a coil?

When a condenser and an inductance coil, as in the primary circuit of a radio set, are placed in parallel, the effect is the same as if additional wire had been added to the inductance. In other words, it increases the wave length.

* * *

What is absorption?

By absorption we mean that portion of radiated energy that is lost due to atmospheric conductivity, or electric conductivity, of

some nearby body, such as a tall steel structure. A tall building in the vicinity of a station materially lessens the radiated power by absorbing some of the energy as a sponge absorbs water.

* * *

What is hysteresis?

Hysteresis is the slowness or lagging when a change of condition is taking place in an electromagnetic circuit. In a circuit that embodies iron or steel, it is generally manifested in heat, which dissipates the active energy. That is the main reason why iron wire cannot be used in radio circuits. The small amount of energy is dissipated or used up in production of heat, due to the molecular motion produced in the substance by the electrical energy. In a magnet (electro magnet), if the current is sufficiently strong in the coils, the heat can be noticed if the current is left on long enough. This is the main principle used in heating coils.

* * *

What is meant by A. C.?

This is the abbreviation for alternating current—an alternating current being a current which gradually rises in value from zero to maximum in one direction, and back to zero, and then repeats in the other direction. One alternation is a change in a current from zero to maximum and then back to zero.

* * *

What is a cycle?

A cycle is a complete change in direction, as noted above, or from zero to maximum to zero, then to maximum and back to zero, in the opposite direction. This, as described, is a complete cycle. When a current is said to be 60 cycles, it is meant that it makes 120 alternations per second.

* * *

What is meant by D. C.?

By D. C. we mean direct current, or current that travels only in one direction continuously. Direct current is produced by a machine called a dynamo. Alternating current is produced by an alternator.

Steinway Concerts on Fridays at 3 P. M.

THE latest improvement in the way of concerts to be heard from WJZ is the broadcasting of the weekly concerts held at Steinway Hall every Friday afternoon at 3 o'clock. This was brought about by the invitation of the officials of the Steinway Company in New York City to the Radio Corporation-Westinghouse Station to install microphones in the large concert hall.

This new development will bring joy to the hearts of thousands that cannot attend the concerts but who, through the agency of radio, can listen in when the concerts take place at the concert rooms.

Many of the most famous artists in the world are heard at these concerts, and as the capacity of any hall, no matter how large it is, is limited, this new development will allow an unlimited number of people to hear the singing and music without the annoyance of travel. At the

Perfectly Satisfied



"Gee, Annabelle! ain't it nice of them to broadcast 'That Ever Lovin' Pair' for our benefit. They know us, all right."

same time, people who never have attended concerts of this kind will receive education in a musical way.

Radio Grows in Holland

OF LATE there has been a remarkable increase in the popularity of radio throughout Holland. Several large broadcasting stations have been planned, and they now are broadcasting directly from The Hague, on a 2,600-meter wave length. This interest has sprung up rapidly, and is a direct result of the reports of the American and English transatlantic tests, in which the American amateurs did such remarkable work.

Over the Water

A stock company has been formed in Sweden, with a capital of \$170,000 to broadcast news, market reports and entertainment from Stockholm. Remarkable interest has been shown in the new science, as evidenced by the generous purchases of radio goods throughout the kingdom.

Subscribe for RADIO WORLD. \$6.00 a year, \$3.00 six months, \$1.50 three months.

World Conditions of Today Broadcast

The main addresses delivered at the fifty-first annual dinner of the Silk Association were broadcast from the grand ballroom of the Hotel Astor, in New York, between 8:30 and 9 on the evening of Saturday, Feb. 3, on 360 meter wave by WJZ, the Radio Corp.-Westinghouse Station. The speakers were S. S. McClure, the writer, publisher and editor,

and Alexander Woolcott, well-known dramatic critic, now with the New York "Herald" and formerly with the New York "Times." Mr. McClure is a world traveler, and spoke on "World Conditions of Today," from a first-hand knowledge of many countries and public events. Mr. Woolcott, as interesting a speaker as he is writer and critic, talked on "Behind the Scenes." The toastmaster of the evening was James A. Goldsmith, President of the Silk Association of America.

The Silk Association is a fifty-one year old trade organization composed of firms in every branch of the American silk industry, from those who import raw silk from Europe or the Orient to those who manufacture, dye and finish fabrics. The association acts as a clearing house for trade problems and a center for the improvement of the industry.

The dinner was attended by more than 1,200 men. The guests included a number of the foreign ambassadors from Washington, and distinguished delegations to the exposition from Japan, China and Great Britain. At ten o'clock the company adjourned to Grand Central Palace for "Embassy Night," the private and formal opening of the exposition.

the coast between Balboa, Panama and Rio Suchiate.

The stations of Hermosillo and Mexicali will broadcast notices emanating from stations situated between the Mexican boundary and San Francisco.



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American Radio Stores
 235 Fulton Street, New York City
 All orders must include postage.

Telling How It's Done

The WJZ program for Sunday evening, Feb. 4, included a talk on "How the Waldorf-Astoria Concerts Are Broadcast," by Dr. William H. Easton of the Westinghouse Electric & Mfg. Co. This address was broadcast, thus enabling both the invisible and visible audiences to hear the WJZ's broadcasting problems.

Mexico's Service for Mariners

THE Mexican Government inaugurated on November 1 last a new service of picking up and broadcasting notices to mariners emanating from foreign radio stations, American and Cuban. The notices will be broadcast for three consecutive days at 12 o'clock (local time) as follows:

The radio station of Tampico will pick up for broadcasting notices emanating from stations situated on the coast between Florida and Rio Bravo and also from Cabo San Antonio radio station of Cuba.

The Merida and Payo Obispo stations will broadcast notices emanating from the Cuban stations and also those of the coast up to Colon, Panama.

The station of Salina Cruz will broadcast notices emanating from stations situated on

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This book answers every question one can ask about modern aircraft, their construction and operation. \$75 pages, 136 specially made illustrations with 7 plates. Price, \$2.50

THE COLUMBIA PRINT
 100 Broadway, New York City

Attention! Fans and Amateurs!

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Why not share this knowledge with your thousands of brother fans who read **RADIO WORLD** every week?

We want pictures of receiving sets with descriptions of how you overcame some difficulty, or of any additional part or unit that you have added to obtain better results. These are the things that, probably, the other fellow is looking for. Send in your information; pictures or whatever you have done to improve the art. Remember the beginner is looking for them.

We intend to print in this paper, each week, pictured information and description of value to radio amateurs. If you have found a newer or better way of doing anything, don't keep the secret but tell it to your thousands of brother fans.

Send in a photograph of your set with or without accompanying diagrams and measurement. State whether you figure in the picture yourself, or not, and without any expense whatsoever to you we will make an engraving and publish it. Be sure to write your name and address plainly on photograph.

Send in your picture at once, or if you have not made a set or done anything else in making radio material, tell the boy next door all about this offer.

Address Technical Editor

RADIO WORLD, 1493 Broadway, New York City, N. Y.

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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

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BROADCASTING MAP

of the United States appeared in RADIO WORLD No. 8. Sent on receipt of 15c, coin or stamps; or start your subscription from that number (\$6.00 for 52 issues).

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Editor Discusses Kellogg-White Bill

THE government has found it impossible to properly regulate the radio operations of 1923 through the provisions of an act passed in 1912, says the *Norfolk Pilot* in an editorial discussion of the radio congestion. The provisions of that act may have been satisfactory ten years ago, when amateur stations were a rarity and broadcasting stations unknown; but at a time when the country contains twenty thousand transmitting stations and more than five hundred broadcasting stations the old law is ridiculously inadequate. The Department of Commerce, by the adoption of regulations not inconsistent with the Act of 1912, has tried to keep pace with the advance of wireless, but the department has been sadly encumbered by archaic limitations of authority. The result is such a congestion in atmospheric traffic as to render receiving apparatus at times almost useless and to endanger the essential uses to which radio is put. That stricter regulation and a new effectual assignment of wave-lengths to sending stations are necessary for the future of radio is evident to any owner of a receiving set who has listened helplessly to a medley of grand opera, stock reports, bedtime stories and political speeches.

A step in the direction of more effective regulation has been taken through the introduction in Congress of the Kellogg-White Bill for radio control, hearings on which have begun in the merchant marine committee of the House. This measure, the result of study by radio experts and Department of Commerce officials, is hardly the last word as a remedy for the conditions which prevail, but it has features which commend themselves as worth trying. Its most significant provision is that which grants the Secretary of Commerce the power to classify radio stations, to prescribe the nature of service to be rendered by each class of station and to assign wave-lengths. In this he is aided by the amendment which removes the old restriction on wave-lengths, except for army and navy stations, to less than 600 or more than 1,600 meters. Twenty thousand transmitting stations and five hundred broadcasting stations cannot satisfactorily be limited to wave-lengths of between 200 and 600 meters, and that was virtually the effect of the limitations of the old law, for 1,600 meters is too great a wave-length to be practicable.

The license fees provided by the Kellogg-White Bill would probably have the effect of reducing the number of stations. The provision which gives the Secretary of Commerce the power to grant licenses only to stations which are "in the interest of the general public service" would work to the same end. The Secretary of Commerce is given wide discretionary powers which, if used wisely, would effect a welcome clarification of the existing radio confusion; but which, if abused, would militate against the amateur radio fans who have done much to develop the science in this country. Legislation looking to the regulation of an industry as new as radio is in a virgin field, and the probability of error is high. The Kellogg-White Bill is probably not free from unwise provisions, whose unwise will not be discovered until it has been passed and put into effect. Its clearly sound provisions are so many and its debatable ones so comparatively few that the measure seems well worth enacting into law. A start has to be made in bringing order out of the present radio chaos, and no better plan than the present one is in sight.

Meteor Appears

THE officers of the Meteor Radio Club, of Leland, Florida, are: President, Horace Williamson; secretary, Arthur

Radio Station Blown to Sea

A REPORT received by wireless at Anchorage, Alaska, declares that wind has demolished the naval radio station on St. Paul Island, in the Bering Sea. The report came from the Steamer *Starr*. The naval radio station on St. Paul Island is used for relaying messages to Japan by the northern route and plays a large part in the transmission of marine intelligence.

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With the DX Nite Owls

(Continued from page 20)

Hears 36 Stations in One Night

From Raymond Pendery, Fort Worth, Texas.

I HAVE a detector radio set using a radiation tube and a sleeper hook-up. I have heard the following station: KHJ and KFI, Los Angeles; KUO, San Francisco; WAAL and WLAG, Minneapolis; WGY, Schenectady; WBAY, New York City; CJCG, Winnipeg; WHAS, Louisville; WOZ, Richmond, Indiana; WFAT, Sioux Falls; KYW and WDAP, Chicago; KSD, St. Louis; WLW, Cincinnati; WWJ, Detroit; PWX, Havana; WDY, Roselle Park, New Jersey; WLK and WOH, Indianapolis; WDAJ, College Park, Georgia; WJH, Washington; WEAB, Ft. Dodge; WOC, Davenport; WSB, Atlanta; WFAV, Lincoln; KDKA, Pittsburgh; WDAY, Fargo; WGAK, Macon; WFAC, Terre Haute; WCAJ, University Place, Nebraska; WAAW, Omaha; WKN, Memphis; WAI, Dayton, KLZ and KFAF, Denver; WOS, Jefferson City; WGM, Atlanta. I heard thirty-six stations in one night.

Report from a Novice

From P. F. Albright, 3925 So. Bannock St., Englewood, Colo.

AFTER reading Mr. Gordon's fine article, "DX Work with a W-D 11," in your issue of January 20, and noting the wide interest being taken by other "Nite Owls" in this little tube, I am prompted to tell you of my experiences with my home-made "dry cell set."

My set is a one-tube set without amplification, constructed in the evening on the kitchen table. The circuit is a modification of that suggested by Mr. Miller a few weeks ago and shown in your magazine. Being a mere novice at the radio game and this being my first tube set, I at first thought that my results were just ordinary. But after reading what are presumed to be records from other DX Nite Owls, I have come to the conclusion that I have been standing in the water myself and didn't know it.

In the past three weeks I have heard clearly fifty-two stations in twenty-one different states beside six stations in four provinces of Canada. This is not counting about eight Colorado stations that I hear. On the evening of January 15, while KFAF, just five miles away, was going full blast, I tuned in in the order named, KYW, WDAF, WFAA, WHB, WLAG, WOQ, WBAP, WOC, CFCN, WSB, KSD, WWJ, CHCB, KHJ, WGM, KFDB, KWH. These were all heard within three-quarters of an hour. At 1:50 A. M. on January 7 I listened for fifteen minutes to a test program broadcast from WCAE by the Pittsburgh "Press" and on January 8 about midnight, and one evening since I tuned in clearly WHAZ, Troy, and have a letter from them confirming this reception. CFCA at Toronto has been tuned in on several evenings. WWJ, at Detroit, also WSB and WGM at Atlanta can be heard nightly, while CJCC, CKCK, CFAC, CFCN, CHBC and CJCG are nightly diet also. Six Pacific Coast stations are consistently heard, while my range to the south includes KFCB and KFAD, Phoenix, Arizona; WJAE and WOAI at San Antonio, Texas. WBAP, WFAA, WHB and WDAF have all been heard faintly, but clearly, with antenna entirely disconnected. Our local station, KLZ, comes in so loud on the aerial that the music can be heard in the second room from the phones, and is best enjoyed with both antenna and ground disconnected.

I might add that my entire set cost exactly \$24.22, including even the phones, and is entirely contained, batteries and all, with still room for the phones, in a cabinet 8 by 11 by 12 inches.

I give the credit for these results to the inherent fine qualities of Mr. Miller's circuit and to the fact that I feel I have made a decided improvement over the regulation fifty-turn honeycomb coil shown in the original circuit. Careful construction is another item that I feel has contributed to my good results.

On Detector Only

From Floyd Clements, Junction City, Kansas.

IT'S a mighty poor set that won't receive 750 miles consistently, nine nights out of every ten, on detector only. I am located at the exact geographical center of the United States and have received stations on the Pacific, Atlantic and Gulf coasts, and across the line in Canada—all on one tube and an aerial averaging only twelve feet high, 275 feet long.

Using a four-foot indoor loop, wound with ten turns of 96-wire braid, I get Atlanta (725) miles, very QSA on detector only. Same with Davenport.

I have heard 77 stations this season, on detector only. Among them were KHJ, WGY, WFAA, WAOI, WDAJ, WSB, WWJ, WCX, WGM, WHAS, WHAB, WJZ and a dozen nearer.

Will be glad to describe my instruments in detail to anyone who cannot do as well with what he is now using.

With Mr. Taulbee's Detector

From George W. Finn, care "Daily Telegram," Norton, Kansas.

I HAVE constructed the detector as described by E. C. Taulbee, of Waco, Texas, in RADIO WORLD for November 11, 1922, and have been using it for three weeks. With it I get nice reception from KHJ, Los Angeles; WSB and WGM, Atlanta; KYW, Chicago; WLAG, Minneapolis; WLW, Cincinnati; CFCD and CJCG, Winnipeg, and many closer stations. I use a W-D 11 tube; in fact, I followed out Mr. Taulbee's instructions to the letter, and made my own grid condenser, using no grid leak.

All my best work has been done on the 12-volt tap. If I tap a higher voltage my signals are mushy.

This hook-up is certainly worth a tryout by any one, and Mr. Taulbee is to be commended for passing it along. Any inquiries would be gladly answered by me.

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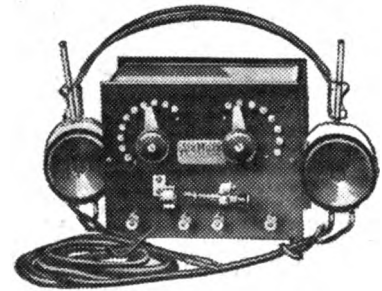
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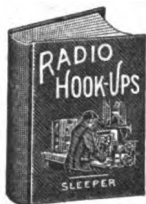
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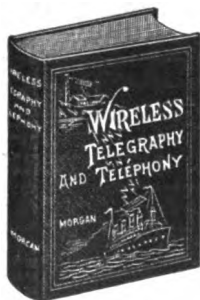
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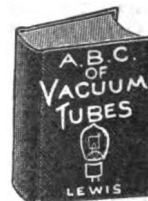
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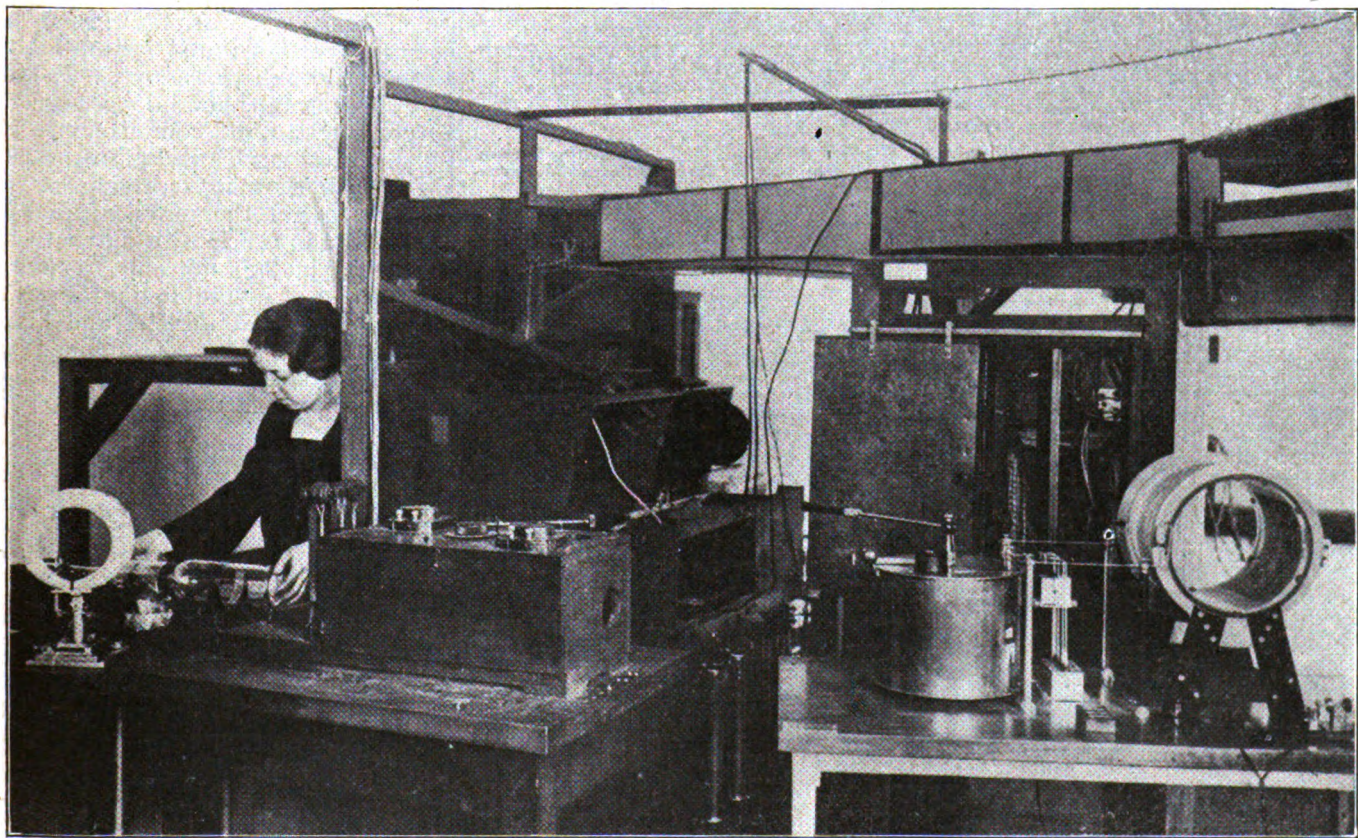
RADIO WORLD

(Title Reg. U. S. Pat. Off.)

ILLUSTRATED

WEEKLY

Bureau of Standards Uses Oscillograph to Measure Wave Length of Transmitters Accurately



(C. Wide World Photo)

The large number of transmitting sets now operating makes it necessary to have a means of accurately measuring the wave length of different stations. This illustration shows an Oscillograph and tuning fork, by which it is possible to photograph the form of an emitted radio wave. It is thus possible to determine the wave length to an amazing degree of accuracy. The Oscillograph is the square box shown in the left center of the picture. This apparatus, which is an American invention, is the most accurate measuring apparatus of its kind in the world, and is used by the Bureau of Standards in Washington

An Inexpensive Reflex Circuit, by C. White

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Radio Comes to Relief of Snowbound Farmer

FARMERS who were lukewarm to radio or who looked upon it as a diversion for the women and a toy for the children, are today convinced that radio broadcasting is a real utility. New York State, for example, was veritably buried under twenty-six inches of snow. The cities were able to cope with the snow after a fashion, but the country was practically isolated, especially after the wind churned up the snow and drifted roads as rapidly as shovelers and tractors opened them.

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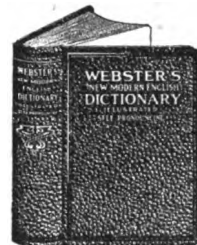
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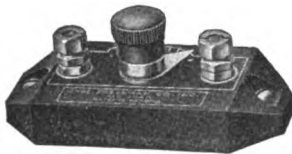
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Action on White Bill

Developments in radio legislation are discouraging in that no action was secured in the House on Wednesday when the White bill was introduced. After an afternoon of debate, chiefly due to uninformed members who propounded questions, some of which indicated that they had not read the bill, the matter was deferred until a later date. The discussion revealed the fact that there were, however, no real objectors to the legislation.

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RADIO WORLD has no free list. The only copies sent out by the publishers are to fill the ever-increasing orders of the American News Company, the large numbers of subscription orders received at the office of publication, and one voucher copy to each advertiser and advertising agent represented in current issues.

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[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879.]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. II, No. 21. Whole No. 47

February 17, 1923

15c per copy, \$6.00 a year

Canada's Largest Radio Station Broadcasts in Both French and English

By *Pierre D'Orsay*

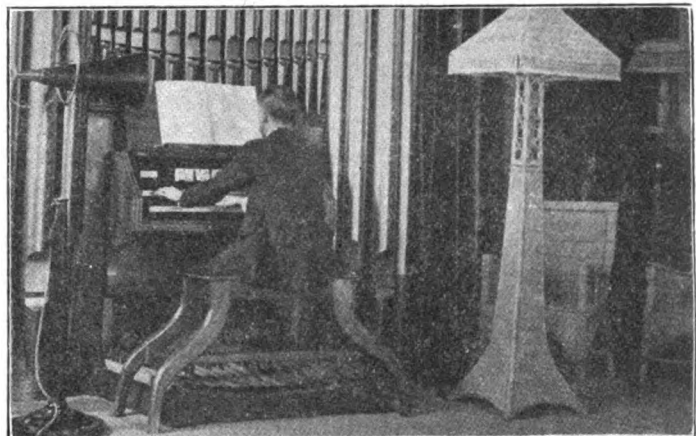
THE most powerful broadcasting station in Canada is located in Montreal, and is operated under the direction of the French newspaper, "La Presse." One of the features of this station is that it is the only broadcasting station that possesses a pipe organ as a part of its installation.

J. N. Cartier, who is announcer, manager and operator, was responsible for many of the unique features embodied in this station. They are absolutely no motor generators used in this station, the alternating current supply from the city being used, and rectified by means of large rectifying tubes.

It is the only station in the world that broadcasts regularly in more than one language, both French and English being used. This is done because of the fact that there are within its range people that speak nothing but French, and therefore it was necessary to enable those people to understand what was being broadcast.

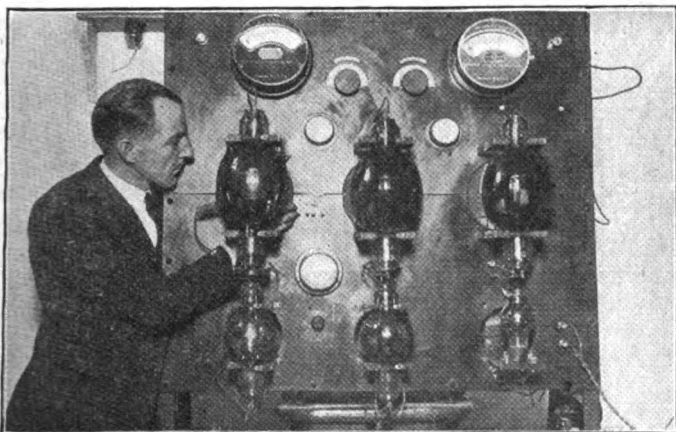
For quality, modulation and distance, this station stands foremost among the stations of Canada, and a great many American amateurs have heard "CKAC."

These accompanying pictures give a very good idea of the station and how it is operated.



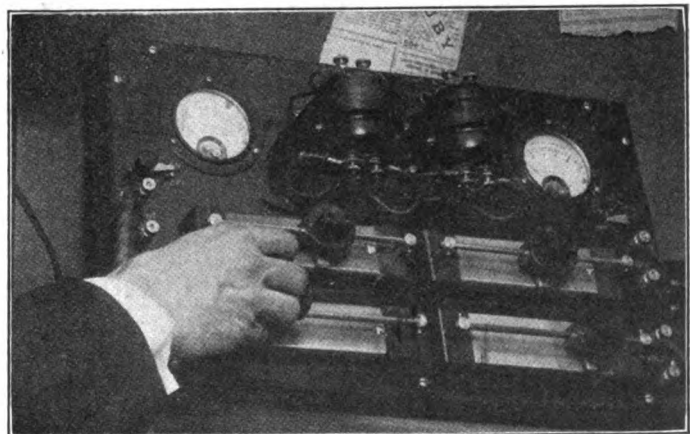
(C. Kadel and Herbert)

The magnificent pipe organ in the studio of the Canadian broadcasting station, CKAC, located at Montreal. This is claimed to be the only broadcasting station in the world that possesses a pipe organ as a part of its regular equipment, and many people have commented upon the wonderful organ recitals that are sent out by this station. The microphone, as can be seen in the picture, is located directly in front of the organ.



(C. Kadel and Herbert)

J. N. Cartier, manager of station CKAC, working on the transmitting panel. The first large tube is an oscillator, while the two next to it on the right hand side are rectifiers used to convert the alternating current to direct. This was done in order to eliminate the motor generators. The first and second tubes underneath are the 1KW modulators, and the next small tube is a speech amplifier. While one of the most powerful of radio stations, it is said to be most simple to operate.



(C. Kadel and Herbert)

The microphone current control used in this station. This device was built by Mr. Cartier and is used to regulate the speech intensity and quality. It is one of the devices that make the station simple in operation. Mr. Cartier, who designed it, is one of the foremost radio men in Canada, and the entire design of the station and of its apparatus was completed under his direct charge. This station has been heard over great distances.

In Next Week's Radio World
The Limitless Possibilities of Radio for the American Farmer,
by Gen. James G. Harbord

Importance of Radio Transmitter on Ships of Many Classes

By *B. R. Cummings*

A RADIO transmitter is primarily an alternator. Instead of generating the usual commercial frequencies, however, radio transmitters generate frequencies in the order of from 20,000 to 1,000,000 or 2,000,000 cycles. Obviously the usual form of alternator cannot be employed for this purpose, and the system used is usually one which is not dependent on moving mechanical parts.

The function of a radio transmitting equipment is to generate alternating current at these frequencies and transfer its output to the antenna system. The antenna system consisting of aerial wires, inductance units, and a ground system, or counterpoise, forms a series alternating-current circuit, which represents the load on the transmitter. Frequencies of this magnitude (so-called radio frequencies) are essential in order that efficient radiation of energy be obtained from the antenna. Of the total power in the antenna, the percentage that is radiated decreases very rapidly as the frequency is lowered, or (which is the same thing) as the wavelength is increased.

Radio transmitters in order to be applicable for commercial use must usually be capable of generating any one of a number of frequencies, and in many cases must be so designed that the frequency of its output can be changed by throwing a single switch. This requirement is brought about by the fact that, in commercial traffic, it is customary to use one wavelength for calling purposes and then to transfer to a second wavelength for communication, keeping the calling wave free for calling purposes.

When the transmitter is used for telephony, a modulation system is incorporated in the radio transmitter proper. For telephony this modulation or control system consists of a group of radiotrons termed modulators. The function of the modulator is to vary the amplitude of the radio-frequency alternating current in the antenna circuit in such a manner that the envelope of the maximum amplitudes of the radio frequency alterations reproduces the wave form of the voice.

Modern radio transmitters are rated in terms of their output in watts or kilowatts, which is in keeping with the rating of other electrical machinery. For example, when we speak of a "one kilowatt radio transmitter," we mean a transmitter which puts one kilowatt of power into the antenna system. Radio transmitters are built with outputs from as low as one watt or less to as high as several hundred kilowatts. The largest single radio transmitter was built by the United States Navy Department at Bordeaux, France, and has a capacity of 1,200 kilowatts. This station, known as the Lafayette Station, call letters "LY" sends on a wavelength of approximately 23,400 meters, and can be readily heard in the United States.

The proportion of the input into the antenna system which is actually radiated into space depends upon a number of things, chief among which are the wavelengths at which transmission is carried, and the resistance of the antenna system, including the ground or counterpoise.

It is permissible for any one to maintain and operate a radio transmitting station, providing a license is obtained from the United States Department of Commerce for such operation, and providing transmission is carried on in accordance with the rules and regulations of the Department of Commerce, and in accordance with any restriction placed upon the equipment by the manufacturers.

In a previous paper read at the General Electric Co. station, the term "wavelength" was defined. The wavelengths which may be used by Radio Transmitting Stations are assigned by the Department of Commerce. All wavelengths below 600 meters are assigned to commercial work, those below 200 being assigned to so-called "amateur transmission." The wavelengths 360 and 400 meters have been approved by the Department of Commerce for radio broadcasting, although these wavelengths have not as yet been established by law.

All wavelengths between 600 and 1,600 meters are reserved for the exclusive use of the U. S. Government, and are used by the various Government Departments, including the Army and Navy, for radio communication between shore stations, warships of all types and aircraft. The necessity for restricting a band of wavelengths for government use, thereby insuring freedom from interference from commercial radio traffic, is, of course, obvious. Wavelengths above 1,600 meters are available for commercial radio work.

To secure a license for the operation of a radio transmitting station, it is necessary that the applicant be able both to send and receive the Continental Code at a rate depending upon the class of license requested, and to give assurance that he is capable of operating his own apparatus. The restriction that licenses are given only to people capable of receiving the Continental Code is based upon international regulations which require that all transmitting stations cease sending immediately and give absolute priority to any distress signals from a ship at sea. Obviously therefore the operator of any transmitter must be able to receive and identify such distress signals in order that he may comply with this requirement.

Since 1912 it has been required by law that every ship cruising more than 200 miles from shore, and carrying 50 or more persons aboard, including the crew, be equipped with a radio transmitter and receiver capable of communicating a specified distance. Not only must such equipment be installed on all vessels but must be inspected by an inspector of the Department of Commerce each time the vessel puts into port. If the inspector of the Department of Commerce finds that the radio equipment is not, in his opinion, capable of carrying on the required communication and gives indication of unreliability, he reports this condition to the commanding officer of the vessel. Any vessel which sails without remedying this condition is subject to a penalty of \$5000.00

This requirement is, of course, fundamentally intended for the safety of the personnel aboard the vessel, and in this connection it is interesting to note that probably no other piece of electrical or other equipment is so likely to be called upon at any time to be responsible for the safety of hundreds or thousands of people, as the radio transmitter. The most difficult engineering in the building of radio transmitters is not in establishing electrical circuits which will function as required, but in the selection of materials, and in establishing the necessary safety factors, which will insure reliable service under the extremely varying conditions of installation and operation.

From all of which it can be seen that the business of the sea has been vastly affected by the new science of radio.

An Inexpensive Reflex Receiver

By C. White, Consulting Engineer

THE REFLEX type of receiver is here to stay and this fact is clearly demonstrated by the activity that is being shown by both amateurs and manufacturers in its development.

The idea of the reflex receiver is by no means new, for the French made extensive use of it during the recent World War. While the principle has been simple enough in theory, still there has been quite a bit of trouble to get the many different types of circuits simple enough for general construction and use. The trouble has been mainly in getting a reliable form of radio-frequency amplification. Although the tuned-plate type of radio-frequency amplification possessed the desired amount of selectivity, still when more than two stages were employed it was almost next to impossible to hold or get the proper adjustment. Radio-frequency amplifying transformers have been highly developed so that it is possible now to employ as many as five stages with little or no bother in operation since there are no controls on the transformers. For a single tube circuit, such as I shall describe in this article, the tuned-plate is quite superior in that it is not only a cheap but a thoroly reliable method.

In designing the circuit shown in the accompanying illustration, I have kept several points in mind. First, to design a set that would be simple in operation, having as small a number of controls as possible; second, to make its action selective; and, third, to avoid the use of any switchpoints or coil taps. It will be noted that there are only four controls, the two variometers, the "A" battery potentiometer, and the filament rheostat. This means not only that a small panel can be used (about 6x14 inches), but also, that there need be only four holes drilled in the panel. To those who have tried to drill and set switchpoints and switch arms exactly true this feature will be greatly appreciated.

The theory and operation of the outfit are just as simple as the construction. The main tuning circuit or the Ant.-Gnd. circuit consists of a fixed mica condenser C-1 of .0005 mfd. capacity, and a variometer. After the incoming signal has been tuned in, the high-frequency waves pass on to the grid and filament, taking the path thru the fixed mica condenser C-3 instead of the secondary of the audio frequency transformer A. T. which forms a path of high impedance to high frequency oscillations.

The capacity of the condenser C-3 should be about .002 mfd. for the average audio-frequency amplifying transformer, but the amateur will do well to try out several sizes, for under some conditions satisfactory operation has been obtained with C-3 omitted completely.

The vacuum tube amplifies the radio-frequency carrier wave and passes it on thru the bypass condensed C-4, which has a capacity of .001 mfd., to the tuned-plate circuit element, consisting of a fixed mica condenser, .0005 mfd. (C-2), and a variometer. The crystal detector picks the voltage from across this variometer and condenser and detects or rectifies it. The rectified portion goes on to the primary of the transformer, and is reproduced amplified in the secondary. Now the audio-frequency waves pass thru the tube to be amplified and in the plate circuit the

phones render them audible. The purpose of the circuit is to make one tube play the dual role of radio- and then audio-frequency amplifier.

The virtues of this set do not end in simple construction and theory, but above all it is the cheapest and most inexpensive to build as well as operate. For comparison with the itemized bill of materials of other receivers I will list

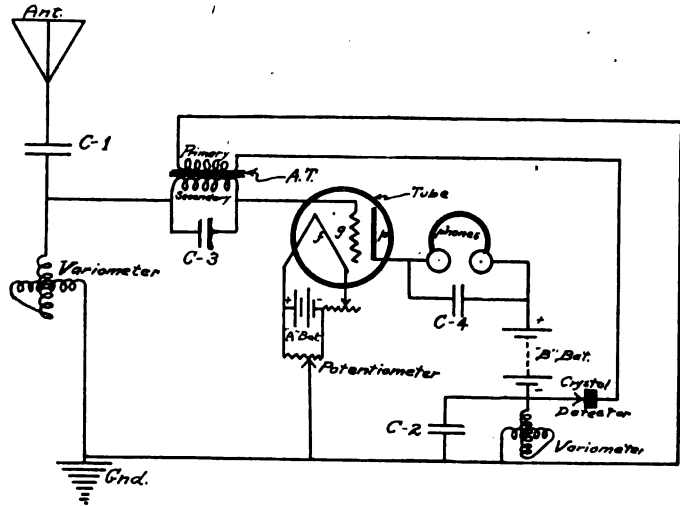


Fig. 1. Schematic wiring diagram of the reflex set described in the accompanying text. The controls on this circuit have been kept down to a minimum. By the use of two variometers, switches are unnecessary. This is a very easily constructed and controlled circuit.

the parts necessary for the construction of the tuner. The following list does not include tube, batteries, or phones:

2 Variometers	\$10.00
1 Audio-frequency transformer	6.00
2 .0005 mfd. mica condensers .....	.80
1 .002 mfd. mica condenser .....	.40
1 .001 mfd mica condenser .....	.40
1 Vacuum tube socket	1.00
1 Filament rheostat	1.20
1 Potentiometer (250 ohms)	1.60
1 Crystal detector	1.40
1 Panel	2.20
Binding posts, wire, etc.	1.00
Total	\$26.00

In the foregoing estimate I have given the average cost of the various items, but the total cost should not exceed the total of \$26.00 unless exceptionally expensive apparatus is purchased. Of course, if the price of a good cabinet is to be added the total cost of the set can be approximately placed at \$30.00, which is indeed very reasonable for a high grade receiver for radiophone work. The volume obtained will not be lower and most likely higher than that obtained from the best single tube regenerative outfit, while the quality will be exceptionally excellent, due to the fact that a crystal detector is used.

The receiver is not intended for straight C-W work, but is paramount for radiophone reception on the wave lengths at present employed by broadcasting stations.

Six New Broadcasters

THE following broadcasting licenses have been issued by the Department of Commerce:
 KFGB, Loewenthal Brothers, Pueblo, Colorado, 10 watts; WQAF, Sandusky Register, Sandusky, Ohio, 5 watts, 360 meters; WRAM, Lombard

College, Galesburg, Illinois, 100 watts; WQAD, Whitall Electric Co., Waterbury, Connecticut, 10 watts; WSAB, Southeast Missouri State College, Cape Girardeau, Missouri, 100 watts; WQAH, Brock-Anderson Electrical Engineering Co., Lexington, Kentucky, 20 watts.

Two-Way Talk By Radio

Broadcasting Station at Rensselaer Polytechnic Institute Exchanges Verbal Communication Between WHAZ at Troy, New York, and CFCN at Calgary, Alberta, Can.

TROY, N. Y., February 4.—For the first time since the discovery of wireless, two-way radio telephone verbal communication more than two thousand miles overland has been accomplished. This feat was performed at the instance of radiophone station WHAZ, the largest college broadcasting station in the world conducted by the Rensselaer Polytechnic Institute at Troy, N. Y. The two-way communication was carried on with absolute success and at the will of the operators with station CFCN at Calgary, Alberta, Canada, a distance of approximately two thousand miles airline, and breaks all previous records for two-way overland radio telephone communication by a wide margin, and it is not believed that this distance has ever been exceeded even over water.

The new radio station at the Rensselaer Polytechnic Institute, although established only at the opening of the college year last fall through a gift of \$50,000 from the Roebings, engineering graduates of the institute, famous as the builders of the Brooklyn Bridge, has already become well-known as the most versatile as well as the widest in range and one of the most efficient of the Class B installations in the United States. Unlike nearly all of its companion high-power broadcasting equipments, station WHAZ does not confine itself to broadcasting, but enters into all other phases of wireless activity as well.

Regularly Heard Over the Continent

Of course the Troy Polytechnic station, like many others, has been heard over considerably greater distances than that of the two-way test. In fact, station WHAZ announced recently the establishment of a new world's record for long distance broadcasting of concert programs, clear reception of both music and speech having been reported from three communities, Hilo, Wailuku and Haiku in the Hawaiian Islands, a distance of approximately 5,500 miles. Its regular Monday evening concert programs and its monthly international midnight programs have been heard in France as well as throughout the North American continent from coast to coast and from Alaska to Panama. It is not unusual for its broadcasts to be reported heard in all of the forty-eight states of the Union, in every province of Canada, in Mexico, Cuba, Porto Rico and the Panama Canal Zone. Widely scattered instances of these reports have come from a Northwest police officer in Hodgson, Manitoba, a snowbound prospector in Alaska, a sojourner in the eternal summer of Miami, Florida, a Cuban planter, a minister entertaining his little group of parishioners high up in the mountains of Lake County, California, a rancher in Montana, a government official in Mexico City and an engineer in Panama. The point is, however, that such listeners have no way of replying, except by cable, telegraph or letter. This has been true, heretofore, even of the high-power, long-wavelength transmission experiments carried on with England by the large commercial companies.

Many Difficulties Overcome

As all radiophone listeners know, it is one matter to "pick up" a program broadcast from a station, say two thousand miles away, by accident, and an entirely different thing

to "receive" from a particular station at that distance, by design, at a definite time and regardless of all kinds of interference. Yet that is what both stations WHAZ and CFCN did early on the morning of January 13 last.

A previous test, hastily arranged and quite casually after the midnight transcontinental program from station WHAZ at Troy on the second Monday of the month, was a partial failure because of interference from other radiophones near Troy. Work was then hurried on a new super-selective receiving set, which had already been almost completed by the engineering instructors at the Rensselaer Polytechnic Institute, and a more complete test was scheduled for four days later. That time, in spite of very severe local electrical disturbances, communication was established during the pre-arranged period and was maintained as long as desired, actually for more than an hour. The communications of the test were reported heard at many remote points. There was a heavy snowstorm in progress in Troy at the time and the static was extremely bad. Sparks were continually jumping across the antenna series condenser and it was possible to operate a small electro-static motor by connecting it across the antenna and ground wires.

A Powerful Receiving Set

The radio engineers at the Rensselaer Tech describe the new receiving set, which they used in this record-breaking test, as a conventional type of super-heterodyne, employing a maximum of eleven vacuum tubes. Eight were used at the time of the test with Calgary. The 400 meter wave length of the incoming signal is first changed to 3,000 meters; the signal is then amplified by a five-stage radio frequency amplifier and passed on to a detector tube. Additional audio frequency amplifiers are used when it is desired to use a loud speaker. Pacific Coast stations were heard with this receiver on the night its construction was completed. Varied experiments are being carried on now by the Institute engineers with other sets of this type which are less conventional, and the Institute is providing a large amount of equipment and measuring apparatus.

Short-Wave Experimentation

Short-wave telegraph experiments of all kinds are being conducted by the radio staff and Station 2XAP, the chief radio telegraph installation of the Institute, has been reported QSA in Hawaii, France and England and at all points between. This station was one of the first successful contestants in the transatlantic tests last December. A larger telegraph transmitter of a newer type is now nearing completion, and several smaller sets are in operation for short distance work. The two operators at the Institute station state that they will be glad to use both 2XAP and 2CDC in inter-collegiate communication and in American Radio League work as much as their rather limited time permits.

From all this it is apparent that the Monday evening concert programs, with which the radio public of the country is now so familiar, represent but a part of the wireless activities of the Rensselaer Polytechnic Institute's versatile radio station.

Birds, Song, Mystery



(C. Hance and Herbert)

At a recent demonstration, three mechanical birds were made to move their heads and sing in the most mysterious manner. The birds sang the Mendelssohn "Spring Song" and moved in a very natural manner.

Makes Deaf Hear



(C. Keystone View Co.)

Geo. Farrar, 12-year-old lad, attending the California School for the Deaf, claims he has perfected a means of enabling the deaf to hear by means of vibrations. Power amplifiers are used in connection with phones whose diaphragms are unusually thin, so that the vibration against the dead ear drums are as strong as possible.

The "Farthest North" Broadcasting Station

By J. L. Wilkie

TO amateurs, sitting in nice cozy, warm rooms, with loud speakers and all the newest accessories which make the up-to-date radio set, this article is addressed. Imagine, if you will, that instead of being where you are, you are up in "the farthest north," where the wind is biting cold and where the snow lasts for ten months in the year instead of ten weeks. Add to all this the hardships of working under the most adverse conditions possible, and you will have a slight idea of what the crew of the "World's Farthest North Radio Broadcasting Station" has to contend with.

This broadcasting station in question is the one located on Jan Mayen Island, a tiny cone of an extinct volcano, in the Arctic Ocean, north of Iceland. This station is financed by the Norwegian Government, and is in charge of Akbard Ekerold, an American citizen.

This station was erected by Norway, as a Central Weather Broadcasting Station, because of the fact, well understood by scientists, that all weather, be it good or bad, warm or cold, windy or calm, originates in the Arctic zone. This is the first of three stations that will be erected in the Arctic, and when the three are in operation, it is expected that weather predictions, originating from the chain of stations, will be so accurate that storm warnings can be sent out with amazing accuracy, and many lives and millions of dollars can be saved.

Imagine the captain of a large ocean liner crossing the vast expanse of water. Suddenly, the radio operator picks up the telephone that connects

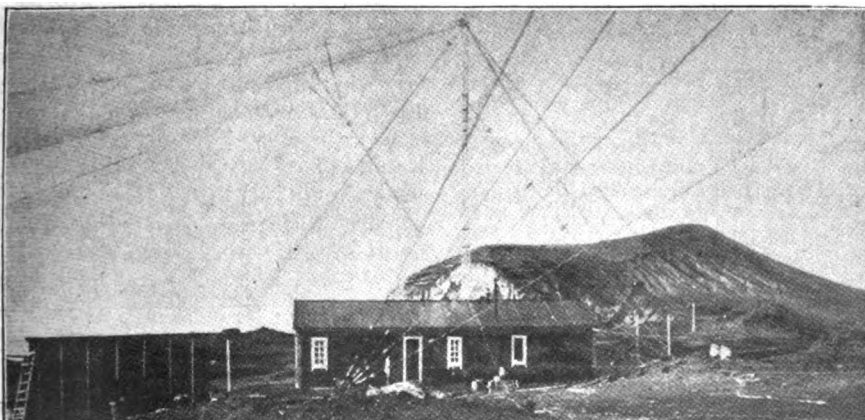


(C. Gilliams Service)

The Ekerold party that established the station. Mr. Elkerold, who is in direct charge of this station, is the second man on the right. The man at his left is chief operator.

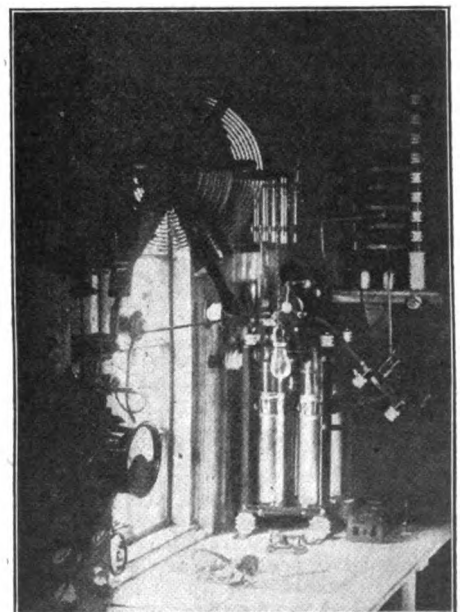
with the bridge. "Yes, sir. Jan Mayan Island just sent out a storm warning of a hurricane originating over latitude —, longitude —, and sweeping rapidly southeastward." The captain, plotting his course, and the course of the hurricane, finds that if he continues on the direct course he is pursuing he will cross the path of the storm in a certain number of hours. Therefore, secure in the knowledge that he possesses he is able to either change his course or make such changes as he thinks necessary for the safety of his passengers.

These daring pioneers of this outpost of "radio communication" are to be commended. The service that they render to the public in general cannot be measured in terms of dollars and cents.



(C. Gilliams Service)

The antennae used by the world's "farthest north" broadcasting station, established by the Norwegian Government for the purpose of broadcasting weather forecasts, marks the outpost of civilization. It is located on Jan Mayen Island, in the Arctic Ocean.



(C. Gilliams Service)

Transmitting apparatus used. As travel is impossible for nearly seven months of the year, it was not thought advisable to install the regular telephone apparatus. Therefore, regular spark transmitting apparatus is used.

Radio Frequency vs: Audio Frequency Amplification

By *M. C. Batsel*

Radio Engineer, Westinghouse Electric & Manufacturing Company

CONSIDERABLE confusion exists in the minds of the public regarding the functions of radio frequency and audio frequency amplifiers. In this article I shall endeavor to give the distinguishing difference between these two methods of amplification, and to point out the advantages of each.

If music or speech is received by means of a detector tube only, without regeneration or other amplification, the music is not very loud, even when received from a nearby, powerful station. Distant stations, though received distinctly, may be so weak that they are heard with difficulty. When weak stations are heard distinctly, they may be made as loud as desired by using audio frequency amplification. If head phones are to be used, there is little or no advantage in using more than one stage of audio frequency amplification, as experience has shown that if the music or speech cannot be heard distinctly with one efficient stage of amplification and good head phones, they cannot be heard with any amount of audio frequency.

If an efficient loud speaker is used two stages of audio frequency amplification will give about the same strength as an ordinary phonograph, provided the music can be heard distinctly on the detector tube alone, and if sufficient power can be delivered by the last amplifying tube. It is often advisable to use two tubes in parallel in the last stage of amplification unless a much higher plate voltage is provided for this stage than is used for the first stage. Additional stages of audio frequency amplification can be added to make the music or speech as loud as may be desired.

In order to preserve the quality of music and speech, the audio frequency amplifier must be capable of amplifying practically all audible frequencies. All noises due to batteries and tubes are, therefore, amplified to the same extent as the music. For this reason it is necessary to use plate circuit batteries especially designed for use with vacuum tube amplifiers and to have all parts of the circuit well insulated.

Audio frequency amplification is absolutely necessary for satisfactory operation of a loud speaking receiver. Since the advent of radio broadcasting much development work has been done to improve the audio frequency amplifier, and as a result amplifiers have been developed which produce practically no distortion of music or speech, and loud speaking receivers are now available that reproduce music so accurately that it meets the approval of the most exacting critic.

All radio detectors that can be used for the reception of music are least efficient when the received currents are weakest. For this reason radio frequency amplification is desirable.

Radio frequency amplification strengthens the received

currents before they are changed to audio frequency by the detector. Thus by using radio frequency amplification, stations can be heard distinctly which cannot be heard on a simple detector and with any amount of audio frequency amplification.

The most widely used and simplest form of the radio frequency amplifier is the form represented by the Armstrong regenerative circuit. This is also the most efficient means of obtaining radio frequency amplification. No additional tubes are required, the same tube being used as a radio frequency amplifier and a detector. Most all efficient radio frequency amplifiers, that operate on the wave lengths used for broadcasting, function on account of regeneration.

The regenerative detector tube produces about the same amount of amplification as can be obtained by using two stages of radio frequency with transformers. If more amplification is desired than can be had with a regenerative tube it is necessary to use at least three stages.

The benefits accruing from the use of a great amount of radio frequency amplification are: it gives greater sensitivity; smaller antennae or coil antenna may be used; and due to the greater sensitivity very loosely coupled antenna and secondary circuits may be used, resulting in a greater selectivity.

The greatest use of multistage radio frequency amplifiers is where receivers are located in apartment houses or in other locations where an efficient antenna cannot be erected, or when extremely weak stations are to be received. The loud speaking receiver with three stages of radio frequency amplification usually has at least six vacuum tubes. The expense of maintaining the tubes and batteries is, of course, greater in proportion to the number of tubes used.

During the summer months there is a greater freedom from atmospheric disturbances when small antenna or coils are used with the radio frequency amplification. This is due to the fact that the small antenna is less affected by atmospheric disturbances, than is the large antenna, in proportion to the energy received from the transmitting station.

The development of tubes requiring a small amount of filament energy and operating on dry cells should give a considerable impetus to the development of multistage radio frequency amplifiers.

The elimination of the storage battery as a necessary part of the receiving equipment makes it possible for those who desire to operate a radio receiver in a well furnished room, to do so without danger of injuring the floor coverings and woodwork. The entire equipment using dry cells may be enclosed in an attractive cabinet and requires no attention except an occasional renewal of dry cells. These can be purchased at any electrical supply house.

Gov. Alfred E. Smith's Noon Hour Address Broadcast

Governor Alfred E. Smith of New York, who appeared before a special noon hour meeting of the New York Board of Trade and Transportation on

Saturday, Feb. 3, outlined his plans and policies toward the big problems that confront him in his second administration. Governor Smith's address was broadcast direct from the clubrooms of the New York Board of Trade and Transportation at 41 Park Row, New York City, on a 360 meter wave length by WJZ.

The broadcasting of this address made

it possible for business men in New York State to get the Governor's viewpoint at the same time or perhaps a fraction of a second before the gathering at the clubrooms. Sound waves travel by radio over a million times faster than they travel through the air; namely, 186,000 miles a second by radio and only a thousand feet a second through the air.

Efficient Radio Control of Battleships

By *Garrett F. Erskine*

ONE of the latest inventions tried out recently by the United States Navy is the control of a battleship by means of radio from an airplane above

fact, everything that is possible with a full crew of men was attempted and successfully carried out.

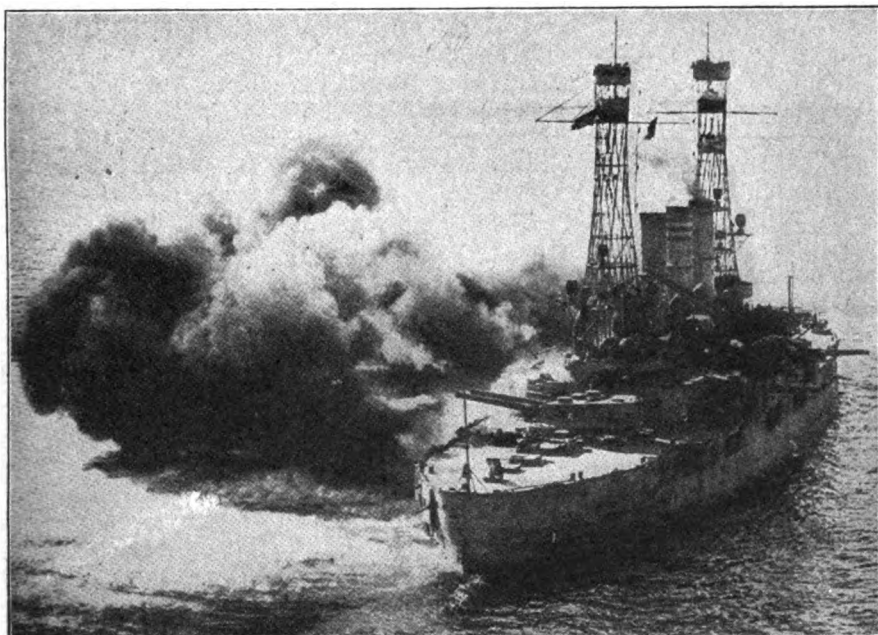
Of course, the principle of radio con-

ever been attempted on such a tremendous scale. While the maneuvering of the ship was in the hands of the operator in the airplane or on the distant ship, there were still enough men aboard the radio-controlled ship to enable the men to take the ship back safely in case any trouble was experienced with the control apparatus.

In this maneuvering of the ship a special wave-length was used to prevent any trouble being caused by interference.

The mechanical details, such as the loading of the guns and the starting of the fires in the boilers, were, of course, impossible by remote control, and were done by the gunners and firemen aboard the ship; but the actual firing of the guns and steering of the ship was independent of the few men aboard.

The United States Government is the first to successfully utilize radio as a means of controlling vessels, and, although many other governments have been attempting it, we are the first to really do it successfully. This, of course, will be of the utmost importance in case of any future trouble necessitating the use of men and battleships. It will mean a great saving of life in case of war, and will also mean that the immense number of men that have heretofore been a necessary part of a ship's complement will be reduced as all the necessary maneuvers can be executed from an airplane above.



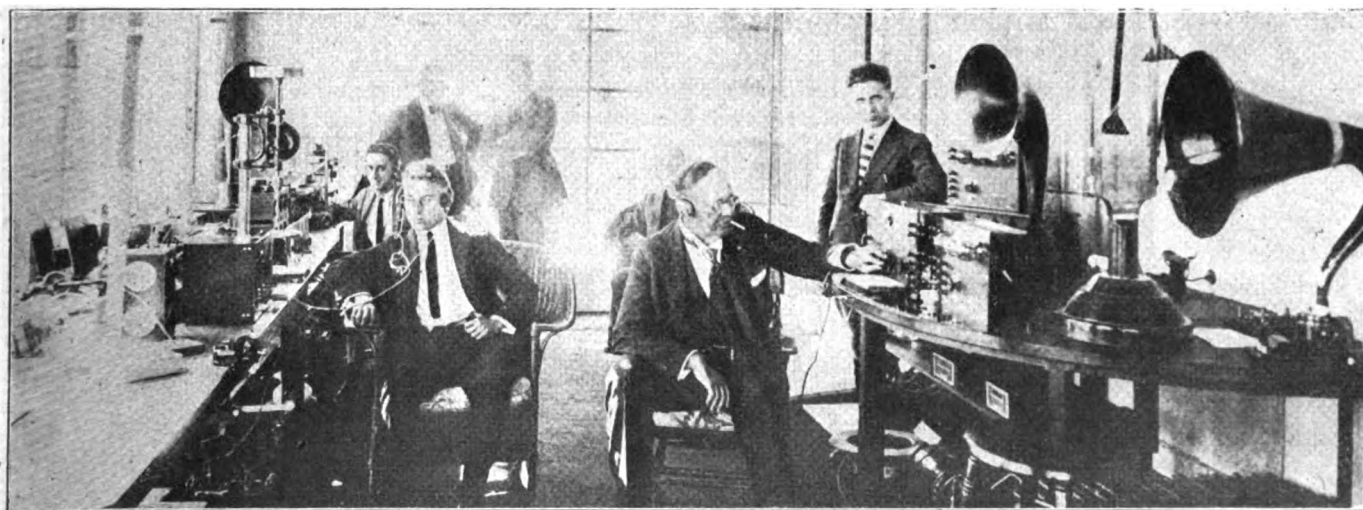
(C. News Events)

Broadside salvo of 12-inch guns being fired by means of radio control from an airplane flying above the ship. This is one of the latest inventions tried out by the United States Government, and is a perfect success.

—also from another battleship miles distant. The apparatus installed controlled the speed of the vessel, steering it at the will of the operator on the remote vessel, fired the guns; and, in

control has been known of for several years, and many small models of both ships and automobiles have been successfully built and worked; but this is the first time that radio control has

Col. E. H. R. Green an Ardent Radio Fan



(C. Fotograms, N. Y.)

Colonel Edward H. R. Green, millionaire son of the late Hetty Green, is a radio fan of the first water. He has built one of the finest radio laboratories in the United States, and some of the most eminent radio experts in the world are working out their ideas in his laboratory, which he has given over to the purpose of improving radio. Col. Green is an ardent experimenter himself, and spends many hours each day working in his laboratory, and the radiophone station at Round Hills, Mass., has been heard at great distances. The photo shows one corner of the laboratory, with Col. Green in the center right-hand side spending a pleasant few moments listening in.

Latest List of Broadcasters Totals 570

By Carl H. Butman

WASHINGTON, D. C.—For the first time since broadcasting began in September, 1921, fewer new stations were licensed during the past month than dropped out, indicating that the field for broadcasting is practically filled. This is not to be wondered at, officials point out, because the "saturation point" has been reached. Many fans say, "Well, there are enough anyway; we don't want any more; let the better ones survive."

Today there are 570 broadcasting stations, 28 of which are in the B Class on 400 meters, the balance being on the more popular 360 meter wave. On January 1 there were 576, showing a loss of six during the month. While there were 28 new stations licensed in January, 34 old ones failed to renew their licenses.

On the first of February last year, there were only 36 stations licensed in the new pastime of broadcasting—today there are almost 16 times that number. Many people believe that this is far too many, particularly since they are not well distributed on the 360 meter wave. The radio bill, however, provides for the distribution of a large number of new waves, which will aid in decreasing the interference. Competition is creeping into the game. The best equipped stations giving the best service to the fans will probably become the permanent ones in the long run, it is believed.

Within the past week, seven new broadcasters were licensed by Mr. Hoover's Radio Section, and two Class A stations were transferred to the B Class, on the 400 meter wave.

List of New Broadcasting Stations

- WRAV—Antioch College, Yellow Spring, Ohio, 200 watts.
 WQAO—Calvary Baptist Church, New York, N. Y., 100 watts.
 WPAZ—Koch, Dr. John R., Charleston, W. Va., 20 watts.
 KFCV—Mahaffey, Jr., Fred, Houston, Texas, 50 watts.
 WRAJ—Pickering Co., M. H., Pittsburgh, Pa., 500 watts.
 WQAR—Press Publishing Co., Muncie, Indiana, 10 watts.
 WSAA—Sprague, B. S. Elect. Co., Marietta, Ohio, 25 watts.

Transferred from Class A to Class B Stations on 400 Meters

- KFI—Anthony, Earle C., Inc., Los Angeles, Calif., 500 watts.
 KPO—Hale Bros., Inc., San Francisco, Calif., 500 watts.

Broadcasters Which Have Stopped

The thirty-four broadcasters which have not renewed licenses and consequently were deleted from the records of the Commerce Department during January follow:

Broadcasting Stations Deleted

- WLAO—Anthracite Radio Shop, Scranton, Pa.
 KZY—Atlantic-Pacific Radio Supply Co., San Francisco, Calif.
 WNAJ—Benson Co., Chicago, Ill.
 KFBN—Borch Radio Corp., Oakland, Calif.
 WOE—Buckeye Radio Service Co., Akron, Ohio.
 KDYO—Carlson & Simpson, San Diego, Calif.
 WPE—Central Radio Co., Inc., Kansas City, Mo. (Re-licensed at Independence, Mo., Jan. 5th.)
 KFBM—Cook & Foster, Astoria, Oregon.
 WSX—Erie Radio Co., Erie, Pa.

- KDZW—Gerdes, Claude W., San Francisco, Calif.
 KFAC—Glendale Daily Press, Glendale, Calif.
 WDAQ—Hartman-Riker Electric & Machine Co., Brownsville, Pa.
 WKAZ—Landau's Music & Jewelry Co., Wilkes-Barre, Pa.
 WKAD—Looft, Charles, East Providence, R. I.
 WBAJ—Marshall-Gerkin Co., Toledo, Ohio.
 KVVQ—McClatchy, James, Sacramento, Calif.
 WDAV—Muskogee Daily Phoenix, Muskogee, Okla.
 KDZP—Newbery Elect Corp., Los Angeles, Calif.
 KFC—Northern Radio & Elect. Co., Seattle, Wash.
 WBAB—Potter, Andrew J., Syracuse, N. Y.
 WAAX—Radio Service Corp., Crafton, Pa.
 KYY—Radio Telephone Shop, San Francisco, Calif.
 WNAG—Rathert Radio & Elect. Co., Cresco, Iowa.
 WGAS—Ray-Di-Co. Organization, Chicago, Ill.
 WFO—Rike Kumler Co., The, Dayton, Ohio.
 WPJ—St. Joseph College, Phila., Pa.
 KFBO—Savage Elect Co., Prescott, Arizona.
 WHW—Seeley, Stuart W., East Lansing, Mich.
 WSN—Ship Owners Radio Service, Inc., Norfolk, Va.
 KJC—Standard Radio Co., Los Angeles, Calif.
 WCAQ—Tri-State Radio Mfg. & Supply Co., Defiance, Ohio.
 WJAL—Victor Radio Corp., Portland, Me.
 WNAH—Wilkes-Barre Radio Repair Shop, Wilkes-Barre, Pa.
 WJAU—Yankton College, Yankton, S. D.

First American Aircraft Licenses Issued

By Washington R. Service

WASHINGTON, D. C.—Radio as a safety measure for the protection of pilots and passengers has come into its own in air travel as well as on the sea, where its value was first realized. Seven airplanes and flying boats are now equipped with radio and answer to regular calls.

The first American aircraft, other than those of the Army and Navy, which are all radio-equipped but not licensed, to be licensed as a limited commercial station was one belonging to the Airline Transportation Co. of California.

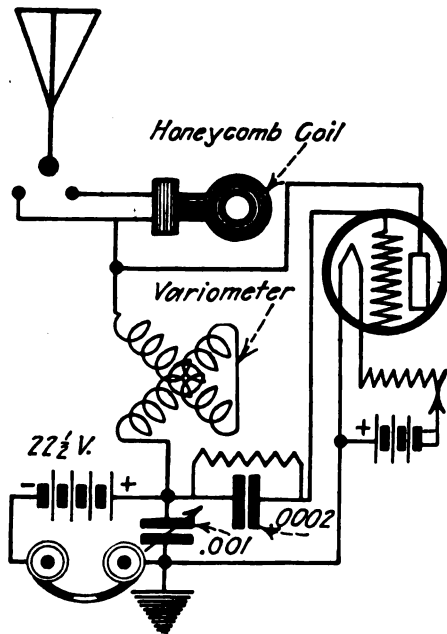
Aircraft Licensed as Limited Commercial Stations on 525 Meters

- KFBI—Airline Arrow, No. 1, Airline Transportation Co., Los Angeles, Calif., Aug., 1922.
 KFBY—Balboa, Aeromarine Airways, Inc., New York City, Jan. 18, 1923.
 KFBA—Buckeye, Aeromarine Airways, Inc., New York, Dec. 22, 1922.
 KFBB—Gov. Cordeaux, Aeromarine Airways, Inc., New York City, Jan. 18, 1923.
 KFBJ—Nina, Aeromarine Airways, Inc., New York City, Jan. 18, 1923.
 KFBM—Ponce de Leon, Aeromarine Airways, Inc., New York City, Jan. 18, 1923.
 KFBZ—Santa Marie, Aeromarine Airways, Inc., New York City, Jan. 18, 1923.

A Hookup That's a Wonder

By George W. May

ONE of the old-time devices used for tuning was the tuning coil having one, two or three sliders. Many are in use since the idea of broadcasting swept the country, probably because they can be constructed quickly



A new single-circuit, one-tube set that will keep the experimenters busy for a while. The grid leak in this set is very critical. By the use of the honeycomb coil, any wave length may be reached. When short waves are desired, the variometer alone is used. Extreme care should be taken in the wiring of this set.

but there is shown herewith a hookup that is the "cat's meow" when it comes to breaking in on DX stuff. You don't have to throw everything you have into the paper bag or into the furnace, but just make a list of its parts and look over the ones needed. The parts consist of a variometer, a 22-volt B battery, 43 plate variable condenser, vernier type, a grid condenser and leak, a vacuum tube and its etc., and also a honeycomb coil with switch.

The leak in this hookup is a very critical part of the sketch and most careful attention should be given the tube. Also it permits the amateur, with the use of the honeycomb, to get up on the higher waves and listen to the transoceanic stations as well as the shorter ones. It utilizes a simple circuit by carrying a wire back from the plate to the antenna lead so that a honeycomb coil can be used with the variometer. RADIO WORLD of Nov. 25 showed the original May circuit—a diagram similar to this. Under ordinary circumstances this would constitute a tickler coil, but in the present case it is only in the apparatus.

The tuner takes in all wave lengths from the amateur to transatlantic by merely shifting coils. It is simple to assemble and admirably serves the purpose of the radio-
phone novice. For the beginner or the amateur getting out of the crystal class it is, in my opinion, "the goods."

Never mind the mounting of the parts of the panel. Just take a brief glance at the diagram and proceed to the makeup. A set of coils covering the desired range should include D.L. 75 up to 1500 inclusive.

Using this set and hookup without any coils gives you a range within the broadcast limit. With a D.L. 1500 coil most of the high-powered stations such as POZ, FL, YN, MUU and IDO could be read with ease. Very little difficulty is experienced with the set in tuning or oscillating.

The beginner should make a study of the circuit and proceed easily until he masters it, and he will find that after while he will start to add a two stage amplifier for volume or louder signals.

and easily, but their efficiency is not to be compared to the results obtained with variometers, or honeycomb coils.

Several new hookups have appeared from time to time,

A Literary Critic for Broadcasting

ALL over the country, KDKA, the radio telephone broadcasting station of the Westinghouse Electric and Manufacturing Company is recognized as having about the best trained announcers of any broadcasting station.

The reason for KDKA's reputation, which is deserved, is because that each announcer is trained carefully preceding each program. A supervisor who acts as a literary critic listens to the reading of each announcement prior to its being broadcasted and corrects any inaccuracies or grammatical errors that may be found.

This voice culture is an important part of the broadcasting plan. Each announcer is chosen because of the quality of his voice, for each broadcasting station is known through its announcers.

Since KDKA was first started three years ago, this constant supervision has been exercised over the men who tell the radio fans what is being done.

At East Pittsburgh is located T. H. Bailey Whipple, Literary Critic of the Publicity Department, who exercises a constant supervision over all those who speak from KDKA, in the broadcasting studio. This supervision has been the cause of KDKA

receiving a great deal of praise for its "voice." Each day any number of letters are received which state that KDKA was heard best at any station because of its good voice. Part of this praise is due to the radio engineers and part of it to the quality of the announcer's voice.

It has been a long time since any error has been broadcasted from the Westinghouse station. Theoretically, there is no reason why any mistakes at all should be sent out, but as it is impossible to read proof on a man's voice, as can be done with print, errors do sometimes occur.

It is astonishing to find how quickly errors are caught and how many people write in about them. It is, of course, entirely possible, that in an audience of several hundred thousands, there are many literary critics, but it seems the radio fan is more critical than any other class of people.

An instance of what a broadcast error will stir up happened many months ago at KDKA. A new announcer, who had been rushed into the breach to fill an unexpected vacancy, unconsciously mispronounced the name of an Italian composer. His slip was slight and hardly noticeable, but within the next few days letters from all parts of the

Union, including those from musical circles, college professors, and other widely divergent paths were received, all calling attention to the fact that KDKA had been in error.

Since that experience, which was painful to the pride of the radio officials, very, very few errors have been allowed to go unnoticed, and the announcer who makes an error always corrects himself immediately or knows that he will hear about it from those "higher up."

It is only by constant supervision and training that a broadcast program can be made perfect, and it is felt that KDKA has set an example for other stations that will tend to make the average broadcasting intellectually higher, and what every critic wants—grammatically correct and elocutionally perfect.

Youmer

Jibbs: "Have you got Davenport yet?"
Fibbs: "No, we decided to get twin beds instead."

Subscribe for Radio World, \$6.00 a year, \$3.00 six months, \$1.50 three months.

The Radio Primer

A Weekly A. B. C. of Radio for the Beginner, in which Elementary Facts and Principles Are Fully and Tersely Explained and all Words and Terms Used by Amateurs and Experts Defined

WHAT is the purpose of the radio compass?

By means of the radio compass (direction finder) a person is enabled to determine the location of a transmitting station. In locating stations generally two or three sets are employed, usually some distance apart. By plotting the direction of each of the received signals on a map or chart the exact location of the transmitter can be found. * * *

Upon what principle does this apparatus operate?

A radio compass, or direction finder, operates upon the principle that, when a coil is turned so that the plane of its windings is perpendicular to the direction of an emitted electric wave, the induced E. M. F. is at a minimum; but when the coil is turned so that the plane of its windings is parallel to the direction in which the waves are traveling the lines of force cutting the coil will be at a maximum, and the signals will be the strongest. In the operation of such a coil (loop antenna) used for direction finding there is what is termed a broad "maximum." By that is meant that there is not a critical position in the rotation of the coil at which the signal intensity in the receiver will be of such intensity as to be readily distinguishable from other

signals originating within a number of degrees on either side of it. This is overcome, however, by rotating the coil so that the plane of it is at right angles to the incoming signals. When this is done a sharp "minimum" signal will be heard, and more accurate bearings may be determined. * * *

What are some of the advantages of using a loop antenna for receiving sets?

By use of the principle above outlined it is seen that loop antenna lessens interference by providing a directional effect. It is therefore easier to tune out stations that are not desired. Static or atmospheric disturbance is lessened. Inductances are unnecessary, the tuning generally being accomplished by means of a variable condenser in parallel with the loop and changing the plane of the loop in relation to the direction of the signals. * * *

Can an outside antenna be said to be directional?

It is a generally accepted fact that a straight-wire antenna is more or less directional in the direction of its plane. By this is meant that, if the antenna lies east and west, the signals will be slightly stronger from either the east or west than from the north or south. This slightly different intensity, how-

ever, is not noticeable, as the difference is so slight that it matters little. * * *

Which antenna is considered to be best for general use?

A one-wire aerial from 60 to 100 feet in length and 40 to 70 feet in height is generally considered to be most efficient for average use. * * *

In erecting an antenna, what precautions are necessary?

When erecting an antenna it should not be allowed to touch any walls or iron structure. It should be well insulated. It should not cross any power lines. It should not be too long, otherwise trouble will be experienced when short-wave reception is desired. The lead-in should be brought in to the set through an insulating bushing. If more than one wire is used in an antenna the diameter of the lead-in should be approximately the combined diameters of the number of wires used. * * *

What is the purpose of a "ground switch"?

The purpose of a ground switch is to connect the antenna directly to the ground when it is not in use. According to the new regulation of the Board of Fire Underwriters they are not necessary if a device called the Vacuum Lightning Arrester is used.

An Accidental Discovery

By D. P. Metzgar

AFTER spending considerable time in experimental work, and building all of the popular circuits and a few of my own, I had one of the most puzzling things happen with my outfit that I have ever experienced.

One day I wanted to get a local concert, and not having a suitable circuit at hand, I built the well known vario-

meter circuit. Completing this, I placed it in my cabinet.

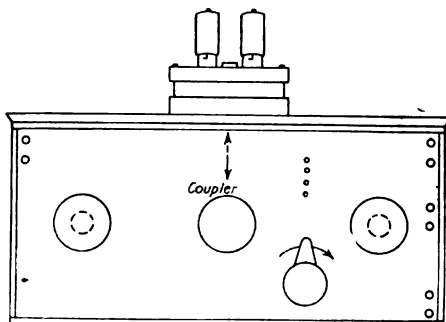
I am using a well known two-step amplifier which is enclosed in a steel, oval-shaped cabinet. I mounted the two-step in the center on the lid of the cabinet and proceeded to replace battery and phone connections. I placed in the grid, a .0005 condenser without a grid leak. After a moment of tuning, I knew that something was wrong. I went over the circuit three times and found things in perfect order.

In one last effort I lighted my tubes, but got no results. I started to raise the lid of my cabinet and immediately "The Star Telegram" came in loud and clear, and within the course of an hour I had copied nine phone stations, including WSB, the Atlanta Journal.

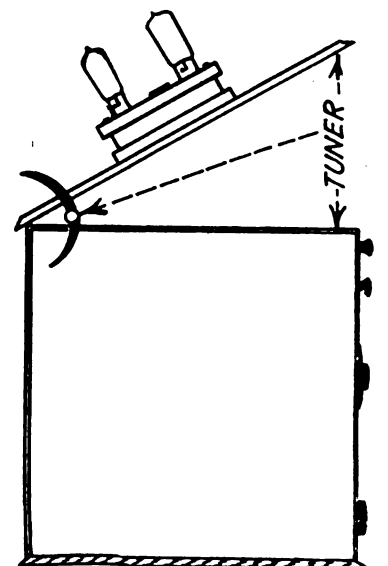
I found that tuning with variometers and with secondary had no effect whatever on the music while I had the lid open at different angles.

Most of you radio fans will know that the induction from the two-step through the lid of the cabinet was the cause of this, yet how many of you can take this little incident and work out a simplified

tuning device that may aid the coming radio?



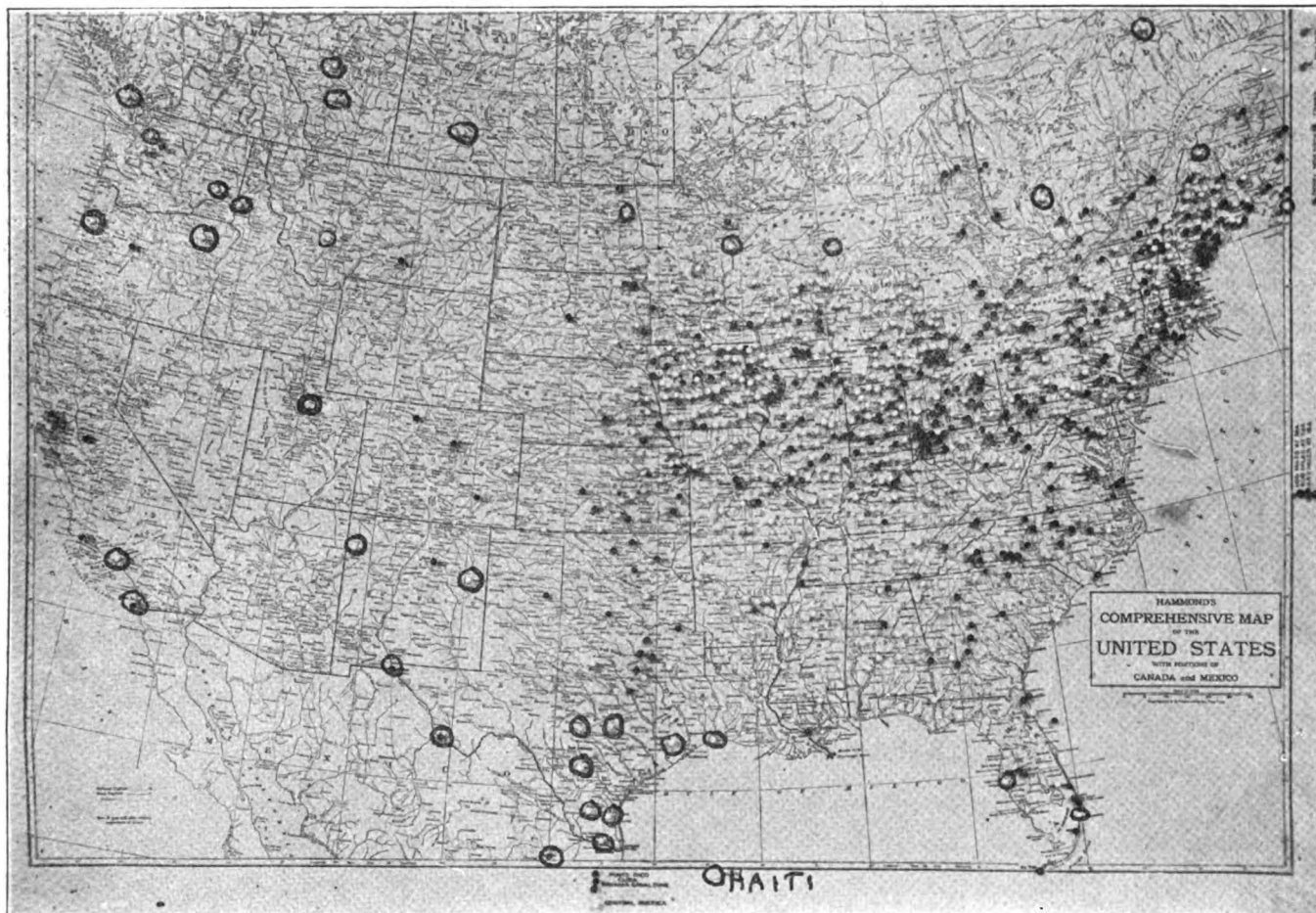
How the amplifiers was mounted.



Tuned by raising and lowering top.

WJZ Heard from Coast to Coast

By John Kent



Map showing the enormous range of the broadcasting station WJZ at Newark, N. J. The little black circles are pins, which were circled in ink to make them stand out. You will notice that the best reception has been accomplished on the eastern side of the United States, and there is a very well-defined area where they have suddenly dropped off. This is a ready reference for this station, showing where it has been heard.

THE map of WJZ's distance record shows the range of one of the largest eastern broadcasting stations. It is what you would see were you to visit station WJZ, the Westinghouse broadcasting station at Newark, New Jersey. By this method, originated by the operators at the station, when they receive a letter or a telegram from some locality hitherto unheard from, they place a colored pin in the city mentioned. This gives them a ready reference as to where they have been heard.

In all the operators have charted over 188 towns, the furthest west being located in California and Oregon. Fifty reports have been received from England and a number from France, telling of entire programs received, and one ship at sea has heard this station on a crystal detector using

two steps of audio frequency amplification while 1,750 miles out of New York harbor.

This station receives so much mail during the day, that were it to announce the names of letters received over the "air" they would not have any time for the rest of their program, and so they just stick a pin in the map and acknowledge the letter otherwise. This was impressed on the writer on his visit to this station. An enormous pile of mail, from all parts of the continent, and some from foreign countries, was in stacks in a large table, and being read by two girls. It looked like the mail room of a mail order house instead of a broadcasting station, and vividly impressed on our mind the enormous range of this most powerful station.

Has it Ever Happened to You?

YOUR Set is working fine—in other words, "it's the cats!" Your door-bell rings, and your next door neighbor steps in. "I just thought I would invite myself over to hear the set that you have been bragging so much about." "Sure; step right in. Chicago is just on with some fine dance music."

You go into the room, light up your tubes, adjust your phones comfortably, and start tuning. Nothing happens (it never does) and you start to get worried. "Oh, may be he has just shut down for a little while." "Oh, well, I see where they have Senator Glabbout

talking at Newark tonight. Can you reach him?" "Can I reach Newark! Don't make me laugh. It comes in so loud that you can't wear your phones—wait, here is somebody. Hear that squealing noise?" "Yes, who is it?" "Well, I don't know; wait until he talks."

A very faint and weak voice announces, "Senator Glabbout, will now entertain the radio audience with a very interesting talk on 'My Travels Through Washington in a Flivver.'"

"I thought that he was talking at Newark, tonight?" "Yes, something must be wrong. It never acted this way before."

And then you wonder what your friend thinks of you.

Transmission via Westinghouse

By D. G. Little

Radio Engineer, Westinghouse Electric and Manufacturing Company

SOME very interesting things have been discovered about radio transmission since broadcasting began. The purpose of this talk is to tell you something about the peculiarities of radio transmission, something about the difficulties encountered, and something of the development that is under way to overcome these difficulties.

Consider for a moment some of our distance records: KDKA has been heard on board a ship in the Pacific Ocean a distance of over 5,000 miles from Pittsburgh; also in Chile, South America, a distance of 4,000 miles. Our Newark station "WJZ" is being heard almost nightly in England and France and has been heard on board a ship in the Mediterranean, 200 miles east of Gibraltar. There seems to be almost no limit to the distances the radio waves travel under exceptionally good atmospheric radio conditions—the average range of these stations is of course not nearly so great as that mentioned.

We are in the habit of thinking that radio signals travel incredibly fast, with the speed of light, at approximately 186,000 miles per second. Of course this is fast compared with our fastest automobiles and airplanes, but it is nevertheless a perfectly definite rate of speed. Let us figure out the length of time it took that artist's voice to reach the listener in the Pacific Ocean, 5,000 miles away. The artist probably stood two feet from the microphone in KDKA's studio. It required two-thousandths of a second for the sound wave from the artist's mouth to reach the microphone. Another two-thousandths of a second elapsed while this sound was being turned into electrical vibrations and then placed upon the transmitting antenna. The 5,000 miles was then traveled in twenty-seven thousandths of a second. Another one-thousandth of a second might be required for the electrical vibration to be turned back into sound at the receiver; giving a total elapsed time of thirty-two thousandths of a second. Now since we do not readily think in thousandths of a second this, to use an old familiar illustration of the speed of sound, would be the length of time required to hear the stroke of a hammer if you were standing thirty-five feet away.

One might think offhand that the radio waves originating at the broadcasting station would travel outward with an equal strength in all directions, and that at a certain distance a receiving set would give a signal of whether the receiver was north, south, east or west of the transmitter. One might also think that this signal would be constant in strength whether the season were summer or winter, daylight or dark. The broadcasting listener is learning that this is far from being the case. Distant signals are much stronger in the winter than in summer. Signals are received much louder at night than in the daytime. As to the direction from the transmitter, each broadcasting station seems to cover certain localities much better than others.

Take for example reception in Boston from Station WBZ at Springfield, Mass, 100 miles distant; from WJZ at Newark, 250 miles distant; and from KDKA at Pittsburgh, 550 miles away. On the average KDKA is received better in Boston than either WBZ or WJZ; although it is over twice as far away and in the same general direction. Likewise KDKA is received better at Springfield than in Newark. On the other hand the States of Ohio, Indiana

and Michigan seem to receive Newark better than KDKA, although Newark is twice the distance. In other words, the area covered by each broadcasting station has some dead spots where this station is received but poorly, and likewise some localities where reception is very good.

In addition to the effects just described there are variations in signal strength from night to night which seem to sweep over the country like a cloud. In a certain locality for example, eastern stations may be received well, and western stations will be weak on a certain night, while the next night the reverse may be the case. On a third night, however, both eastern and western stations are loud. This then would be considered an exceptionally good night for radio.

Then there is fading, a name which has been applied to rather rapid changes in signal strength. This effect is noticeable only with stations over 100 miles away. A distant station may be loud for a few seconds and then may die down or be lost altogether for a relatively short space of time. Fading, no doubt, has been noticed by a large number of broadcasting listeners when trying to hear distant stations. To say the least it is rather annoying. Dead spots are generally constant; seasonal variations can be expected, but good and bad nights and fading cannot as yet be predicted. Observations have been made by the United States Bureau of Standards on this fading without anything being proved except that this effect seems to follow no definite laws nor be caused by any particular condition of weather.

Broadcasting difficulties due to the above conditions are more or less beyond the power of the radio engineers to correct. Of course as a general remedy, more power may be used at the broadcasting station, but this may cause trouble due to interference, particularly in congested areas where there are a number of broadcasting stations. The maximum output is now designated by law as 1,000 watts.

The quality of transmission must be improved to the point where the speaker's

voice becomes again a reality at the receiver. Extraneous noises must be kept out of the radio transmitter so that they will not interfere with the speaker's voice. The wave length of the broadcasting station must be kept constant so that the listener may be able to adjust his tuner dial always to the same point to hear a certain station.

Before any improvement in this direction may be noticed however the Government will be obliged to limit the number of stations in use at one time in a given locality, and assign separate wave lengths to those stations that operate at the same time.

You may be interested in some of the precautions taken at Westinghouse stations to insure that grams are not interrupted through failure of apparatus. The most vital part of the broadcasting set is the vacuum tubes which generate the radio frequency carrier wave, and modulate this wave according to the voice frequency. These tubes are exactly similar to the small tubes in your receiving set, except that they are many times larger. Every Westinghouse station carries a complete spare set of nine of these tubes for replacement in case of failure of one or more of those in use. Each station also carries spares of such parts as condensers, inductances, etc., which may fail in time. In addition a large stock of tubes and parts is carried at the East Pittsburgh works ready for immediate shipment to any station.

The studio equipment at Westinghouse station is installed in duplicate, that is, there are two sets of entirely separate sound pick-up and amplifying apparatus. Either set may be used, leaving the other set always in reserve.

It is absolutely essential that we keep on improving or else the listening public will say we are slipping backward. Experimental work is constantly going on at the East Pittsburgh works towards perfecting each part of the rather complex system. With proper government regulation and the co-operation of all broadcasting stations with the listening public radio broadcasting will become the service that it should be.

Electrical Experts Hear First Transatlantic Phone Message



(C. International News Photos)

The foremost electrical experts of the United Kingdom listening in on the first wireless telephone message transmitted between England and the United States by the American Telephone and Telegraph Co. Signor Marconi can be seen seated in the middle of the group.

Radio Transforms Life for the Lighthouse Keeper and Lightship

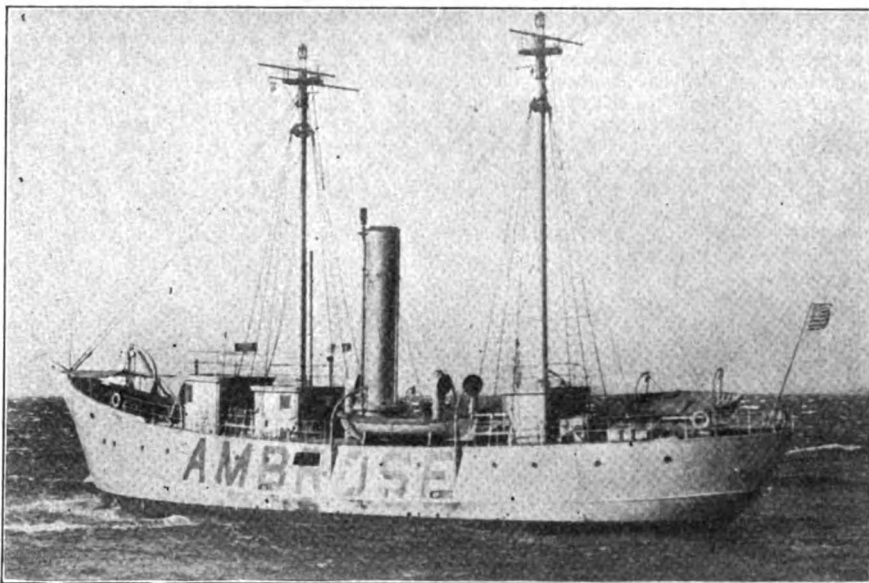
By *Albert J. Fieldson*

IT is fairly well agreed that where men are called upon to perform rigorous and exacting service there should be some means provided for healthy and needed reaction.

The Lighthouse Service solved one problem by giving the light-tenders along the coast a very liberal amount of shore leave. Until the radiophone came along, however, it could not solve the problem of occasional diversion while the lonely sentinels of the deep were on duty. Now that the radiophone is here with its myriad attractions, the Lighthouse Service has lost no time in bringing it into play, not only for intercommunication between lighthouses and lightships, but also for the entertainment of the man or men on duty.

With this latest addition to their already powerful apparatus, the big lighthouses and lightvessels will have as comprehensive an array of instruments as any station ashore. The Fire Island Lightship outside of New York, for example, has a complete telegraph and telephone transmitter, and an up-to-date regenerative receiver with amplifying unit complete. It has also a radio beacon device, with which it can throw radio waves in one direction much in the same manner as the lamp on its foremast throws out rays of light.

All lightships, however, are not so well equipped as the one guarding the approach to the busiest harbor in the world. To some lightships, the radiophone will come as a boon, and will be the first radio apparatus of any kind to come on board. Think of those lonely old ex-mariners sitting in won-



(C. Kadel and Herbert)

The Ambrose Lightship, which has just been equipped with the latest radio apparatus to aid ships at sea. It has a complete direction-finding equipment, as well as the most up-to-date receivers and transmitters. This lightship guards one of the channels of New York's harbor.

derment before a radio outfit, and you have one of the most interesting pictures the science can give. The almost continuous concerts coming from broadcasting stations in New York or its vicinity have made life something more than the undying sense of duty so marked in these men.

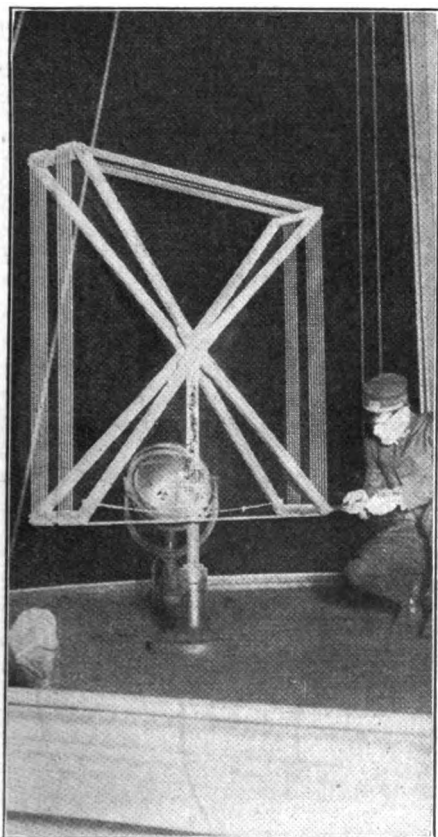
Not only the lighthouses and lightvessels offshore need the radiophone. It often happens that stations situated within sight of land are cut off from the shore for months at a time, while the winter's wind howls and the stormy seas rage. Even the government tenders are unable to reach the near-by station with provisions and other supplies. During these long periods of enforced isolation, the keeper needs a cheering word now and then, and there is no better way to give it to him than by way of the radiophone.

Rather early in the history of radio communication, the value of wireless on board lightvessels was demonstrated by two trial outfits placed on board two lightships in the English Channel. At that time, radio was good for short distances only, thirty-six miles then standing as the record distance. This was in 1898, while Marconi was carrying on his now famous experiments before the Post Office officials in Great Britain.

The set at East Goodwin Lightship has not been installed more than sixty days when a heavy sea struck the lightship and tore part of her bulwarks away. The mishap, the first ever to be reported by wireless, was repaired in record time. This was in January, 1899, and as if the incident were not enough fully to demonstrate the value of the radio equipment, the East Goodwin had the misfortune to be run down by the S.S. *R. F. Matthews* on March 3, of the same year. This accident, seriously endangering the lives of the crew, was reported by wireless to the South Foreland Lightship, and lifeboats were promptly dispatched to the rescue.

In the interval, the other radio set, which had been placed on South Foreland, had not

been idle. She had sustained no accidents, but the first message to go across the Straits of Dover was sent from that station, and received in France at Chalet d'Artois, Wimereaux, near Boulogne. It sounds insignificant in the light of present day progress but at that time the spanning of the channel was considered a feat. Although the distance was not greater than the thirty-six mile record, yet it was the connecting of France and England without visible wires and the wonder of the day.



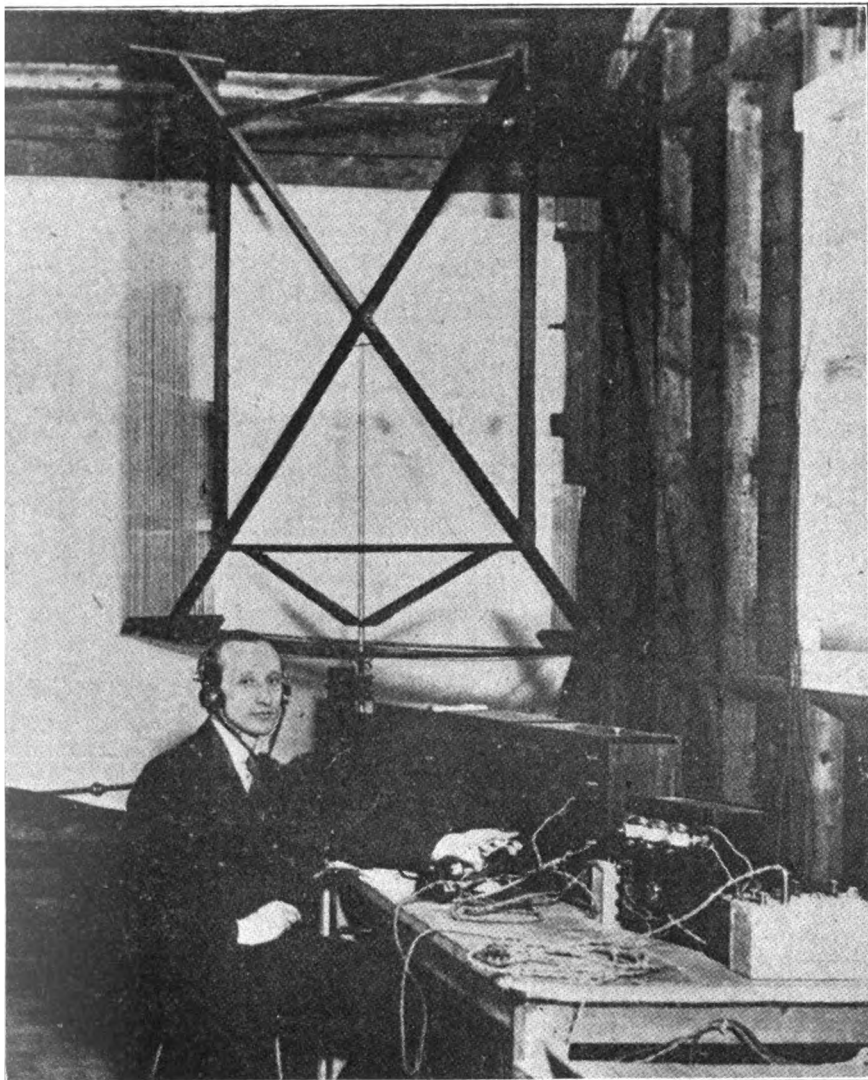
(C. Kadel and Herbert)

Preparing the loop aerial on the Ambrose Channel Lightship, used in connection with direction-finding service.



(C. Kadel and Herbert)

First Officer G. H. Peters operating the direction-finding loop on the Ambrose. The receiving set consists of detector and six stages of audio frequency amplification, as seen in the right rear.



(C. Underwood & Underwood)

Receiving station of the Western Electric Co., Southgate, London, which received the first official radiophone message from New York to London. The loop antenna shown in the photo was the only one used in this work, and remarkable reception was reported. J. I. Carty, vice-president of the American Telephone & Telegraph Co., was the first man to enjoy the distinction of talking direct to London by the agency of a radiophone using low wave length. In order to make absolutely sure of good reception, both radio frequency amplification and audio frequency power amplifiers were used. While this is not the first time that radiophone has been used to span the Atlantic, it is the first time that radiophone speech has been heard over such distances on low wave length, using a loop antenna for receiving.

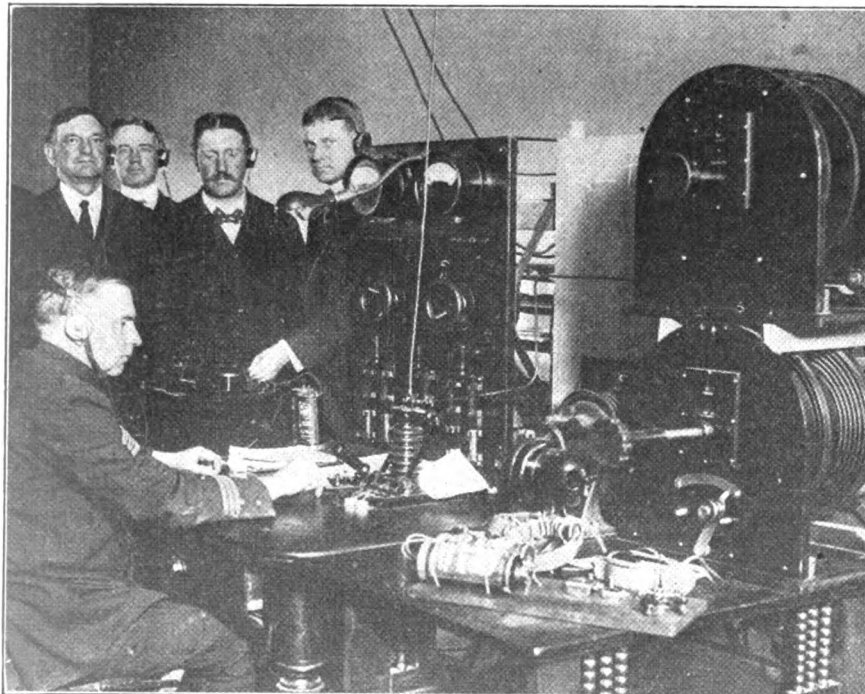
Topical Radio Photo Caught for Radio World Reads

*Captions by
Robert L. Dougherty*



(C. Harris & Ewing)

William J. Burns, head of the Department of Justice, uses radio in the Secret Service in the apprehension of fugitives. The receiver, as can be noted, is one of well-known make. Mr. Burns, shown in the photo, is a firm believer in the idea that radio will make the escape of criminals in the United States almost an impossibility. The Department has on record several cases of criminals apprehended by radio.



(C. Underwood & Underwood)

Spark transmitter which will be used to keep the police stations of the City of New York in touch with Headquarters. The photograph shows a squad of men being instructed in the use of the various instruments. These men will be later detailed as regular operators in the various stations throughout the city.



(C. Photonews, N. Y.)

The new 1½ kilowatt Siemens transmitter recently installed at the New York City Police Department is the first installation of a transmitter of this type on the East coast. This is the first installation of a transmitter of this type on the East coast in use at the present time, having a reliable range of 100 miles. On the left is the oscillator, and the two smaller ones are the audio frequency amplifiers. The transmitter is operated by Wireless Operator L. H. Tamplin, of the S. S. Berengaria. By means of this new installation it is possible for the Police Department to communicate with land during heavy fog.

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lers



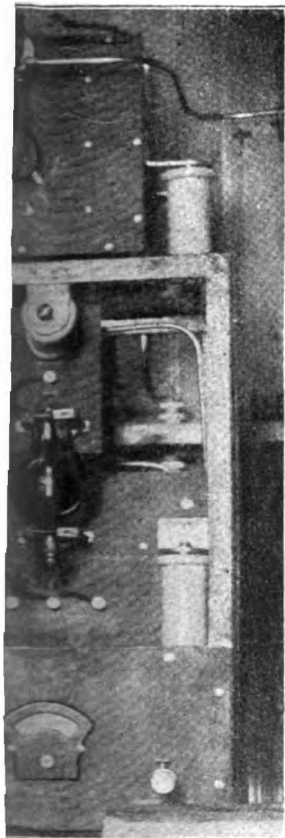
(C. International Newsreel Photos)

Constable Woodin, of the Metropolitan Police of London (upper right hand), who is a regular "bobbie," and the set he constructed. It's a "regular set." Constable Woodin was one of the first to report American signals heard in London. As will be noticed, radio frequency amplification is used, each amplifier being in a separate cabinet, Constable Woodin constructed the set in his off hours, and with the exception of the tubes and amplifying horn, it was built entirely by himself. As there is five hours' difference in time between New York and London, in order to hear a program broadcast at New York at 9 o'clock P. M. he would have to stay up until 2 A. M., which is considerable, even for a Nite Owl, as the programs are just beginning at that time, and some of the stations do not have their big features on until after 10.



(C. Wide World Photo)

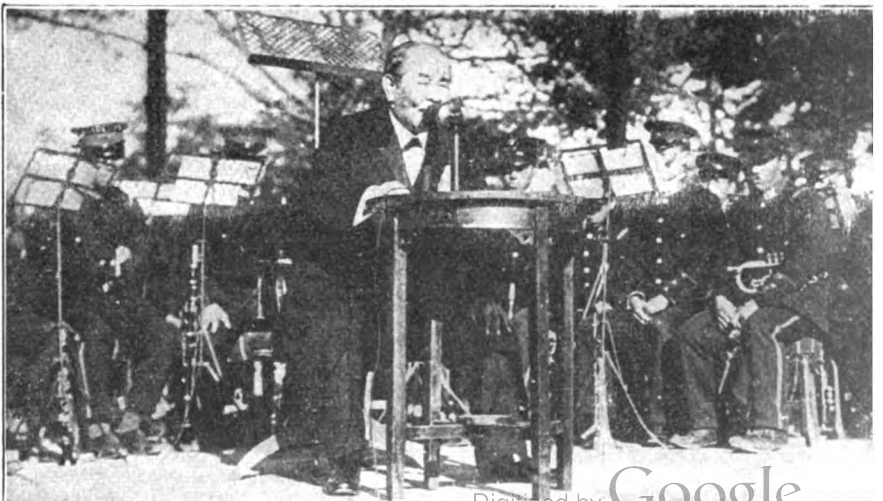
A scene from "The Traveling Salesman" as it was broadcast by the players at the General Electric Company's station at Schenectady, N. Y. This particular scene is laid in a small railroad station and this accounts for the telegraph instrument shown in the photograph. To keep check on how the program is being broadcast, the director is equipped with a pair of padded phones and in this way he is able to hear the play as it is being broadcast.



on the S. S. Berengaria. It is one of the most of 2,200 miles. The large tube is the speech modulator. Chief is shown operating the transmitter ship to keep in telephonic trip.

(C. Wide World Photos)

Broadcasting has become popular in the Far East, as shown in the accompanying illustration on the right. Viscount Shibusawa recently broadcast the address which he made in Hibiya Park, Tokio, on the occasion of the fourth anniversary of the celebration of the Armistice. The fact that radio has taken such a tremendous hold on all the civilized countries of the world shows the important position it commands among the most useful sciences.



Radio and the Woman

By Crystal D. Tector

A FRIEND of mine has written a letter to me and she claims that she has at last solved the problem of assuring herself that everyone that she invites will attend. She writes: "I simply put 'Radio Party and Tea' on the bottom of the card, and then I know that every single soul of them will be there on time. I have never had one person disappoint me, and occasionally the invited guest brings along 'a very good friend of mine.'" Well, what are we going to do when every one of us has a set? Then we will have to find some other way of enticing all the young men and "debs" to attend "our teas."

* * *

LAST week, after reading the radio programs for the evening, we decided that we would listen to a speech by William A. Brady, that eminent producer of Broadway plays, and accordingly tuned in for Newark. Imagine our surprise when we were told that it was impossible for William A. Brady, Senior, to be present, but that his son, Wm. Jr., would come to his father's rescue. He gave a very interesting speech on conditions in the American theatre, and as F. H. said later, "He must be a chip off the old block," but I think that the proverb "Like father like son" more aptly fits the case.

* * *

AFEW of the girls interested in radio, in my town, decided to take a trip through one of the large factories now making radio apparatus. Of course, they left all the details to me, so I wrote a letter to the president of one of the large eastern manufacturers and received a very courteous reply, in which he said that at any time we felt so inclined, we should have no hesitancy about coming "right in." We did go "right in," and I really have not recovered yet. I never, never thought that the radio business was carried on in such a tremendous scale. I couldn't even start explaining it, because I don't know where to begin. All I can say is this one thing: by the number of girls working, winding coils, varnishing coils, soldering, etc., I think that there are more women radio experts than men.

* * *

WE (meaning F. H. and myself) attended a neighborhood "radio dance" given by a well meaning radio enthusiast, the other evening. Instead of dancing to radio music, we had to be content to listen to a phonograph. The main reason being that the program for that evening was made up mostly of vocal selections and classical music. I never met such an apologetic man in

my life. If he apologized once he apologized a dozen times. I know that I listened to about ten of them. "I believe that if he could have had a 'real good cry' that he would have felt much better," sarcastically remarked F. H. on the way home.

* * *

A VERY dear friend of mine, very well acquainted with a girl who is a school chum of a young woman that occasionally sings at little formal teas and gatherings, stopped me on the street the other afternoon, all excited, and in a voice that just shook with emotion, said: "Gene is going to sing at — broadcasting station. Don't you think that terrible! Why, she is lowering herself to the level of a common performer." Well, I never! "Lowering" indeed, I think that she is indeed honored to be allowed to have the hundreds of thousands of radio enthusiasts hear her voice. I notice that the stations never lack entertainers of the very highest type, even going so far as to dip into the ultra-exclusive operatic circles.

* * *

I RECENTLY found out that if while I am wearing the "ear muffs" I put my hand near the variable condenser, shunting the primary of the second step for a few seconds, the signals increase almost 100 per cent, and then fade to normal. I happened to do this the other evening while our neighbor, who is an expert, and consulting engineer for a large radio company, was making a neighborly call. He looked surprised for a few seconds, then called "What circuit are you using?" "Oh, look inside the cabinet and figure it out," Friend Husband very airily told him. Now our neighbor is working feverishly nights, and his wife said that he won't even sleep nights. I wonder if he has discovered something that we have been doing right along, and never took time to find out what caused it. "There goes another chance to make a million, maybe two for all you know," remarked Cousin Kate, "just because this one time you were not inquisitive, and now you won't ride in Rolls-Royce."

* * *

F. H. and myself have started a "Radio Supper Club." We have gathered together all our enthusiastic radio friends, "chipped in," each to the full extent of his or her means, and have bought a real DX set, which is now installed in the drawing room of one of our more fortunate members, who has more room in her home than she can use. Every Friday evening about 10:30 we dance and nibble on a few choice tid-bits, and "a good time is had by all." We find it much more convenient to do our dancing and eating in a radio atmosphere than to endure the unpleasant necessity of having amusement superintended by a police officer or a plain-clothes man.

Radiograms

THE first actual attempt of two amateurs—one George H. Pinney, of South Manchester, Conn., and the other Leon Deloy, of Nice, France—to establish two-way communication between America and France was not entirely successful. Mr. Pinney, while heard in France, could not pick up the French amateur at his station. Mr. Deloy was heard attempting to answer by E. F. Laufer, owner of station 2AQP, located at 699 East 137th Street, New York City. The delay in reporting the French amateur's signals was due to the fact that Mr. Laufer wished to verify the signals before making the story public. It would seem that the French amateurs are paying more attention to their receiving apparatus (which must be really up to date, from all reports) than to their transmitters, but just give them time. That's all they need!

* * *

THE American Legion Show of the S. Rankin Drew Post, which is composed entirely of theatrical and publicity men of this city, will broadcast the entertainment for the benefit of the radio public. The Legion will have the use of the Times Square Theatre through the kindness of the Messrs. Selwyn, and will broadcast by means of relaying the signals over special wires to the broadcasting station.

* * *

BY the aid of radio, the Aeromarine flying boat, "The Buckeye," was recently called upon to perform an unusual service. Shortly before the eleven-passenger flying boat left for its first scheduled trip from Miami to Nassau, a wireless message was received from Carter De Gregory at Settlement Point, stating that his mother was seriously ill and that he had to be taken immediately from the west end of Grand Bahama Island to Nassau. Mr. De Gregory was instructed to board a ship in the harbor, and the flying boat would come alongside and pick him up, and take him to his destination.

* * *

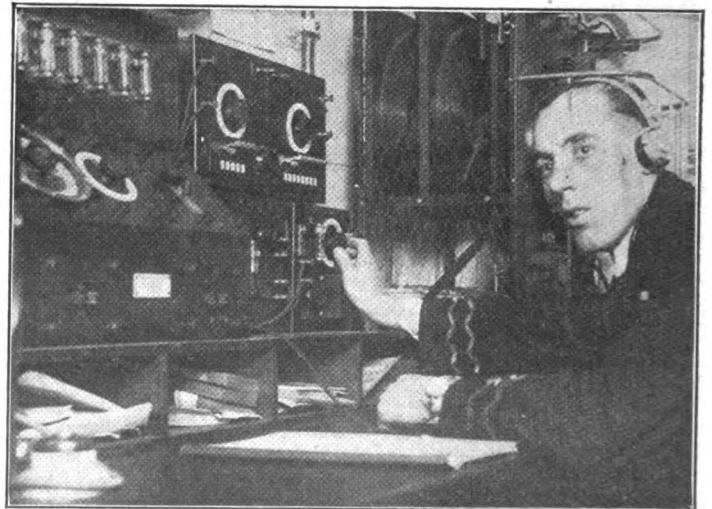
IT has recently been proved that long waves are not necessary for transatlantic communication. During the recent tests, radio communication was established between Europe and America by the

use of short waves, the longest of which was 400 meters. This conclusively proves the fact that it is not necessary to use waves of 15,000 and upwards in order to transmit long distances.

* * *

THE bane of a radio operator's existence may soon be eliminated, if a new call bell system, developed by an officer of the Portuguese army, proves successful. By means of the intended system, it will be unnecessary to continue long watches.

S.S. Empress of Scotland's Radio



(C. Photonews)

The Empress of Scotland has one of the best equipped wireless rooms on trans-atlantic steamers. It is equipped with the new 3,000 meter wave transmitter and direction finder, and has a most complete radio room. Wm. J. Howlett, Chief Radio Officer, is listening in.

The Week with the DX Nite Owls

All on One Tube

From Marshall Beaman, Sharpville, Indiana.

I AM a constant reader of RADIO WORLD. In the January 20 issue I see Mr. Sheron has receiver 1,500 miles with his set, which is described as having three tubes. I only use a detector and I have a record of 2,200 miles. January 23 I received KNJ, Roswell, New Mexico. I received Cuba, PWX, several times. My set includes a 23 plate variable condenser, a variocoupler which I constructed, a grid leak and grid condenser, phone condenser, pair of Federal phones 2,200 ohm, one U. V. 200 one socket, 6 volt A battery, 22½ volt B battery, rheostat. My antenna is 125 feet long. Here are some I have heard: WWJ, WCX, KOP, WLK, WOH, WLW, KDKA, WGY, WOC, WBAP, WMU, WHU, WSB, WOR, WAAF

Henry Is 12 Years Old

From Henry Deibert, 188 South Monroe Street, Columbus, Ohio

LAST night February 2, I heard the following stations with a one-bulb set very clearly: WGY, WMAQ, WWJ, WBF, WOR, KDKA, WLAG, WDAD, WCX, WCAH, WOC, WAAN, WDAP, WJD, WSB, WSY, WJAX, WLW.

I am twelve years old, and I built the set myself, using a regenerative hookup.

I trust you will print this in RADIO WORLD under the DX "Nite Owls." I think I have made a good record for one night, but am hoping for better luck.

Mr. Keating's Competitor

From Lee Schecter, 1535 Sempole Ave., St. Louis, Missouri.

I WAS surprised and interested to note how similar Mr. Keating's and my own results are. I am the owner of a crystal set without amplification. Music and signals from our local station, KSD, can be heard distinctly all over the room, without using the loud-speaker. Mr. Keating believes that his results can be duplicated. They have been. The list of broadcasting stations are as follows: WOC, WCX, WWJ, WDAF, WHB, WDAP, WSB, WGM, KDKA, WBAP, WGY, about a thousand miles distant! My set consists of Western Electric 509W, 2200 ohm phones, a home-made 1-slide tuner 4½ inches long, wound with No. 26 B & S wire; aerial, 2-wire, 85 feet long and 36 feet high. No phone condenser used. These stations have been received with both galena and silicon. There is nothing strange about the hookup. It is a simple one, known to all amateurs.

Now why don't other owners of crystal sets get the same results? There are many who discredit my reception, too,

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

Mr. Keating, but my set is not a freak. My reception is not due to reradiation. The above stations have been heard consistently before and after local broadcasting, sometimes as many as four or five stations an evening. They may discredit our results, but they are welcome to come and see for themselves.

A Record of 267

From Carlton D. Shultz, Fort Plain, N. Y.

AS you ask me for some of my DX records I wrote you once before and gave you my report, but since then I have built this set to five bulbs and I now

heard by voice. It must be remembered that I have heard 267 different stations in all. As I am not able to read code I can give you only what was heard by a friend who called one evening, who can do so. He recorded several ships, both from the Atlantic and Pacific, and many stations located in different parts of the United States. I would like to hear from any one using this hook-up.

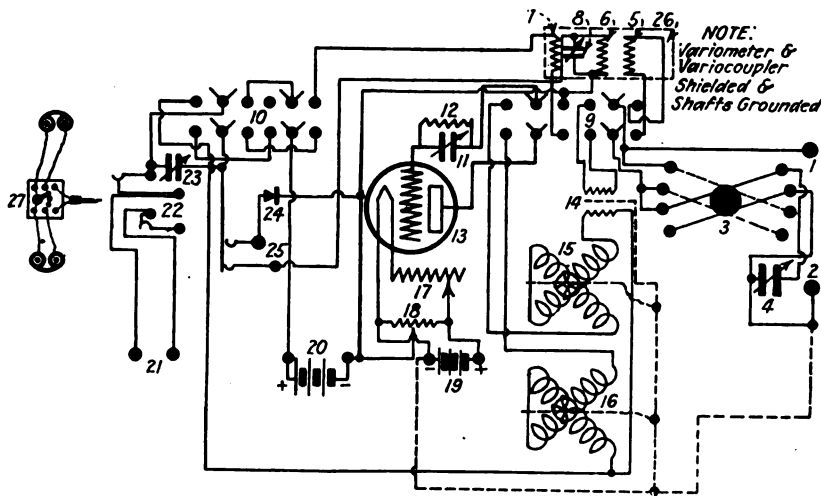
With a Combination Long and Short Wave Receiver

From William W. Crosby, 1st Lieutenant, F. A., N. Y. N. G., Radio 2CAF, 601 West 136th St., New York City.

I AM enclosing a drawing of a combination long and short wave radio receiver which may be of interest to some of your readers. This set has given me excellent results over a period of 2½ years.

Using one U. V. 200 and Baldwin phones I have copied broadcasting stations in the United States as far west as Denver and, from Winnipeg, and amateur signals from every district in the country and parts of Canada.

The short wave part of the set is very efficient. It is possible when using detector and vocaloid to copy nearby stations such as WJZ, WEA, and WOR,



Schematic diagram illustrating the hookup described in William W. Crosby's letter on this page. Change over from long to short waves is accomplished by means of anti-capacity switches.

send you the following: I hear KDYX, Honolulu, quite often, and on one occasion I heard KUG, also Honolulu; WLAY, Fairbanks, Alaska; KDYO, San Diego; KQI, Berkeley; KDZG, San Francisco; KDYO, Portland, Ore.; PWX, Havana. These are the most distant stations I have

over one and two rooms quite distinctly.

The short wave part of this set is very carefully shielded, all metal parts not in the circuits being grounded.

I should be glad to furnish any further information desired to any of your readers upon receipt of stamped envelope.

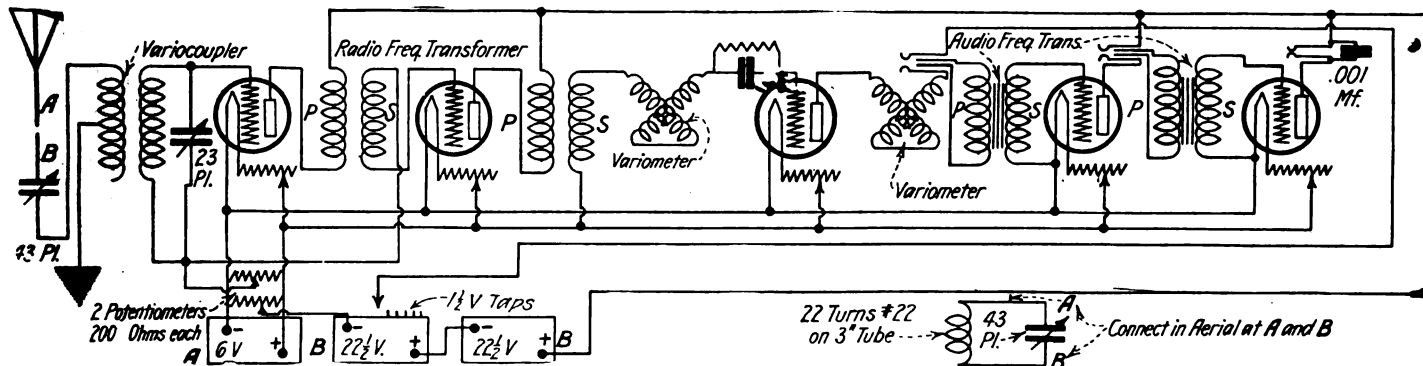


Diagram of the hookup with which Mr. Schultz (see letter) has heard 267 stations. The first two tubes are used as radio frequency amplifiers, the last two as audio frequency amplifiers.

Much Experimenting Decided New York City to Establish Municipal Station at Elmhurst, L. I.

By *Hon. Grover A. Whalen*

Commissioner of Plant and Structures of Greater New York

GROVER A. WHALEN, Commissioner of Plant and Structures of Greater New York, announced a few days ago that the installation of the Municipal Broadcasting Station is to proceed without delay.

This enterprise was authorized by the Board of Estimate and Apportionment on June 2, 1922, but the actual installation of the apparatus was deferred pending the completion of exhaustive tests and experiments conducted with the co-operation of the Western Electric Company, in order to obtain necessary information so as to assure such installation as would be absolutely efficient in operation.

"The result of these experiments," said Commissioner Whalen, "has been of great value to radio science and has necessitated radical changes in plans, which will assure New York City having one of the most effective broadcasting stations in the country.

"The studio, reception room and control rooms will be in the Municipal Building, as originally planned, convenient to the City Departments and to the people. The transmitting station will be erected on city property at Elmhurst, L. I. The antenna towers will be 200 feet high and 300 feet apart. The transmitting station will be connected by cable to the studio and main broadcasting station in the Municipal Building.

Perfect Radio Service for New York City

"The location of the station at Elmhurst has been carefully chosen for its electrical advantages in launching the electrical waves into the ether. In addition, it is in the center of that locality from which it is expected from the results of the tests that strong signals will be obtained meeting all conditions of perfect service for the people of the city and for those at large.

"These changes in the original plans had their inception in the desire to locate the transmitting equipment so as to assure the sending of strong signals to all parts of the city for the benefit of the owners of small crystal receiving sets as well as the owners of the more expensive tube sets throughout the country.

"It was realized that the Municipal Building, a steel structure, 580 feet high, set in a nest of tall steel structures, presented certain prima facie difficulties as a site for the location of the transmitting apparatus, and it was decided to determine definitely exactly what these difficulties were—whether they could be overcome or whether the adverse conditions made another location advisable. The officials of the Western Electric Company, which was the low bidder on the contract, agreed cordially that preliminary tests were desirable in order to give assurance of the efficient working of the station, and decided to conduct these tests with the department engineers, supplying all necessary apparatus, without cost to the city.

"The Municipal Building, as far as the launching of radio waves is concerned, has unusual dimensions not calculated from an initial survey to be beneficial, but not precluding failure. It is higher than other buildings used for this purpose, being 580

feet in total height. It has a centrally located tower, above which it would be impossible to locate the antenna and the shielding effect of this tower was feared. It is also surrounded by and is in close proximity to other steel buildings of a massive structure, such as the Woolworth Building, and the absorption, deflection and shielding from this source had to be considered.

Temporary Installation for Test

"In order to make the test, it was decided to install temporarily in the building a 100-watt transmitter, erect a small antenna, using the tower of the building as one of the supports, transmit signals, and actually measure the strength of them, at different points on the circumference of a circle surrounding the building. The measuring instrument used was a specially designed extremely sensitive receiving set, employing what is known as the double detection, intermediate frequency amplification method. Reception was made on a loop antenna and the signal strength recorded on a microvoltmeter. By means of a separate oscillator energy of a known amount enough to produce the same deflection on the scale as that produced by the signal was then sent into the antenna and the electrical characteristics of the antenna being known, the strength of the field produced by the signal in microvoltmeter was then calculated. In this way, it was possible to know exactly what may be expected of a broadcasting station at this location.

"On September 15, 1922, the temporary antenna was erected. It was of the flat top inverted L type, made up of four strands of No. 18 phosphor bronze wire, 75 feet in length. It was supported between the balcony above the 39th floor of the building and the roof of the 25th floor on the north side and the lead-in taken from the lower end to the transmitter on the 25th floor. Testing under an experimental license was begun on September 28, 1922, and continued until December 27, 1922. Lloyd Espencheid, of the American Telephone and Telegraph Co., and R. A. Heising, of the Western Electric Co., had supervision of the test and their experiments were carried out by E. H. Hall and I. C. Crowley, under the direction of S. H. Willard, all of the Western Electric Company, in conjunction with men from the Department of Plant and Structures.

"When the operating conditions had been found giving the best field strength, measurements were made with the measuring set at Atlantic Highlands, N. J., Cliffwood, N. J., Rahway, N. J., Maplewood, N. J., Passaic, N. J., Englewood, N. J., Yonkers, N. Y., New Rochelle, N. Y., Great Neck, L. I., and Lynbrook L. I.

Results Are Most Interesting

"At the same time field strength measurements for comparative purposes were made of the signals of the Western Electric Company's station WEA, on the same wave lengths, this station being recognized as a very efficient one. The results obtained from this test were most interesting. The curves of field strength for the two sta-

tions were similar in shape. In certain directions, such as Passaic, signals were strong, while in other directions, such as Yonkers, signals were weak. This condition is evidently caused by the absorption and deflection of the waves caused by all of the steel buildings in lower Manhattan taken as a whole, to the contour of the land rivers, valleys, etc., and finally to local receiving conditions at the points where measurements were made. This condition would therefore exist for any station located in lower Manhattan and could not be improved.

"The strength of our signals was, however, much less in practically every direction in comparison to the strength of the signals from station WEA. This condition we encountered in all of our tests: namely, weak signals on the 360 to 400 meter wave lengths upon which we will be required to operate, and strong signals on the 550 to 600 meter waves which we will not be permitted to use. This effect is attributed to the dimensions of the Municipal Building itself. The building is 580 feet from the curb to the top of the tower or approximately one half of a 400 meter wave length. It persists in oscillating, therefore, at a frequency which causes opposing voltages to exist between the free end of the antenna and the ground. Throughout all of the experiments attempts were made to prevent the building from oscillating by employing various combinations of antenna counterpoise shields and filter circuits placed between counterpoise and ground, etc. Some measure of success was attained, at least enough to justify continued efforts, but not with satisfactory results. Efforts were made to change the oscillating period of the building to one which would strengthen instead of weaken the signals, by the use of resonant and anti-resonant circuits between counterpoise and ground, and between antenna and ground, but with no greater success.

"It was then decided to locate the transmitter in a room on the thirty-fourth floor of the building at a height above the street level of approximately 450 feet. An umbrella type antenna was erected consisting of eight strands of wire extending from above the thirty-ninth floor of the tower to the roof above the twenty-fifth floor on the north and south sides of the building. The tower was completely surrounded by a shield consisting of twelve wires extending its entire length, and counterpoises consisting of six wires each were used above the twenty-fifth floor, on both the north and south sides of the building. On November 28, tests were begun here similar to the ones made on the twenty-fifth floor and better results were obtained, but they were still not what they should be. In this case the antenna was driven from the top down, and it was from this location that the tests for field strength made from different locations on the circumference of a circle surrounding the building previously mentioned were made.

"In the final effort a very novel experiment was tried in which the antenna wires

(Continued on next page)

Commercial Interests May Take Over Naval Radio Stations Closed Recently

SECRETARY of the Navy Denby has directed that four naval radio stations be sold, four others abandoned, and two radio compass stations be closed and dismantled, which proposed action was predicted in RADIO WORLD recently. In carrying out the recent recommendations of the Rodman Board in the interests of increasing fleet efficiency, particularly in communication, the Secretary is disposing of unnecessary radio stations.

The stations at Cape May, N. J., will be closed and abandoned by naval personnel at once. Its work hereafter being handled by the station at Cape Henlopen. At Seattle, another station will be abandoned as soon as the Navy Yard at Puget Sound can take over the traffic. Grande Isle in Louisiana has been ordered closed and abandoned, as has also the station at Navassa Island in the West Indies.

Radio stations at Baltimore, Md., Mobile, Ala., Miami, Fla., and Port Arthur, Texas, will be offered for sale as soon as invitations for bids can be drawn up. It is also planned to dispose of the station at Managua, Nicaragua, when commercial facilities are provided at that place.

The War Department has been asked if it desires to take over any of the ten naval radio stations on the Great Lakes, but it is not likely that the Signal Corps will accept any except those at Buffalo and Cleveland. Such stations as the army does not take over will remain closed, as the navy does not need them and cannot afford to continue

their operation. Three compass stations on the Lakes, however, will probably be opened in the Spring as aids to navigation.

Radio compass stations at Pass a Loure, La., and St. Petersburg, Fla., will be dismantled and the land vacated by the navy. Several other stations are being held subject to abandonment as soon as the handling of existing traffic is arranged.

In closing the stations, the Navy Department does not desire to interrupt traffic in radio, but, on the other hand, as commercial traffic was only handled when other facilities were lacking, officers are of the opinion that commercial interests may now be induced to open general traffic stations at points previously covered by the navy. The prime purpose of naval shore radio stations is to aid the fleet, and when a station ceases to benefit the fleet, it becomes a liability to the Government instead of an asset.

Can It Be So?

"Pa, what does broadcasting mean?" asked Clarence.

"Telling a secret to a woman, son," replied Pa.—Cincinnati Enquirer.

A Matter of Hair

Now that the White bill has been passed, a lot of amateurs will have to have their "permanent wave" re-hooked, or they will be completely out of style.

(Continued from preceding page)

were lengthened so that they extended down the sides of the building to a point below the eighteenth floor. The total length of the antenna wires was equal to one half the height of the building. By this arrangement it was hoped that the voltage in the antenna, and in the upper half of the building would oppose and neutralize each other, leaving the lower half of the building free to radiate. This condition, theoretically would be the same as operating from a building one-half as high or one-quarter higher, in which case the height of the free end of the antenna would be one-quarter or three-quarters of a wave length, and the voltage at the free end would be a maximum instead of a minimum. This test, however, did not give the results desired.

"In view of these results it was decided that efforts to operate the broadcasting transmitter from the Municipal Building cease and a new location be chosen for it.

"It has been realized that the radio public has been anxiously awaiting the advent of the Municipal Broadcasting Station, and has been wondering why it has not been placed in operation. It has been necessary to exercise patience in regard to the time required for the tests mentioned and for many reasons. It was desirable, if possible, to operate from the Municipal Building, one reason being that in this case it would not be necessary to erect towers, the central tower of the building being used for the support of the antenna. The information and data obtained from the tests are of much scientific interest and value, there not having been much data obtained previously in regard to the functioning of antennas when erected on the tops of high buildings. In order that this information obtained be of value it was

necessary to make the tests with precision and thoroughness and this, of course, involved time.

"The idea of a city-owned broadcasting station was promulgated on March 17, 1922, when, at a meeting of the Board of Estimate and Apportionment, a resolution was adopted approving the suggestion of Maurice E. Connolly, President of the Borough of Queens, relative to the establishment of a Municipal Broadcasting Station and recommending the appointment of a committee to conduct a thorough investigation.

"To carry out the purpose of this resolution, Mayor Hylan appointed a committee on which the following gentlemen were asked to serve: Rodman Wanamaker, Philip Berolzheimer, Maurice E. Connolly, Lloyd Espenchieff, S. G. Rhodes, Merritt H. Smith, Arthur S. Tuttle, Sanders A. Wertheim and Grover A. Whalen. This committee in its report to the Mayor on May 2, 1922, after having sought the advice of many radio experts and after having gathered considerable data on the subject, stated that it believed it was the duty of the municipality to immediately take steps to erect, under city control, the most modern and best equipped radio broadcasting station in the country, and that the importance of municipal broadcasting was so far-reaching, and its possibilities so limitless, that it felt the city would be derelict in its duty were it not to take the necessary steps at once.

"On June 2, 1922, the Board of Estimate and Apportionment appropriated the sum of \$50,000.00 for the purchase and installation of a complete radio telephone broadcasting station, including antenna structure, power supply and voice amplifying apparatus with loud speaking, receiving and amplifying sets."



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WHEN your boy points to the Magnavox trade mark and says "Dad, that's the real reproducer," he sums up pretty much the whole story of Magnavox supremacy and radio enjoyment.

To enjoy all that radio offers in the way of daily concert, lecture and news, ask your dealer for a receiving set equipped with Magnavox Radio, the Reproducer Supreme

R-2 Magnavox Radio with 18-inch horn: this instrument is intended for those who wish the utmost in amplifying power; for large audiences, dance halls, etc.

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Hoover Loses Test Case

THE District of Columbia Court of Appeals recently overruled Secretary Hoover when he refused to issue a license to broadcast to the Intercity Radio Co., of New York City. The license was withheld, the court was told, because the station interfered with the transmission of government messages from naval and military stations.

Recognizing the fact that interference would be caused, but that this fact was also recognized by Congress, Justice Van Ordsel declared that the law under which all radio licenses are issued embodied provisions for the

minimizing of such interference, and that that was no reason for refusing the license applied for.

The court said in part:

"The only discretionary act is in selecting a wave length within the limitations prescribed in the statute which, in his judgment, will result in the least possible interference. The issuance of a license is not dependent upon the fixing of a wave length. It is merely a restriction entering into the license. The wave length named by the Secretary merely measures the extent of the privileges granted to the licensee."

Heard at the Radio Counter

Episode XIV

"Good morning. Is there anything that I can do for you?"

"Why, yes, I wonder if you could tell me if it is possible for me to purchase a set that does not need an outside wire."

"Certainly. The latest thing in radio sets is a set using a loop, in connection with radio frequency."

"I don't understand anything about that at all. The only thing I know is that my wife wants a set, and the owner of the house refuses to let me put up a wire on the roof. So I thought I would try and get one that didn't need any wire."

"If you will step over here, I will show you several different types that operate on just a small inside loop aerial."

"But I don't want anything that will freeze us all out."

"Freeze you out! I don't understand?"

"Well, don't I have to keep the windows open when I use those things there?"

"Why, of course not. This set will work in a closed vault under the ground."

"Oh, I must be dense, I thought that you had to leave the window open in order to catch the music and talk."

"Absolutely not. Now, here is a nice little set, and it uses only three tubes. Positively the most economical set on the market. Then here is another type that is very popular, but it uses five tubes."

"Well, which is the more efficient? I don't care if it costs a little more. You see, my wife is an invalid, and the best isn't half good enough for her. You just pick out the best one you have in the shop—say, is all that music coming from that little set?"

"Yes, sir. That is, this set over here,

using an extra power amplifier, but that is not necessary, if you want to use it in one room only. In that case, the outfit as you see it is sufficient."

"Well, send it up to my house, and have a man up there tomorrow afternoon, to show us how to work it will you?"

"Most certainly, I will attend to it myself personally. Is this your address?"

"Yes. Will you see that it gets up there soon?"

"Yes, sir. Good day."

Half Million Dollar Order for Westinghouse

BECAUSE of a large increase in traffic, the Long Island Railroad, which handles probably the heaviest suburban traffic in the world, has just purchased from the Westinghouse Electric & Manufacturing Company 40 motor car equipments, 20 trailer car equipments, and four baggage mail car equipments. The baggage cars will be equipped with Westinghouse type 308 D-7 field control motors and Westinghouse electric-pneumatic control. In order to take care of the increase in power demand when this new equipment is put into service, it has been necessary to increase the sub-station capacity of the railroad, and an order has been placed, also with the Westinghouse Company, for one 4000 kw., and one 3000 kw., six phase, 25 cycle, 650 volt, converter with the necessary transformers.

The entire order amounts to over a half a million dollars.

Coming Events

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

FIRST UNIVERSAL EXPOSITION OF INVENTIONS AND PATENTS, Grand Central Palace, New York City, February 17 to 23, inclusive, 1923.

New Radio Firms

(The new firms and corporations mentioned in these columns can be reached directly or by communicating with the attorneys, whose addresses are given when ever possible.)

Eagle Radio Corp., Manhattan, \$5,000; J. J. Reiss, W. C. Johnstone, L. K. Knowlson. (Attorney, J. E. Kinsley, 120 Broadway, N. Y. C.)

Electric Service Engineering Corp., Manhattan, electric supplies, \$50,000; I. Gottlieb, R. B. Davis. (Attorney, J. E. Ankus, 35 Park Row, N. Y. C.)

Newburgh Radio Shop, Newburgh, N. Y., \$10,000; M. M. and J. H. Hinemon, Jr., T. Gray. (Attorney, W. C. Olsen, 30 East 42d St., N. Y. C.)

Nowak Electric Co., Buffalo, general contracting, \$50,000; J. J. Nowak, R. F. Horig, P. Masur. (Attorney, R. W. Werner, Buffalo, N. Y.)

Nelson Electric Corp., Manhattan, \$50,000; J. H. Nelson, W. A. Blue, J. W. Willford. (Attorney, Subway Electric Shop, Richmond Hill, N. Y.)

Radio Stocks

(Quotations as of February 7, 1923, furnished by Frank T. Stanton & Company, 35 Broad Street, New York City, Specialists in Wireless Securities.)

Stock	Bid	Asked
American Marconi Stamped	5c	20c
Am. Marconi Unstamped...	\$5	\$7
American Tel. & Tel.....	122½	122½
Canadian Marconi	2½	3½
De Forest Radio	7	10
Dubelier Condenser	6	6½
English Marconi com.....	11	15
English Marconi pfd.	11½	15½
Federal Tel. Calif.	5½	6
General Electric	187½	188
Mackay Company com.....	105	107
Manhattan Elec. Supply....	54½	55
Marconi Int. Marine.....	8	10
Radio Corporation com.....	3½	3½
Radio Corporation pfd.....	3½	3½
Spanish Marconi	1	3
Western Union	112½	113
Westinghouse E & M.....	62½	63

Western Electric in the East

THE Western Electric Co., whose headquarters were formerly in Chicago, have moved to New York. This change was brought about by the building of a large plant in Kearney, N. J. All department heads, with the exception of C. G. Stoll, will hereafter be located in New York City.

The Recent South Sea Storm

ALL EFFORTS TO REACH SAMOA BY RADIO, after the seismographic observatories throughout the country reported a terrific quake in the Pacific, in the region of the Hawaiian Islands, were in vain for several hours. The later reports showed that the earthquake had caused tidal waves in the vicinity, seriously damaging the station, and communication was not possible until the damage was repaired. The reports from the observatories stated that the records showed that the shocks were the worst in years, and had been recorded all over the western hemisphere.

Answers to Readers

I WOULD like to know how to make a good one tube set. Where can I get a description for making one?—Clifford Vesey, 104 East 16th St., University Place, Neb.

We refer you to RADIO WORLD No. 43, dated Jan. 20, in which you will find an excellent article, with all plans in full working size, and everything minutely described for you, by Ortherus Gordon.

1. What is the best type of receiving apparatus to enable me to receive from 1000 to 1500 miles?

2. Is an inside antenna as efficient as the regular outside antenna?

3. What is the probable cost of such outfits?

4. Where can I get a book, that will explain radio to me?—Thos. Ross, 43 Brooks St., Sanford, Me.

1. We advise either the popular three unit regenerative circuit with one or two steps of audio frequency amplification, or a radio frequency set, with two steps of radio frequency, detector, and one or two steps of audio frequency.

2. If you intend using radio frequency, we advise the inside loop. Otherwise, use the outside antenna.

3. We cannot discuss the various prices of

competitive apparatus through these columns. See advertisements.

4. We refer you to the books sold by The Columbia Print advertised in current issues.

* * *

1. Kindly give me the details of the variocoupler, used by Mr. F. J. Rumsford, in his article on the two tube super-regenerative receiver.

2. As the English Government makes all owners of radio sets submit their diagrams, with details of all the receiving circuits and sets, would it be permissible for me to build this set? I understand that this circuit is an American patent.—C. H. G. Crossman, 17 Hougoumont Ave., Waterloo, Liverpool, England.

1. A suitable coupler for this circuit can be made as follows: On a tube 4 1/4 inches in diameter, and 6 inches long, wind 100 turns of No. 22 SSC wire (single covered silk wire), taking taps off the first 10 turns, and then tapping every 10th turn. Do not shellac the winding. Wind the rotor full of the same size wire. The rotor should be 3 1/2 inches in diameter. No taps are taken off the rotor. This coupler will tune to approximately 1000 meters with an ordinary antenna, with a .001 condenser shunting the primary.

2. We do not believe that there is any infringement on a patent in this case, as you are constructing the set for your own use, but we advise you to take the matter up with an English patent attorney, as the laws vary in different countries.

* * *

1. What are the sizes of the primary, secondary and tickler coils used in the hookups published on page nine of RADIO WORLD dated December 30?

2. Will this circuit bring in signals any louder than the regenerative set using the regular 6-volt tubes?

3. Can all three windings be made on the same tube?—William E. Johnson, Wayne, Neb.

1. The construction and arrangement of the coils used in the hookups you mention were fully described in RADIO WORLD, No. 26, dated September 23.

2. If these circuits are carefully hooked up and the directions followed out, remarkable results can be obtained with them.

3. See explanation of how these coils were constructed in issue of September 23.

* * *

1. How can a test be made to determine if there is a broken wire in a transformer?

2. Is the enclosed diagram of one stage of audio frequency correct? I have connected it as in diagram, but cannot get it to work.—L. C. Cornic, Anthony, Kan.

1. The simplest and best test as to whether there is a break in the wire (open connection) is to test the windings separately with a pair of phones and a battery. If, when the current is made and broken, there is a click in the phones the transformer is O. K. If there is no re-

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D-X-RADIO COMPANY specializes in Radio instruments designed for DX (Distance) Work. To receive distant stations your instrument must be built with proper equipment. And that means the D-X-Radio Company—particularly since we offer highest quality radio parts at lowest prices.

SPECIAL GENUINE FISCHER 180° VARIOCOUPLER



14 TAPS, SEVEN IN UNITS
SOLDERED LEADS READY TO USE
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Outfit includes 1 1/2 Volt Bulb—Pig Tail Variocoupler with 14 taps—4 stops—23 Plate Variable Condenser—2 Knobs and Dials—Rheostat—Socket—Grid-Leak Condenser—Dry Cell—2 1/2 Volt Plate Battery—7 Binding Posts—Also Drilled Panel—Easy to Assemble.

With Extra Sensitive Standard Double Headset... **\$16.70**

\$2.00 Brandes Phones	\$2.00
Fisher Variocoupler	\$1.50
Fisher Variometer	\$1.50
43 Plate Condensers	\$1.55
23 Plate Condensers	\$1.25
W.D. 12 Transformer	\$4.50
1 1/2 Volt French Tube for Dry Cell, Guaranteed to Work.....	\$4.50

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\$12.00 King Apitone Lead	\$4.75 43 Plate Variable Condenser	\$2.75
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7.00 All Wave Coupler, 3000 Motors60 V. T. Sockets.....	.60
5.00 Variometers	1.50 2 1/2 V. Cyclopedia B. Batteries75
1.75 3 Plate Variable Condenser	1.15 2 1/2 V. Cyclopedia B. Batteries	1.15
3.75 23 Plate Variable Condenser	1.75 2 1/2 V. Cyclopedia B. Batteries	1.15

To avoid delays check items and total amount.

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sponse there is a break in the windings. Test both the primary winding and secondary windings separately in this manner, and use a very weak current. A single dry cell or flashlight cell is sufficient.

2. Your diagram is correct. Test the transformer as described. See that your tube is making good connection with the lugs in the socket, and that the positive connection of your B battery goes to the plate.

A GILBERT & SULLIVAN opera, "The Pirates of Penzance," will be broadcast by WGY, the General Electric Company station at Schenectady, N. Y., Tuesday evening, February 20. Practically the same group that sang "The Mikado" and "Pinafore" at WGY will be heard in this production, which is put on as a result of many hundreds of requests for more light operas.

BIG MONEY IN

See Back Cover of Feb. 3rd Issue
RADIO WORLD **RADIO**

CASH WITH ORDER PARCEL POST PREPAID	\$5.00 Detector Tubes Gear.....	\$3.00
0.60 Amplifier Tubes	3.50	
0.50 Guer. 1 1/2 Volt Tubes (detector and amplifier)	4.00	
W. D. 11 Transformer and for all dry cell tubes.....	4.50	
Phones, good quality, 2200 ohms.....	3.75	

Ex-President Wilson Has Badge

EX-PRESIDENT WILSON was the first and probably only honorary Chief Radio Inspector of the United States. Although few fans will recall it, President Wilson was presented with the badge of Chief Radio Inspector by Secretary of Commerce Redfield during the Safety Exposition at the National Museum in 1916. At the opening

of the exposition Secretary Redfield, who was waiting to welcome the President to his exhibits of radio and other safety apparatus, "robbed" the Chief Inspector of his badge, so that he might add to the ceremonies by decorating the President. Somewhere among his possessions, it is understood, Mr. Wilson still cherishes this title.

Siffer Lemoine, Radio Engineer of the Royal Swedish Telegraph Board, is in the United States studying the American radio systems and to confer with Government radio officials.

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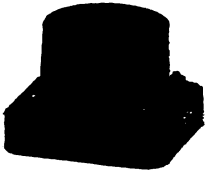
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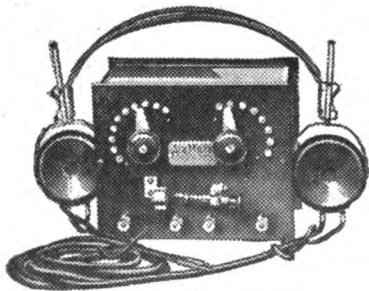
SIMPLEX SPECIALS

Aerola Sr. Receiver.....	\$58.50
Aerola 2-Step Amplifier.....	\$1.20
Baldwin Type "C" Phones.....	10.15
Growl Fixed Detectors.....	1.65
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Broadcast Bill's Radiolays

By William E. Douglass

MY wife has got a habit, Tuesday nights, of "lissnin' in" when they send out their talk on styles. Of course I can't blame Min but last week when the parson came to make his monthly call she had him listen to the talk. It pleased him??? Not at all. The chap who did the speakin' seemed to me to be right clever but Parson Brown wux horrified. You'd never guess why, never. The talk begun by tellin' how the girls should wear their hair an' then he told the ladies too what they had ought to wear. Now while I'd like to tell you more I haven't got the heart so I'll just quote some extracts so you'll get, at least, the part that Parson Brown objected to. Perhaps he's justified but as fer me an' purty gals I'm always on their side. "The skirts this spring are longer without going to excesses;" "Behind Dame Fashion's last decree regardin' length of dresses the ones with skinny props, of course, are glad enough to hide but for the rest, oh well—you know—let conscience be your guide." I tried to calm the parson, but as soon as I'd begin he'd interrupt me sayin' "It's an instrument of Sin." "What's that?" I sez real peevish like, "You let me have my say. If you had one of these here sets you wouldn't talk that way. Last week I heard four sermons each one from a different place. I tell you Radio's a boon fer all the human race." We both got so excited Min thought there would be a fight, but I convinced the Parson, after while, that I wuz right. He's comin' over Sunday after church to "listen in" an' pick up other services as fast as they begin. I told the boys about it when I met 'em at the store. They thought that it wuz funny an' you'd ought to heard 'em roar. Next Tuesday night the boys are comin' over so's to hear some more about the fashions we expect to have this year. An' if they get too noisy 'bout the sights they'll be denied, I'll tell 'em that the rule still holds "Let conscience be your guide."

Copyright, 1922, Westinghouse Electric & Manufacturing Company.

Rado Club Formed at Colby Academy

Colby Academy Radio Club recently organized at New London, N. H., is announced by the school. Officers have been elected from the student body as follows: V. C. Buhler, president; Roy Knight, chief operator; Albert Laidbought, vice-president; Quinlon Dodge, secretary-treasurer. Meetings are held in Colgate Hall Saturday nights at 6:30.

A Record

According to letters just received by mail from three different communities in the Hawaiian Islands, the radio-phone station WHAZ at the Rensselaer Polytechnic Institute in Troy, the largest station in any educational institution, has established a new world's record for long distance broadcasting of concert programs, clear reception of both music and speech having been established at a distance of approximately 5,500 miles.—N. Y. Mail.

Marion Davies Thru the Air

Marion Davies, the motion picture star, gave a talk over the radio a few nights ago on "How to Make Up for the Movies." The star of Cosmopolitan Productions told how to apply powder or grease paint to achieve just the right effect for the camera. The message was picked up all over the country. It was broadcast from station WEAJ, 24 Walker Street, New York.

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By CAPT. V. W. PAGE. This book describes the basic principles of aviation, tells how a balloon or dirigible is made and why it floats in the air. Describes how an airplane flies. It shows in detail the different parts of an airplane, what they are and what they do. Describes all types of airplanes and how they differ in construction; as well as detailing the advantages and disadvantages of different types of aircraft. It includes a complete dictionary of aviation terms and clear drawings of leading airplanes. The reader will find simple instructions for unpacking, setting up and rigging airplanes. A full description of airplane control principles is given and methods of flying are discussed at length.

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**Government Broadcasts
Educational Data Twice
a Week**

To reach the general public, as well as school workers, with educational information and to spread it promptly, cheaply and widely, the United States Bureau of Education sends out messages twice a week from NAA, the naval aircraft station at Radio, near Arlington, Va., on a wave length of 700 meters, says the *New York Times*. The messages are sent on Monday and Thursday evenings from 6:45 to 7 o'clock.

The first of the radio talks was given on Dec. 7, the subject being the economic loss due to illiteracy. Later messages discussed the money value of education, visual aids to education, the necessity of education in a democracy, the work of the Bureau of Education in Alaska and the shortage of school buildings.

"The Bureau of Education has started this service because it is the duty of the bureau to reach not only technical experts but also the general public," says the announcement of the innovation, "and it is the opinion of Dr. John J. Tigert, United States Commissioner of Education, that the public can be reached more quickly and directly by radio than in any other way.

"Radio has the advantage of intimate contact between speaker and audience, and since the bureau's messages will be sent on a regular schedule, they will have the continuity necessary for informing the public on educational matters. Since public education cannot progress any faster than the state of public opinion about education, the Commissioner believes that the inauguration of the radio is an important step in advance. Newspapers in California and Washington have requested permission to broadcast the bureau's messages to the Pacific Coast States, since the Anacostia radio reaches only to the Mississippi River.

"Such subjects as the combating of illiteracy, the consolidation of rural schools, health work in the schools and Americanization will probably be taken up in future message. Those hearing the talks are urged to write to the Commissioner of Education and to comment on the material presented and upon its form. Tell him whether you derived any benefit."

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CARRYING on educational propaganda among people who are working all day long and cannot attend university classes, is one of the great uses of radio, according to Prof. Michael I. Pupin in New York "Evening Post." Think of the potential audience within listening distance of Columbia University by radio. There are 8,000,000 people within a radius of fifty miles. You can reach them by radio with the simplest and most direct medium of communication, the spoken, the living word!

Think of what it would have meant to St. Paul if he had had such a medium of communication. Then, while he traveled from Jerusalem to Cyprus, Caesarea, Corinth, Ephesus, Philippi, Thessalonica, Athens, and Rome, he could have sent the words of his mouth to all the churches every day. Those marvelous epistles would have been given a most powerful reinforcement.

We need St. Pauls in our universities today—men who will rise up and preach the doctrine of truth and democracy. People who work all day, people who will not leave their homes to attend a lecture course, people who tire of reading the dry printed word, will listen if all they have to do is to use a radio. There are millions of people who are thirsty for knowledge whom we could not reach by the old methods.

The singing of carols in the U. S. was distinctly heard by an Aberystwyth wireless amateur. Nevertheless, nothing daunted, he proposes to continue with his hobby.—London Opinion.

Pictures and intimate gossip of some of the entertainers you hear via radio.

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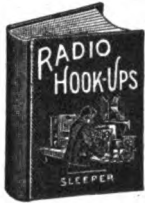
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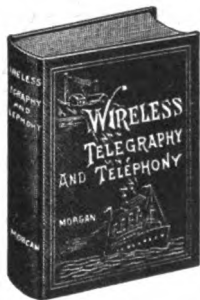
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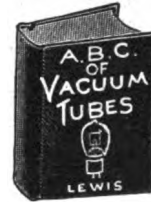
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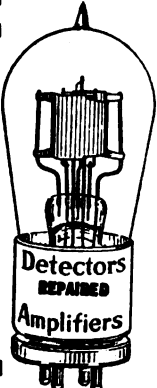
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Banneker Radio Club of Maryland a New One
 535 Presstman Street, Baltimore, Md.
 January 28, 1923.

Dear Sirs:
 I am forwarding you the names of our present officers.
 Roland Carrington, president; Clarence Fax, vice-president; Tecumseh Woodland, secretary; Ralph Reckling, treasurer; John Hebron, chairman of executive committee.

Yours truly,
R. CARRINGTON,
 President.

Manager Keeps Track of Theatre While on Ocean

WHILE S. L. Rothafel, manager of the big Capitol Theatre, New York City, was on the high seas last week, bound for England, he was able to keep in touch with the program at the Capitol Theatre by means of the radio which was installed in his stateroom on board the *Berengaria*. A wireless report from the liner reports that he is receiving the music which is being broadcast direct from the theatre through the American Telephone and Telegraph station, WEAf.

Why Not Try It?

Editor, RADIO WORLD:

If somebody wants to try something that will make him so excited he can't sleep nights, let him try the hook-up described in RADIO WORLD, page 19 of the issue of December 23, and make the following changes.

Put in a grid leak of about 1 megohm and a condenser of .0005 mf. Then take the phone condenser out and throw it away. Put in a WD-11 tube and a pair of Brandes 2000 ohm phones. Then take the old storage battery and give it to somebody, because you won't need it any more as long as you live. Hook up a dry cell in its place and that's all. Then sit down and turn the rheostat about half way on, twist the variable condenser dial around until you hear something that sounds like the stock yards, adjust the tickler and the rheostat, and oh, boy! Another bug added to the list!—A READER.

Cannot Make It Too Strong

THE minister of our church gave us a little talk the other evening at the meeting of the Ladies' Society, on the way in which radio has helped the human race in general. After the meeting our pastor appealed to me, asking me if he had made his point strong enough or if I thought it was too strong. I thought it was just wonderful, as did all the others. You simply cannot make anything that relates to radio too strong.

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 Complete with 3000 Ohm
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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

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VARIOMETERS, \$1.50 each. These are regular 4 1/2-inch square variometers. Couplers, \$1.00 each. Both usually sell at three times the price. THE RADIO SHOP, 261 East Broadway, Milford, Conn.

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EXCHANGE LETTERS with friends everywhere. Pleasant pastime. Information for stamp. Smith, Box 3123, M. Portland, Ore.

AMATEURS—LOOK! Send in 15 cents to RADIO WORLD for issue of January 20 containing panel layout, hookup and full explanatory data on the construction of a D-X receiver, which simply lays the long distance on your table. Or start your sub. with that issue. RADIO WORLD, 1493 Broadway, New York City.

MODEL MAKING—By Raymond Francis Yates. A new book for the mechanic and model maker. This is the first book of its kind to be published in this country, and all those interested in model engineering should have a copy. The first eight chapters are devoted to such subjects as Silver Soldering, Heat Treatment of Steel, Lathe Work, Pattern Making, Grinding, etc. The remaining twenty-four chapters describe the construction of various models such as rapid fire naval guns, speed boats, model steam engines, turbines, etc. 400 pages. 301 illustrations. Price, \$3.00. The Columbia Print, 1493 Broadway, New York City.

STANDARD ELECTRICAL DICTIONARY—By Prof. T. O'Connor Sloane. Just issued an entirely new edition brought up to date and greatly enlarged—as a reference book this work is beyond comparison, as it contains over 700 pages, nearly 500 illustrations, and definitions of about 6,000 distinct words, terms and phrases. The definitions are terse and concise and include every term used in electrical science. 767 pages, 477 illustrations. (See page 18 for fuller description.) Price, \$5.00. The Columbia Print, 1493 Broadway, New York City.

PATENTS—Inventors should write for Free Guide Books and Record of Invention Blank before disclosing invention. Send model or sketch of your invention for our Free opinion of its patentable nature. Radio, Electrical, Chemical, Mechanical and Trade-Mark experts. VICTOR J. EVANS & CO., 924 Ninth, Washington, D. C.

OLD MONEY WANTED—\$2.00 to \$200.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. Clarke Coin Company, Ave. 83, La Bqy, N. Y.

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HAVE YOU SEEN IT? My unusual fully illustrated radio catalog is complete. Only a dime. N. E. Ristey, Spring Grove, Minnesota.

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(Patent Applied For)

Eliminates body capacity when tuning in. With Tuning Rod in your hand you can stop unnecessary noises and shrieking. Every radio fan should have Radio Tuning Rod. Send 35 cents stamps or money order. Radiophona Co., 505 Fifth Avenue, New York City.

EXCHANGE JOLLY, INTERESTING LETTERS through our club. Stamp appreciated. Betty Lee, Inc., 4254 Broadway, New York City.

CASH FOR OLD GOLD. Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magnets Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 337 Hippodrome Bldg., Cleveland, Ohio.

ATTENTION, Amateurs! Have you seen the RADIO WORLD'S page of hook-ups in the Oct. 21 issue? 15c a copy or start your subscription with that Number. Many people are writing in for the hook-ups listed here. RADIO WORLD, 1493 Broadway, New York City

MILLION POINT TESTED CRYSTALS—Mounted in Woods Metal. These Adbrin Crystals are tested and are guaranteed or money refunded. With so many sensitive points, it is impossible to miss contact. Stop wasting time and send us 30c for one Adbrin Crystal or send \$1.50 for six, mailed prepaid. Also write us for information as we have other styles, including our new type combination twin Galena and Raricite. Diolite Radio Panel Boards, insulated, rubber base, cut, bored and drilled with ordinary tools without spoilage. Sizes can be furnished cut to your requirements up to 2x2 1/2x1/16. Write to us for prices or ask your dealer. DIOLITE INSULATOR CORPORATION, 287 New York Avenue, Brooklyn, New York.

A COURSE IN MECHANICAL DRAWING—By Louis Rouillon. The author has written a most practical book on the subject of Mechanical Drafting. It fully explains the art of Drawing, Lettering and Dimensioning. It is, by far, the most practical book ever published on this subject, for use in day and evening schools, and more especially adapted for the teacher and for self instruction. Fifteenth edition, revised and enlarged. Fully illustrated. Oblong. COLUMBIA PRINT, 1493 Broadway, N. Y. C. Price, \$1.50.

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BROADCASTING MAP

of the United States appeared in RADIO WORLD No. 8. Sent on receipt of 15c, coin or stamps; or start your subscription from that number (\$6.00 for 52 issues).

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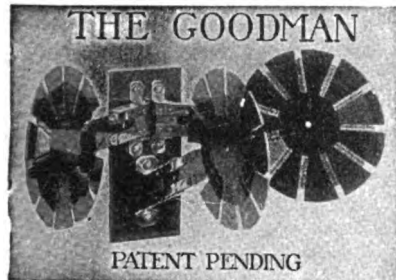
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Eliminates all detector troubles. Extraordinary clearness and volume. Endorsed by radio experts and press. Sold in sealed packages only. Join the ever-increasing Rusonite fans.

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The Niftiest Short Wave Tuner on the Market
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Doctor _____, Norristown, Pa., writes: Listening in recently with my GOODMAN, heard a voice. "We are now 90 miles out from San Francisco." Then DENVER came in and sank the ship.

It's the contact that counts

The special phosphor bronze clips of the Na-ald W. D. 11 Socket maintain perfect contact regardless of any variation in tube prongs and bases.

Moulded from genuine Condensite, these sockets are made for use with the famous W. D. 11 tubes, operated by a single cell battery.

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RADIO WORLD

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PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
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TECHNICAL EDITOR
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If Your Regenerative Receiver Won't Oscillate

Under the heading "Not in the Text Books," a writer in the New York "Mail" gives the following "tips":

"If your regenerative receiver doesn't oscillate there are several possibilities to investigate. The grid leak should be varied either by the insertion of tubular leaks of various resistances or by the addition or erasure of pencil lines between the grid condenser terminals. The phones or the first amplifying transformer primary should be shunted by a fixed condenser of about .001 mfd. capacity. Tickler leads should be reversed. Also the "A" battery leads should be changed around, as detector tubes sometimes are improved in their operation in this way.

"A leaky socket is a very common cause of this trouble, too. A socket having a few thousand ohms resistance between terminals will prevent a circuit from oscillating. High resistance joints in the circuits through which sufficient current might pass to give fairly good signals will sometimes prevent regeneration. Hence all pressure contacts should be thoroughly cleaned with sandpaper and all other joints soldered."

President Tries It Out

President Harding is said to have tried out his radio set for the first time during his recent illness, without satisfactory results. He succeeded in getting a local station and one in Newark at the same time, but, being unable to disentangle what sounded like a conference report, he gave up.

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High dielectric resistance.
 6"x24" \$1.00
 8"x24" 1.50
 12"x24" 1.75

Manufacturers' special sizes solicited.
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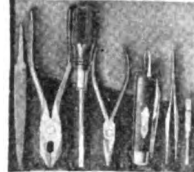
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Cut exactly to size and shipped within 12 hours.
 1/4 inch thick, 1 3/8 per square inch, 3/10 inch, 1 1/4 per square inch. Made of the highest grade black fibre. This material possesses high dielectric strength, is inexpensive, unbreakable, easy to work and takes a nice finish. Special offer, 6x24", 50c; 6x12", \$1.00. Postage paid.

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Side Cutting Pliers
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 Two Screw Drivers
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 Tweezers

\$4.00 in Bag

With Soldering Iron Kit, \$4.75
 With Automatic Torch, \$5.00
 Send Money Order

CEB CO., 100 Park Place, New York City



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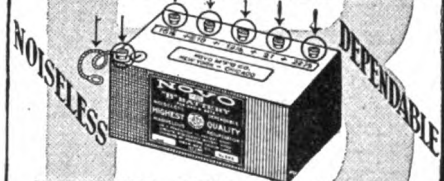
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bring in DX



The invention of this non-magnetic shield cuts out electro-static effects between vacuum tubes, overcomes interstage coupling, which causes distortion and unnecessary noises which make it difficult to tune in distant stations — also guards tubes against breakage. Your tubes should have them.

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Patent Pending

ORANGE RESEARCH LAB.

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Difficult for Ordinary Set to Tune in NAA

THE opening of the powerful Arlington station as a broadcasting station should be of considerably more than passing interest to the millions of radio fans, says the *New York Globe*. No broadcasting organization has the facilities or the staff to compete with the government in the operation of a first class station. Whether the results will be on a par with the possibilities will soon be known.

But the opening of this station is at the same time a disappointment to many thousands whose sets will be incapable of reaching up to the wave length of 710 meters on which Arlington transmits. Many sets whose makers or sellers optimistically credited them with an upper wave length limit of 800 meters will just about tune in NAA, but the short wave sets using variometer tuning in the plate circuit are quite certain to be far below the range.

To load up a three circuit regenerative set is a task requiring patience and above all

else a spirit of research. The primary of the average set is well able to reach 710 meters, but the secondary and tickler circuits must be loaded with additional inductances. Compact coils of the honeycomb or duolaterals type are probably best suited for this purpose.

For the average fan to load a circuit means a makeshift set. If the owner of an outfit wishes to tune effectually to 710 meters a triple coil mounting using compact coils is the best arrangement. The usual variocoupler and variometers are then disconnected and the three coils employed as primary, tickler, and secondary, respectively.

Limitless Possibilities

IT APPEARS not to have been understood by all who have written about this new achievement of General Squier's, that the wire cable is used only to direct the "broadcast" message, as a telephone wire directs ordinary line-radio conversation, says Dr. Henry Smith Williams in his new book, "Practical Radio." The electric-light wire is not functioning as an aerial. It does not catch up signals from the ether, but only conveys messages—lectures, music, or what not—sent directly from a transmitter in the power-house, the transmitting apparatus being connected to a socket, just as is the receiving apparatus at the other end of the line.

It would appear that such use of an electric-light system offers at least one solution of the broadcasting problem. To illustrate: In most village communities, the electric light goes everywhere. Concerts and other entertainments could, of course, be heard by line radio wherever the electric-light system is installed. Half a dozen different programs could be sent at the same time along the wire, by using different frequencies. It would thus be possible for each household to select the particular entertainment that it wished to hear.

It would be possible, apparently, to have different entertainments in various rooms of the same house. Father could listen to the sporting news in his study; mother to a concert in the sitting-room; and the children to some juvenile entertainment in the playroom. Meantime, people whose houses are not supplied with electric lights might gather in various public halls, say school-rooms and churches, to listen to entertainments of various types. The possibilities of the method seem limitless.



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Radio Frequency Transformers

Brings in distant stations on a loop—perfect reproduction. No distortion.

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WALCON Transformers are tested and guaranteed. Particularly adapted for use with W.D.11 tubes.

Four new hook-ups, including a new reflex circuit furnished without charge with each transformer.

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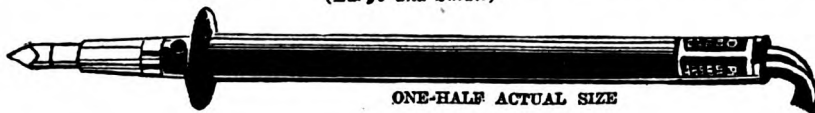
THE RADIO CENTRE, 2 W. Broadway, N.Y., N.Y.

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ONE-HALF ACTUAL SIZE

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NEEDED BY ALL AMATEURS

5 RADIO-WIRE TABLES, BY FREDERICK J. RUMFORD, E.E., R.E.

These tables, showing the number of feet in a pound and fractions of a pound, were published in **RADIO WORLD** as follows: No. 1—Enamelled Magnet Wire, **RADIO WORLD**, No. 24, dated Nov. 18. No. 2—Single Cotton-Covered Wire, **RADIO WORLD**, No. 35, dated Nov. 25. No. 3—Double Cotton-Covered Wire, **RADIO WORLD**, No. 36, dated Dec. 2. No. 4—Single Silk-Covered Wire, **RADIO WORLD**, No. 38, dated Dec. 16. No. 5—Double Silk-Covered Wire, **RADIO WORLD**, No. 40, dated Dec. 30. Sent to any address postpaid at 15 cents a copy, or the complete set of 5 copies for 75 cents. Or start your subscription with any number. Order now. Every amateur builder should have these tables constantly at hand. The supply of back numbers is limited.

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The College on the Hearth

"The National Radio Chamber of Commerce is developing a scheme to establish radio extension courses in American colleges and universities."—News note.

I've taken half a year of Greek,
And studied that exacting
Profession, 'til I've learned to speak
Quite casually of acting.

And, all the time, I've never had
To go to school for knowledge;
By radio I am a grad—

Uate of Broadcast College.
BEAU BROADWAY—
in New York "Telegraph"

A Matter of Cost

The reason that the super-heterodyne, sometimes called "The Rolls-Royce of Radio," is not more popular is the same as for its big brother—"The upkeep is too high."

Broadcasting map, 15c. That is, a complete broadcasting map appeared in **RADIO WORLD**, No. 8, dated May 20. Mailed on receipt of 15c. **Radio World** Company, 1493 Broadway, N. Y. C.

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Special 10¢ Tins

**Has a
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that
men like!**



For smacking flavor, delicacy of aroma and a cheerful invigorating influence, drink the best tea - Ridgways Tea.

Also sold in 1 lb., 1/2 lb. and 1/4 lb. TINS

A Generous Sample will be sent on request. Address: Ridgways, Inc.,
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GOLD MEDAL San Francisco 1915



GRAND PRIZE San Diego 1916

R. U. INTERESTED IN RADIO?

Radio is one year old now! What are its possibilities in another year? Over 1,500,000 Radio Receiving Sets are in daily use. Estimated daily radio audience is 10,000,000. What will the radio audience be, 5, 10, 20 years from to-day?

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\$250.00 Radio Set Free
Six Tube Radio-Audio Frequency Set

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Four Tube Set, Detector and 3 stages Amplification

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\$100.00 Radio Set Free
Three Tube Set, Detector and 2 stages Amplification

To advertise our business we will give the above prizes to the three persons sending us a list of five or more names of Radio fans and who compose the best slogan or phrase of words we can use for our advertising matter. We are interested in sending our catalogue and price lists to Radio fans.

If you are interested in Radio and in its future possibilities don't overlook this opportunity to get acquainted with us, secure low prices on your purchases and an opportunity to win one of the above prizes free of charge.

In the event of two or more persons submitting the slogan judged the best, second best, or third best, each will receive the full amount of the prize tied for. All entries must be received by us not later than March 31, 1923.

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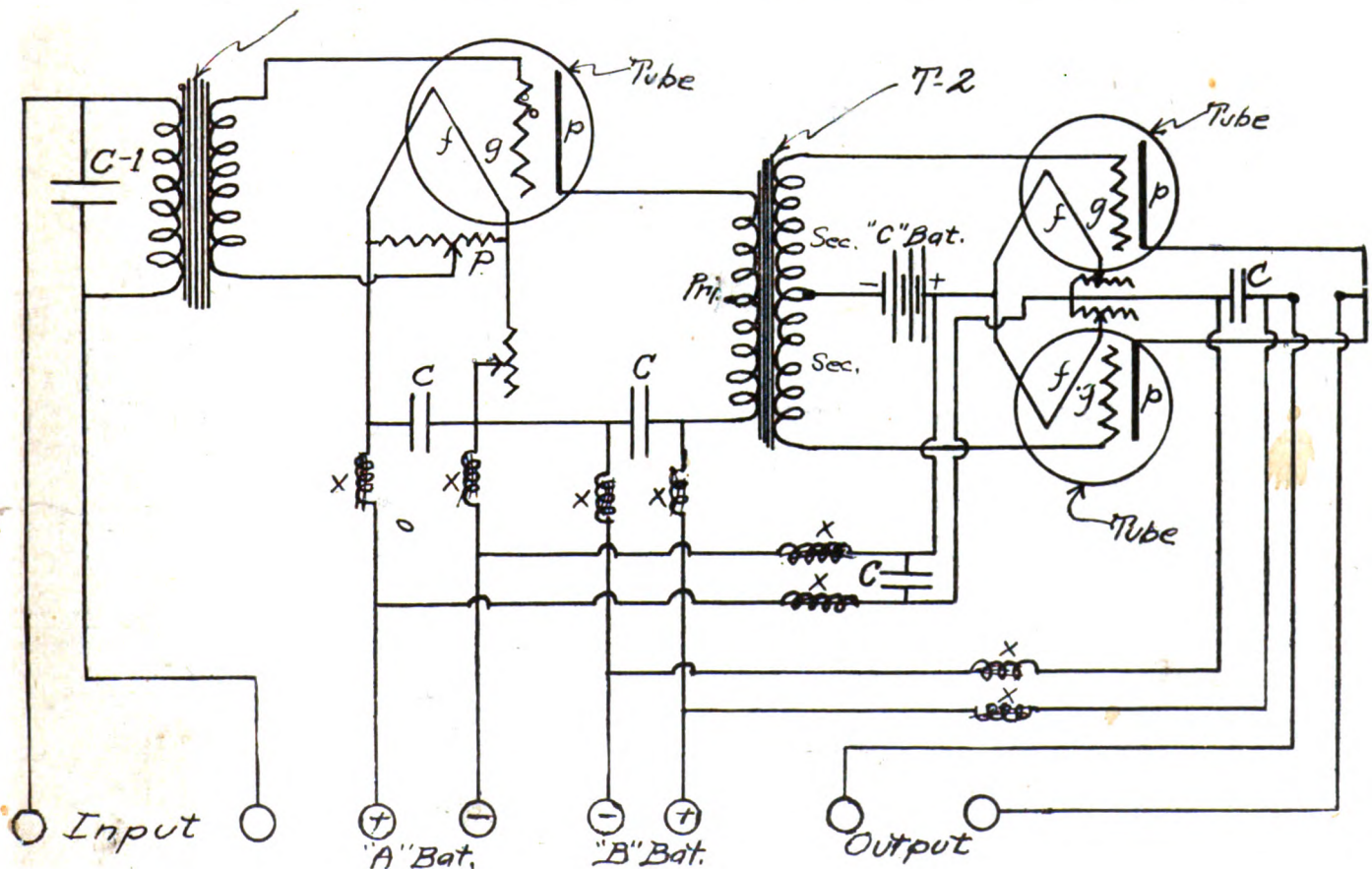
WORLD

ILLUSTRATED

WEEKLY

Hook-up for Building a Power Amplifier

See Article Inside by C. White, Consulting Engineer



This diagram shows in a clear and concise manner how any one can build his own power amplifier. The principle of a power amplifier is that the last two tubes, being hooked in parallel, can deliver more plate current and in a much smoother manner than several stages of regular audio frequency. The transformer is of necessity of the split secondary type, of which a full description is given in an inside article on the subject by C. White, Consulting Engineer. The tubes used in this amplifier must of necessity be hard tubes, preferably of the power type, because of the fact that the transfer of energy is so great that were an ordinary tube used the tube would break down. The various choke coils used in the circuit are necessary to prevent any "backing-up" of the current from the second tube.

Rexite Synthetic Crystals

Sensitive over the entire surface.
Price, including special catwhisker, 50c.
Dealers—Write for unusual proposition.

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237 Centre Street New York

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High dielectric resistance.
6"x24" \$1.00
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12"x24" 1.75
Manufacturers' special sizes solicited.
Agents wanted.
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\$5.00 Detector Tubes, guar. \$2.75	\$4.75 43 Plate Variable Condenser \$2.75	CASH WITH ORDER PARCEL POST PREPAID
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	To avoid delays check items and total amount	1.75 3 Plate Variable Condenser 1.25
		3.75 23 Plate Variable Condenser 1.40

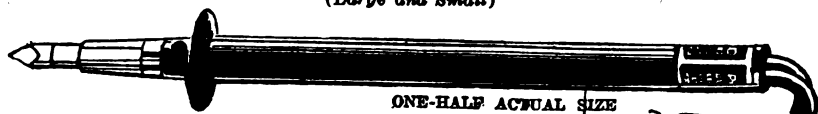
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ONE-HALF ACTUAL SIZE

\$6.00

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VOLUME TWO OF
RADIO WORLD

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February 24, 1923

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Minneapolis Man Perfects "Flivver" Radio Set Capable of Receiving Long Distances

By *Louis S. Fielder*

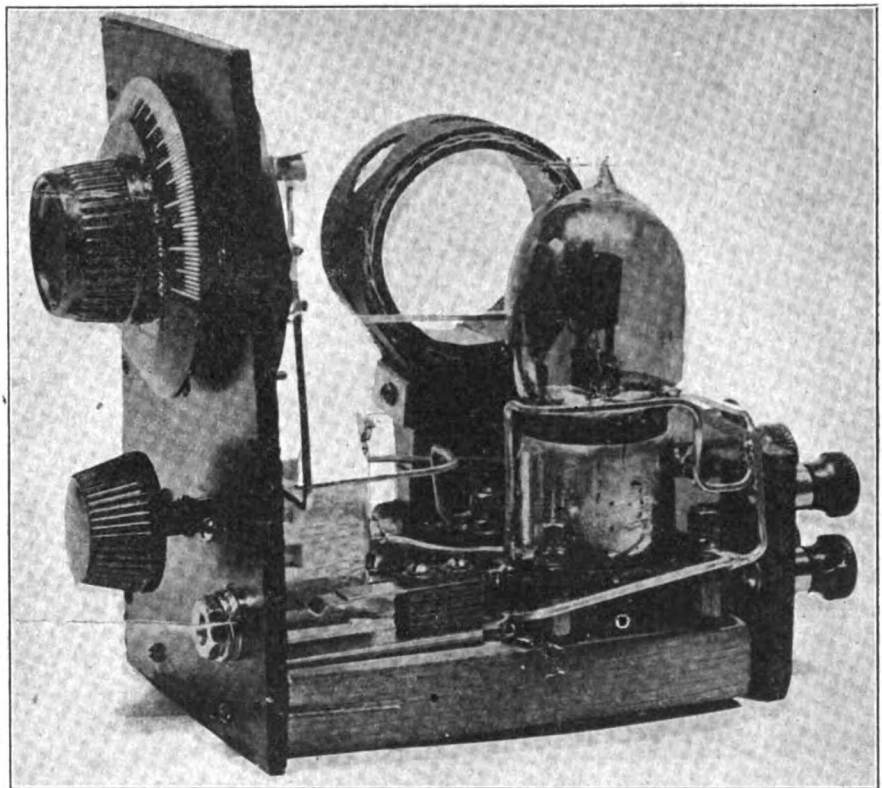
THE trend of radio construction nowadays is toward the extremely compact and practical. This is demonstrated by the almost unlimited number now making their appearance.

W. E. Foster, of 2308 Bryant Ave., Minneapolis, Minn., came forward



(C. International Newsreel)

Mr. Foster, completing the connections on his extremely simple and powerful little receiving set. The complete set, not counting the batteries, can easily be carried in his hand. This is said to be the smallest practical working, long-range tube set in the country, and has established a number of long distance receiving records.



(C. International Newsreel)

Exceedingly simple radio receiving set designed by a Minneapolis man. It utilizes a single circuit, and there is only one control, the condenser, and that used is of the type calling for one plate, with mercury as a second. It is possible to install this type of condenser in a very small space.

recently with an instrument constructed by himself that is a most complete receiver. The whole instrument, as can be seen by the illustrations, occupies little more space than is usually occupied by a socket and rheostat when mounted as a regular detector unit. The set consists of a single honeycomb with mounting, a rheostat, vacuum tube, variable condenser and grid leak. The size of the complete outfit can be computed by comparing the instrument itself with the hand of Mr. Foster in the photograph on

the lower left hand corner of this page. On a test it has been found to be an extremely sensitive and remarkably long distance receiver, and the fact that it has only one control tends to make it one of the simplest of its kind. How long before single control receivers will be the ones mostly used is merely a question of time, as the general plan at present seems to be to simplify everything, cutting out unnecessary adjustments and everything that is not absolutely necessary to the efficient working of the apparatus.

paralyze a tube so far as a radio frequency wave is concerned. That is, the change of potential of the grid would be so great, due to the heavy currents, a very weak radio frequency wave would be lost and have no appreciable effect.

Crystal Detector Advantageous

In experimenting the author has found that the use of a crystal detector is advantageous in many ways. The detector tube is noisy compared with the way a crystal rectifies. Those small parasitic noises when magnified by two stages of audio frequency amplification sound very loud indeed and hence the crystal is a noise eliminator. Another point in its favor is its cost and the fact that it is a distortionless detector. The threshold value of the crystal is higher than that of the tube, but the gain offsets the loss in signal strength. The use of the crystal for a detector also does away with the critical adjustment of the filament rheostat that is necessary when using the soft detector tube. This amounts to eliminating one very critical adjustment with is recommended, for the multi-control set is not a popular one.

The author advises the use of a loop to pick up energy if more than one tube is used. The inherent noises in the air, so called atmospheric or static, will be greatly lessened if a loop or coil antennae is used. The range using a loop is less than outdoor antennae but the directional properties of the loop cuts out interference and hence is to be recommended. At best a reflex circuit is not as sharp in its tuning qualities as the tuned plate circuit regenerative sets; but by the use of a loop and good tuning arrangement this disadvantage is overcome.

Until the operator becomes familiar with the peculiarities of tuning the reflex circuit the author recommends hooking up one tube set using a crystal or a two tube set using a tube detector. The author has given the constants that have given the best results, but conditions may alter them so a little experimenting would be well worth the time if only to get acquainted with the circuit. In radio frequency amplification the tubes function to their best advantage when the grid has a normal negative potential so potentiometers have been incorporated in all circuits in order to keep the grid at the proper operating potential. The potentiometer also acts as a stabilizer, for the tubes are very apt to start oscillating. An added refinement that has not been shown in all hook-ups, is the use of a high variable resistance in the plate circuits of the amplifying tubes. This weakens the strength of the signals to a slight extent but it serves as a check to prevent the tubes from oscillating, helping to overcome one of the bugbears for the novice. The tubes must not be allowed to oscillate, for oscillations will seriously interfere with the proper working of the set. A resistance, variable between 500 and 2,000 ohms, should be used, but a little experience in tuning will enable the operator to get the circuit to function without the use of these resistances.

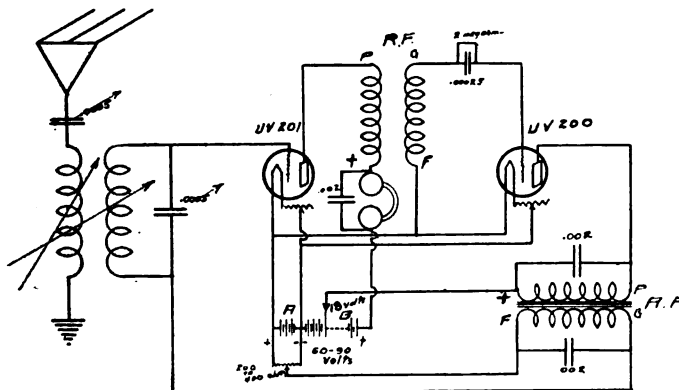


Fig. 2. Diagrammatic hookup of a reflex circuit, using a tube as the detector. This circuit is very selective, and by the use of proper apparatus and careful adherence to the method of hooking up the instruments wonderful results can be obtained.

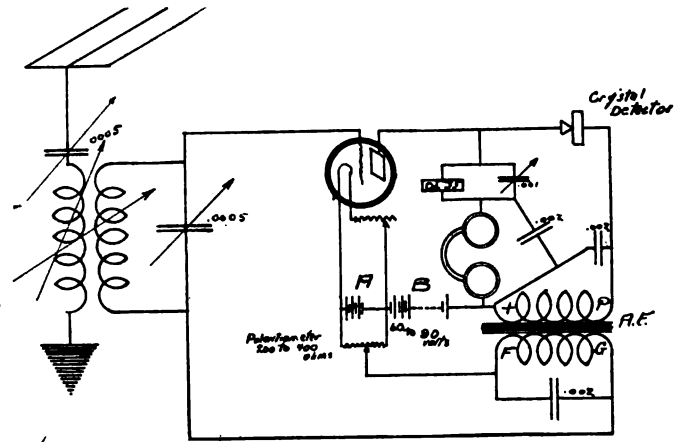


Fig. 3. Diagram of reflex circuit, using a crystal detector for the rectification of the currents. This circuit is harder to handle on account of the condenser shunted across the honeycomb, which is used as a radio frequency transformer. This circuit can be operated on a loop by shunting the loop across the secondary condenser and discarding the tuning inductance.

Local Conditions in Tuning

As to the range of these sets there can be nothing definite stated because local conditions and skill in tuning will govern the distance covered. From Eastern Pennsylvania the author has heard all the middle west stations better than with the popular one tube sets now in use, making use of a one tube set with crystal detector. The signal strength was not loud enough to operate a loud speaker but they came in clear, distortionless and free from noises. As for other sets using three tubes the range will depend upon tuning ability of the operator, atmospheric conditions, use of loop or outdoor antennae and apparatus used, but truly remarkable results have been obtained using a loud speaker, although an external power amplifier is recommended if sufficient volume to fill a hall or auditorium is desired.

Circuit No. 1

This is the circuit recommended for the person unacquainted with the operation of reflex sets. The tuning is done with primary inductance and condenser and with the secondary condenser, which should have a vernier attachment. A vernier secondary condenser in all the circuits given will help in avoiding inter-station interference, with the use of variable coupling between primary and secondary. By using the values given for the by-pass condensers satisfactory results can be expected. The use of the plate resistance is recommended but not necessary. An amplifier or hard tube must be used and the voltages on the plate will depend upon the apparatus used. The regular amplifier tubes U. V. 201, U. V. 201A, etc., will stand 100 volts, but some audio frequency transformers will break down under this voltage, so 60 to 90 volts is recommended.

The path of the signal will be traced for this simple circuit and will be sufficient to give user an idea of the practical application of the reflex circuit. The antennae picks up the radio signal and the secondary circuit has a wave induced in it. This induced wave causes a change of potential of the grid and the plate current is varied accordingly. The by-pass condenser around the receivers allows these high frequency variations to take place and as they are above audibility they do not affect the phone. The crystal circuit gets this amplified energy through the radio frequency transformer and rectifies the waves. The by-pass condenser around the primary of the audi frequency transformer allows radio frequency waves to be set up in this circuit. In the secondary of the audio frequency transformer there are induced electrical waves of audio frequency which are impressed upon the grid of the amplifier tube, which in turn controls the plate cur-

(Continued on next page)

Micro-Variometer for Sharp Tuning

By J. E. Anderson

ALL radio fans who have worked with a highly selective receiving set know the difficulty of tuning in for greatest signal strength and of retaining it when once obtained. They find that the whole signal response from a particular broadcasting station lies within a single division of the tuning condenser, and that the slightest movement of the dial to either side will completely obliterate the sound.

All this is especially true of a regenerative receiver in connection with long distance work, and is a source of great annoyance when proper shielding and grounding have been neglected. The trouble is greater the smaller the effective capacity in the tuned circuit, and may partially be remedied by decreasing the size of the inductance coil and increasing the condenser value. However, this increases the selectivity and decreases the loudness of signals, and the advantage is more theoretical than apparent.

The practical solution will be found in some means of varying the natural wave-length of the tuned circuit very slowly. This is usually done either by means of a slow

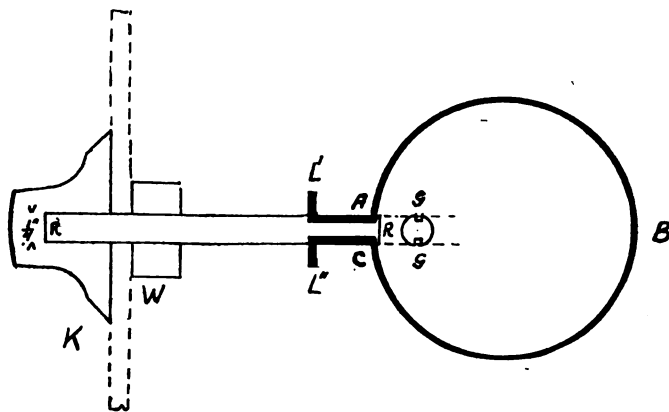
motion attachment to the rotor of the condenser, or by means of a vernier condenser in parallel with the main tuning condenser. But the same result may be accomplished much more neatly with inductance variation at a cost that is negligible. I will describe here a little device that may be called the micro-variometer, with which final and exact tuning may be done no matter how selective the circuit may be.

Referring to the diagram: R, R is a wooden dowel or fibre rod $\frac{1}{4}$ -inch diameter of suitable length. "L" "ABCY" is a piece of heavy wire, or preferably $\frac{1}{16}$ -inch square copper rod, bent into the shape indicated. Near one end of the wooden rod, and on opposite sides, two grooves, (GG) are cut to admit the wire. When the loop has been put in place it is securely tied to the wooden dowel with okonite tape or some other insulating binder. The ends L', L', of the wire are bent up at right angles to the rod to facilitate soldering the connection leads to the loop. A wooden spacer W is attached to the rod either by means of a small brass pin or by a set screw. This is used to secure proper spacing between the panel and the tuning coil with which it is to be in mutual relationship. A small knob, K, may be used for turning the loop.

In case a wooden dowel is used it should be thoroughly soaked in melted paraffine before use in order to prevent leakage. This loop is then connected in series with the main tuning coil in the selective circuit and so placed with respect to it that there will be mutual inductance between them.

If a tuning condenser is used to secure approximate resonance, the loop of the micro-variometer may be of such size and so placed that its entire variation of 180 degrees will represent a variation of 1 degree on that condenser. A finer variation will hardly be necessary. If desired to have the micro-variometer cover a broader range, this may be done by increasing the diameter of the loop, increasing the number of turns, or increasing the coupling between the loop and the main inductance coil.

A device such as has been described here may be used to advantage to obtain final tuning of a tapped inductance coil instead of using single turn tapping at one end of the coil. It is much simpler to construct, and the inductance variation will be continuous. It would be better than an ordinary variometer because its time constant will be higher for low values of inductance and the distributed capacity will be lower for high values of the variometer. It is connected in the ordinary variometer circuit.



Constructional details of the micro-variometer as explained in accompanying text.

(Continued from preceding page)

rent which actuates the phones, as these second variations in the plate circuit are of an audible frequency and since the by-pass condenser forces them through the phone.

The tuning is started by putting the grid negative with potentiometer cutting out resistance in the plate circuit and adjusting other controls until a beat note is heard. This should be made as loud as possible and then oscillations are stopped by using potentiometer and plate resistance. A readjustment of the secondary condenser with adjustments of potentiometer will bring in the loudest signals. These rules apply for the tuning of all the reflex sets except those using a tuned impedance coupling between radio frequency amplifying tubes.

Circuit No. 2

This hook-up differs only in using a tube as a detector. The plate voltage depending upon whether a hard or soft tube is used, but a soft tube with a vernier rheostat is recommended. The values for the grid leak and the grid condenser are dependent upon the characteristics of the tube used, but values given have been found satisfactory for most of the soft tubes, as specified in drawing. A

loop or coil antennae may be used in either hook-up, replacing coupler by loop of about ten turns on a three foot square using same value of secondary condenser. No panel layouts can be given for the author used phase mounting which is to be recommended for experimenting and the readers are advised to experiment to learn the peculiarities of the reflex circuit before mounting in a cabinet, for it will save trouble.

Circuit No. 3

For a set which is very selective and gives very sharp tuning circuit 3 is recommended, for the tuned impedance coupling between tube and crystal can be used to separate interfering stations. The tuning is the same as given above except that the additional condenser shunted around honeycomb coil must be adjusted for a maximum signal strength, and as the addition of this variable condenser complicates the tuning it would be well for the amateur to try out one of the preceding circuits first. By experimenting with different values for the condenser and honeycomb coil a smaller value for the condenser and a larger value for the coil may be used, allowing more critical tuning for this unit.

That Flewelling Super Circuit

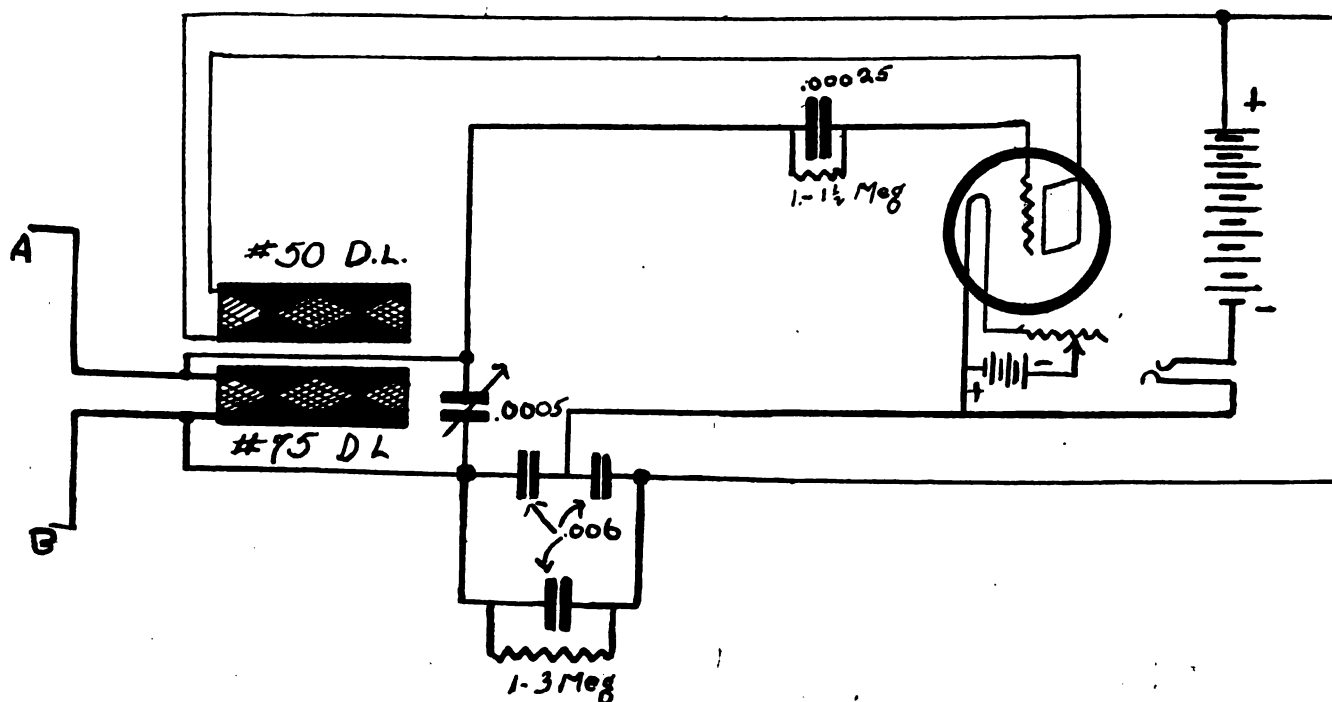
By Robert L. Dougherty

A CIRCUIT that has recently become popular and rightly so, is the now famous Flewelling Circuit. From the amateur's standpoint it is the most practical circuit of the "super" type that has yet been developed. Because of the fact that it can be used with aerial alone, aerial and ground, or ground alone, one side of a loop, or both sides of the loop, it gives the utmost flexibility. Combine these advantages with the fact that it is a most practical and easily-worked circuit (only two controls being necessary), and you have a few of the many reasons for its fast-growing popularity.

Because of the fact that large values of inductance are not necessary with this circuit it is probably the easiest and the most stable of all the circuits that use the principle of "super-regeneration." The tuning is all done by means of

If in the construction of this circuit it is desired to use the conventional variocoupler, the rotor should be rewound, to approximately two-thirds the inductance value of the stator, or primary winding. While this is permissible, it is easier to use the well-known duo-lateral or honeycomb coils with the adapter. By doing so, not only is the builder saved the trouble of rewinding the coupler, but as the circuit has been worked out using the values of inductance that are found in the number 50 and 75 coils, there will probably be less chance of trouble originating through this source.

By the use of a small loop antenna, in connection with this circuit without any outside amplifiers, extremely loud and clear signals have been received from distances truly remarkable. The audibility of the received signals were equal to those received on a set using 2 steps of radio and



Diagrammatic illustration of the famous Flewelling Circuit. The most important part of this circuit is the condenser bank shown in the diagram. The three condensers should be of the correct capacity, .0005, and the leak shunting them should have a resistance of from $\frac{1}{4}$ to 3 megohms. This particular leak is not critical in its adjustment, therefore, does not need changing. When correct value is found it can be substituted by a fixed leak of like value. The leak in the grid circuit is important, and should be variable. The leads A and B are for antenna and ground or loop. Either antenna alone can be used or ground alone. In either case, when used alone, they should be connected to the post marked A. One side of a loop can be used with the circuit by following the same procedure. For local work neither antenna nor loop is necessary.

the plate coil, and the small capacity condenser is shunted across the larger or main inductance.

One of the big features of the circuit is that for local broadcast work the set needs neither aerial nor ground, the reception being accomplished on nothing but the set itself. When used with either a loop or outside aerial, marvelous results can be obtained, and on account of the fact that the tuning is not critical, as in the regular "super" circuits, it is easier to control and tune, and there is no C battery necessary, which simplifies it considerably.

The tuning of this circuit is simplicity itself, the main adjustments being the coupling of the coils and the setting of the grid condenser values. The coupling relation of the coils is first set at an approximate relation of 50 degrees of each other. Then the grid leak is set until the high frequency whistle is either entirely eliminated or is at a minimum. When this is done the variable condenser is adjusted to bring in the voice or phone, and the coupling increased or decreased until the signals are loudest.

1 step of audio frequency, without the troublesome tube noises so noticeable on a set using audio frequency.

When constructing this set, extreme care should be taken in the wiring, keeping all wires that run parallel as far apart as it is possible, and making sure that there is no chance for short circuit. Phones should at least be of 1,000 ohms resistance because of the fact that the inductance in the phone circuit is being used, and accounts for the absence of the large inductances. The fixed condensers should be purchased, as it is extremely hard to get exactly the right capacity without the use of calibrating apparatus, as even when formulas are correct there is always the chance of the thickness of the dielectric differing a sufficient amount to make it impossible to obtain the correct capacity. As the correct functioning of the circuit depends on the value of capacity in the condenser bank, it will make correct operation much easier and surer. If further amplification of signals is desired, the batteries of the amplifier should be separate from those of the circuit proper.

Mounting Crystal Detectors on a Panel

By T. W. Benson

THE simplest and most effective method of mounting a crystal detector on a panel is to make use of a double-contact flush bayonet socket as employed on automobiles. The socket is set in a hole drilled in the panel and held in place with the locknut furnished with the socket.

Detectors for use in this type of socket can be purchased in both the fixed and adjustable types. The constructor can make his own fixed detectors from a double-contact plug as shown in the illustration.

A small piece of the desired crystal is attached to one terminal of the plug

by twisting wire around it and inserting the ends of the wire in the terminal. The other terminal is fitted with a short cat whisker made from copper or brass wire. Plug the detector into the socket and adjust the cat whisker

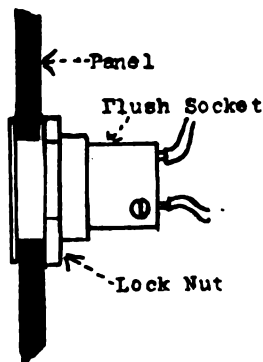
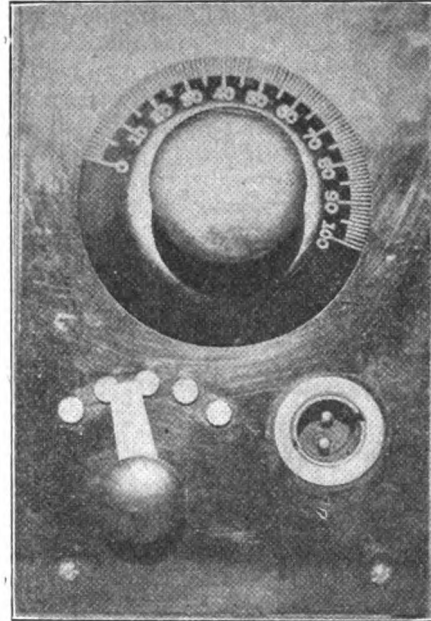
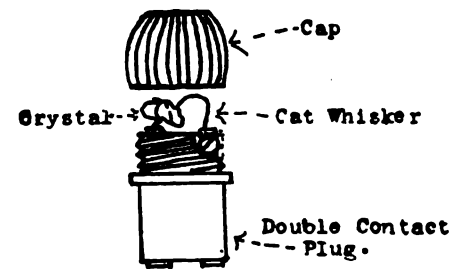


Figure 1. Diagram showing how the headlight socket is mounted on the panel to accommodate a crystal detector.



Photograph showing how panel of simple crystal receiver was made. Notice socket in lower right-hand corner, next to inductance switch.



Details of Fixed Detector.

Figure 2. Diagrammatic drawing, showing how a double contact plug can be easily made into a dustproof, fixed crystal detector.

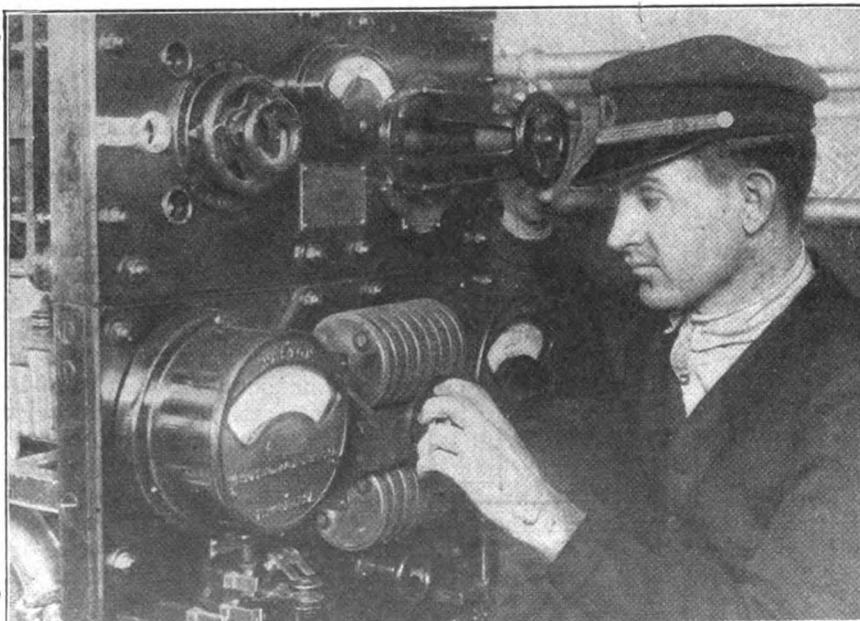
in the usual manner until signals are heard the loudest, then carefully place a drop of sealing wax on the cat whisker and mineral to lock the adjustment. Replace the cap on the plug and fill with sealing wax. A number of these detectors can be made up and no part of a program will be lost on account of the detector going bad.

Any other form of detector usually mounted on the table can be fitted with a plug and flexible leads, and plugged into the set when desired.

"Electragists" Is the Name

THE annual convention of the Association of Electrical Contractors and Dealers was held recently and it was decided by its members to change the title of the organization, and that it should be known hereafter as "The Electragists." It was stated that this was due to the desire to incorporate in the title the trade-marked word "electragist," by which is meant "a member using high standards of practice." This new title also gives recognition to the great number of members who are located outside of the United States.

This Naval Set is Compact, but Powerful



(C. Kadel and Herbert)

Operator Lester Judd adjusting the quenched spark gap of the new naval $\frac{1}{2}$ kilowatt transmitter, such as used on board naval cutters and lightships. Besides being extremely compact, it is one of the most flexible transmitters ever designed, and easily handled, as controls are reduced to absolute minimum. The current for this set is furnished by a separate generator, or the ship's storage battery, which may be used in case of emergency.

ONE of the most complete transmitters, as far as flexibility, compactness, and power are concerned may be found on the United States cutters that patrol the coasts and keep masters of ships constantly informed about wrecks, derelicts and storms, etc.

It is a $\frac{1}{2}$ -kilowatt quenched spark type, of the latest design as far as it concerns control and compactness. As can be seen in the cut, there is a visible check on the wave length, which can be read by means of a number dial inside the little white circular hole as shown in the upper left hand corner. The control for the wave length is made by means of the two handles directly next to it. These handles control the coupling and inductance of the transmitting tuner, by means of sliding contacts, and by varying the angle of coupling. The meter directly next to it is a radiation ammeter, connected in the antenna circuit, by means of which an accurate check on the current being radiated may be kept. Directly below the meter is seen the quenched gap, which is used in place of the usual straight gap or rotary gap. On either side of the gap may be seen the voltmeter and ammeter.

Building a Power Amplifier at Home

By C. White, Consulting Engineer

THE use of power amplification is growing very steadily among amateur radio fans. Many no doubt have come to realize the tremendous advantage in audio-frequency amplification on the power tube principle. Unfortunately the cost of these units completely assembled has greatly hindered the average amateur from purchasing one, and, since there is little literature concerning the construction of these units available, there have been a vast flock of fans who have been forced to give the idea up until prices become more favorable.

Some fans tried making power amplifiers on the same principle as the ordinary audio-frequency amplifiers, using non-power tubes. In general their attempts were far from a satisfactory solution because many factors which would go very little toward aiding or hindering the operation of an ordinary amplifier would either determine the success or ruin of an amplifier on a larger scale. The main reasons for failure have been interaction between the audio-frequency stages due to the employment of one common A and B batteries; another has been due to the fact that they failed to use power transformers and the windings of the ordinary non-power transformers have not been designed to stand the relatively large plate current of a power tube; and, third, if any of the previous troubles were avoided, the results were not very encouraging owing to the large amount of inherent distortion in the output of the amplifier.

Home-Made—Well Made

So far those who are still looking for a good system to build a home-made outfit that gives good results, I have designed a little power amplifier that can be built at a rather reasonable price at home. I do not claim that the principle is new, but, it is reliable, since many large firms are making power amplifiers on the same identical principle.

Distortion is introduced to a large degree in a power amplifier which is built on the same principle as an ordinary non-power amplifier, that is, using one tube per stage, owing to the fact that the voltage variation on the grid of the tube in the last stage is quite excessive and thus introduces serious and sometimes unbearable distortion, especially on high notes and very loud signals. To overcome this tendency to distortion on the last tube, the voltage variation is divided between the grids of two similar tubes instead of being impressed on the grid of a single tube. This principle is commonly known amongst radio men as the "push and pull" system of amplification and is employed extensively for amplification of a high degree. Such a double tube arrangement is not necessary on the first stage of the receiver owing to the fact that the voltage impressed on the grid is very weak and unamplified to any great extent.

It Cuts Down Interaction

To cut down interaction between the tubes of the various stages a choking or filtering arrangement is provided. This filtering arrangement consists of a .1 henry choke coil inserted in each lead-in wire and a 1.0-micro-farad condenser connected between the inner ends of the two choke coils in each lead. In Figure 1 these coils are designated by the letter X, and the condensers by the letter C. Direct current and voltage to light the filaments and supply potential for the

various plate circuits is easily passed through these choke coils, but is practically impossible for any currents of voice or high frequencies to get across from one stage back into another by means of the common A and B batteries. The condenser C offers a path of low impedance for the high frequency voice currents that can pass through the choke coils because of their high impedance to alternating currents. By means of a 250-ohm potentiometer, marked P, the grid of the first tube can be adjusted to the correct negative-potential. The two tubes on the last stage are supplied with negative potential for their grids from a common C battery that can be built into the unit and adjusted once for all times. The condenser C-1 acts only as a bypass for radio-frequencies that might be impressed upon the primary of the transformer T-1. The capacity of C-1 can be any value between .001 and .002 microfarads, depending solely upon the type of transformer.

When and What to Buy

Many of my readers are by this time wondering what type of apparatus to get and where to buy it. The condenser C-1 is quite easily obtained from any radio supply store, but the condensers C can be purchased from a telephone supply house. Choke coils (X) of .1 henry inductance are also obtainable from a telephone supply depot. The transformer T-1 is nothing more than an ordinary audio-frequency amplifying transformer, but T-2 is a power amplifying transformer with a split secondary. The latter may be had from any manufacturer or dealer in transformers for telephone and radio uses, under the name of amplifying transformer for "push-pull" type of power amplification. The tubes used for the last, or the "push-pull" stage, must be of the same type, but the tube for the first stage can be of another type, but it is advisable to employ the same type of tubes.

In assembling the unit, care should be taken to see that the windings of the transformers have the right ends connected to the grids. If the transformers are not so marked this can be easily ascertained by tryout. This power amplifier can be built up for \$40 to \$55 complete if care is taken to purchase the right apparatus. Such an outfit purchased completely assembled would easily cost \$100 to \$180. And the only near difficult things connected with the outfit is the purchase of the 1 mfd. condenser and the transformer T-2, which can be done if inquiries are made for the same at a large commercial telephone and radio supply dealer or manufacturer. For those who wish to try out some interesting experiments many surprising results can be obtained by the use of non-power tubes in this type of amplifying circuit.

Operating Room of WJZ, Newark, N. J.



(C. Kadel & Herbert)

The six tubes on the left are the rectifying tubes, and replace the motor generators formerly used. The cabinet on the right contains at the bottom the five modulating tubes, and directly above them the four oscillators.

The Radio Primer

*For Thousands of Beginners Who
Are Coming Into Radio Circles*

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

WHAT care should be taken of crystals used in crystal receiving sets?

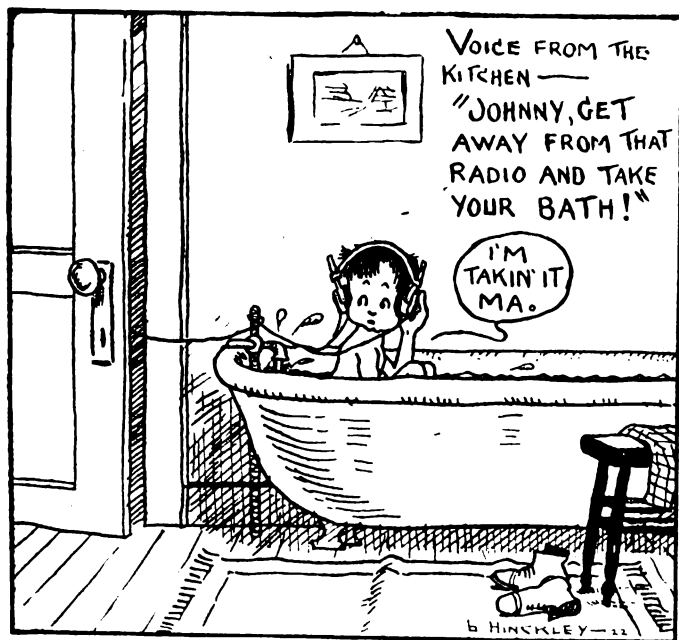
Crystals used for the rectification of radio signals should not be handled except with a small pair of tweezers or pincers. The reason for this is that the hand contains a natural oil, which coats the surface of the crystal and renders it less sensitive to the minute currents. The crystals should occasionally be cleaned with a toothbrush dipped in carbon bi-sulphite (commonly called by the trade name Carbona). If the surface of a crystal loses its sensitiveness a new surface can be had by scraping the old surface with a sharp knife.

* * *

What care should be taken of tubes used as amplifiers or detectors?

The filament should not be allowed to burn too high. It is a waste of current, and also materially shortens the life of the tube. The tube should occasionally be removed from its socket, and the base of the lugs rubbed with emery cloth to brighten the contacts. Do the same to the socket. Tubes should be mounted in the correct position. If a tube is mounted so that its filament is horizontal there is a great chance of its sagging, due to the heat expanding the filament. If this occurs and it touches the grid it will short-circuit and burn out. When a soft tube is used as a detector it is common to have them "blue" up. By this is meant a bluish haze forms around the filament and plate. This indicates too much B battery, and the B battery current should immediately be decreased, otherwise the sensitiveness of the tube will be lost.

Combining Business and Pleasure



Johnnie's Saturday night excursion made pleasant

Are there any decided advantages in having the grid leak variable?

As the tubes manufactured today vary slightly as to the degree of exhaustion they are, of course, harder to manipulate should the grid leak, which allows a small amount of the current placed on the condenser to leak across so as not to choke the tube, be variable. This is especially true in the case of the single-circuit, regenerative sets that are so popular at the present time. By varying the value of the grid leak it is possible to make the tube oscillate at lower filament temperature, thus saving the life of the bulb.

* * *

Is any advantage gained by shunting the phones and B battery with a small capacity condenser?

By shunting the B battery and phones with a small condenser you can eliminate to a great extent the troublesome battery noises which are sometimes so prevalent in the present type battery, especially when they are aging. This allows the small, instantaneous current fluctuations, due to internal chemical action of the cells, to partly disappear.

* * *

Is it possible to operate a 6-volt tube on dry cells?

It is perfectly possible to operate a 6-volt tube on dry cells by hooking up sufficient cells in series to furnish 6 volts. As a dry cell generally furnishes 1.5 volts it would take 4 hooked in series to furnish sufficient current to light the tube. No advantage is gained by using dry-cells, as their life is naturally short, and their constant renewal is eventually more expensive than a storage cell.

* * *

What is meant by a "negative grid charge"?

By a negative grid charge, we mean a negative charge is put on the grid to enable it to hold its negative potential easier. It is generally accomplished by using a small dry cell, such as is used in flashlight cells, connected with the negative lead to the grid.

Radio Dictionary

Aerial: A system of wires, insulated from the ground and generally suspended at a certain definite height above the ground, connected with suitable apparatus to the earth. Such a system is used to radiate or interrupt oscillations.

Aerial Tuning Inductance: A number of turns of wire which can be adjusted to radiate waves longer than the fundamental wave length of the aerial.

Amplifier: An instrument which modifies the effect of a local source of energy used as a rule to produce a larger indication than could be had from the incoming energy alone.

Amplifying Tube: A tube which is exhausted to a higher degree of vacuum than one that is used as a detector. A tube that is not gas filled.

B Battery: A high voltage battery, composed of a number of small cells connected in series in order to furnish sufficient voltage to operate a circuit in which a vacuum tube is used.

Choke Coils: Coils wound in such a manner that they have great self-induction. Usually a coil of wire wound over an iron core, composed of a soft iron wire, or laminated metal sheets (soft steel or iron) insulated from each other to prevent eddy currents. The function is to check the amount of current flowing in a circuit, by means of reaction, due to self-induction.

Compass (Radio): A radio device for determining the direction of a radiated signal.

Condenser: Two or more conductors separated by an insulator, which is used to store up electricity in the form of electrostatic energy.

How to Remedy the "Howl" in Your Amplifier

By *W. A. Dickson*

LOOKING for the seat of trouble in an amplifier that has developed a persistent "howl," is like hunting for the proverbial "needle in the hay-stack," and unless the operator is acquainted with the causes and remedies of this objectionable phenomenon it is almost hopeless to try to stop it.

"Howling" occurs mostly in cases where the vacuum tubes are transformer-coupled, and can be readily distinguished from other tube noises by its sustained audio frequency note in the telephones, entirely independent of legitimate signals. It is caused by the internal oscillations occurring in the circuits of the various tubes, and although probably more common to audio frequency amplifiers than radio frequency amplifiers, it happens in both.

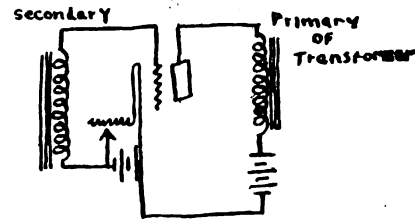
Studying more closely the cause for these internal oscillations, we will take one unit of an amplifier consisting of the secondary of one transformer, the tube itself, and the primary of the other transformer. This circuit is shown clearly in the accompanying diagram. It will be understood that each winding on the transformers contains a certain amount of distributed capacity, and this together with the inductance, forms an oscillating circuit—or at least a circuit capable of setting up self-sustained oscillations of a certain natural frequency. If these oscillations are at a frequency which is audible they will be heard in the telephones connected in the plate circuit of the last tube of the amplifier. Even though these oscillations are inaudible, as in cases of radio frequency amplification, the action of the tubes will be seriously impaired.

Sometimes, however, an audible note is heard in the telephone when the internal oscillations are known to be of a high frequency. This is due to the fact that the grid condenser may become so highly negatively charged that the oscillations are stopped; but as soon as the electrons which are collected on the grid leak off, the oscillations will start again. This intermittent starting and stopping of the oscillations causes pulsations in the plate circuit; and if they are at audio frequency, they will be recorded in the telephones.

Considering the amplifier as a whole, it will be seen that if each tube is oscillating, or capable of oscillating, the tubes will all oscillate at practically the same frequency; also that should the oscillations be started in one tube, and are sustained by the other tubes, the entire amplifier will oscillate.

Howling is more likely to occur when high ratios of amplification are employed than when low ratios are used, and so an amplifier that is noiseless is sometimes not so efficient as one which has a slight tendency to howl.

The following points regarding amplifiers in general should be observed:



Details of a transformer coupled amplifier. The circuit completed through the tube is capable of oscillating at a certain frequency, because the winding of the transformers possesses a distributed capacity. Oscillations would cause tube noise, and would also cause the circuit to howl.

1. Using separate filament and plate batteries for each tube does away with a means of coupling between the units and consequently eliminates possibilities of undesired "feed-backs." Of course, this is almost impossible in the case of the ordinary set, but care should be taken that the batteries which are used have a low value of internal resistance.

2. Resistance-coupled amplifiers are usually constructed without necessitating the formation of an oscillating circuit. However, an oscillating circuit may be accidentally formed by the arrangement of the wiring. Of course, the frequency at which a circuit of this nature would oscillate would be very high. This might cause a howl audible in the telephone if the grid condenser intermittently starts and stops the oscillations as explained previously.

3. It is always best to keep the plate and grid leak wires as far apart as possible. It is also advisable to plan the wiring so as to be sure that the smallest amount of wire is used in connecting the different components.

4. "Shielding" is a very important matter to be considered, and besides helping to eliminate howling, it does away with the objectionable body capacity effect.

Another important feature to be considered in the operation of amplifiers, and also one that is very objectionable, is a foreign noise caused by the tube itself. These noises are usually in the form of "clicks" or "hissing," and can be caused by unstable mounting of the elements in the tube, ionization of a small quantity of gas in the tube, or an irregular flow of electrons from the filament due to surface impurities.

When the voltage of the filament battery drops below normal an unnecessary noise is bound to be heard in the telephones. The same applies to the plate batteries which, towards the end of their life, develop a high internal resistance. This might happen in any one of the numerous cells composing the battery. When a "hissing" or "frying" noise is heard, it is always advisable to test the plate batteries—not only each battery, but each cell.

Wireless from Freighter

A REPORT by wireless stated recently that the American freighter "Winnebago" had been disabled by the terrific gales off the coast of Ireland and that she was in need of immediate aid. The freighter is owned by the American Transportation Company and has been used in connection with the American Relief Administration for carrying food and hospital supplies to Russia.

This Postal Tells Whole Story

Rocky Hill, Conn., February 10, 1923.

Gentlemen:

I have taken your weekly publication regularly, and have a complete set of RADIO WORLDS. They are worth their weight in silver to a radio fan.

Yours truly,

(Signed) C. H. YEAGER.

"How I Constructed and Worked the Set on My Ship"

By Captain Leon Mauriet of the S. S. "Syria"

BEING on board a low powered steamer, running between Marseilles and New York, I had the idea to try, independently of the ship's wireless, to have a small receiving set in the chart room, and the results obtained were such that I think it may interest other captains or officers.

The set can be placed in the chart room or in any other room. Any aeration pipe will do for the entrance of the aerial. A bolt on a beam will make an excellent ground. The set is not expensive and will give short and long wave length in use on ship or shore stations.

During our voyage from Lisbon to New York almost every day we had two or three time signals and errors of our chronometers were daily noted. Longitudes were calculated with exactitude.

From noon on November 6 to 6 p. m. November 7 we had cloudy weather and fog, with no possibility of obtaining the position by astronomical observations. With this set we heard distinctly the radio fog signals of Fire Island light ship. Pointing the head of the ship in the direction where I thought the signals were the strongest we came exactly on the light ship. The same proceeding enabled us to go from Fire Island

L. S. to Ambrose L. S. and anchor close to the L. S. in a very thick fog.

Combining radio, fog signals, soundings and fog sirens, position was found as accurately as with clear weather. The reading of radio fog signals are easy and in my opinion there is no possibility of error. Putting a long cord to the phone receiver I took it to the navigating bridge, leaving the set in the chart room on the lower bridge. Swinging the ship ten degrees on each side I knew the exact bearing of the station, and soon after the fog siren gave another certitude.

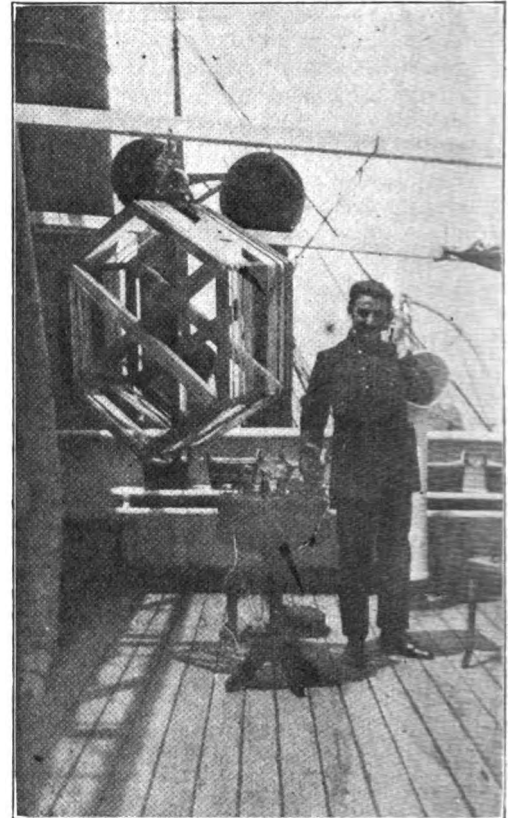
The chart will show where time signals have been heard in day time; during night better results may be obtained.

I am explaining the diagrams and lists of things necessary to build the set. With it good results were obtained.

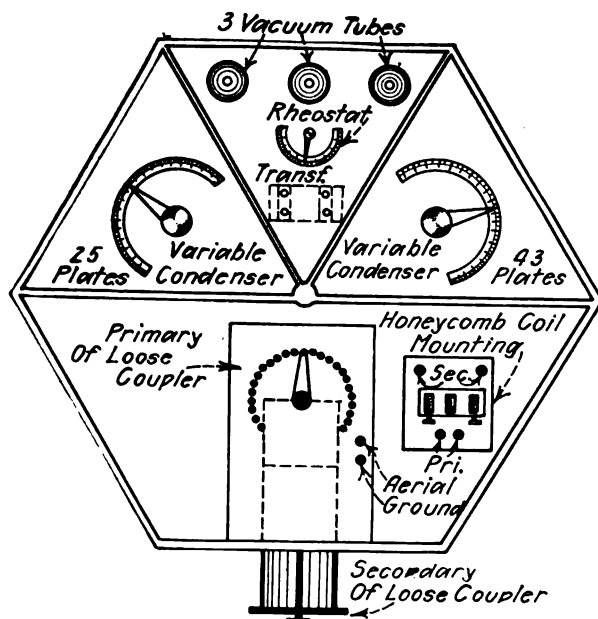
A loop, as shown in the cut, will give the bearings without changing the ship's course, but it is not a great loss of time to swing the ship and the antenna does the work of an excellent and big loop.

Having a wooden box of hexagonal form, 18 inches in diameter, 6 inches high in the middle, a separation and an axle one inch thick.

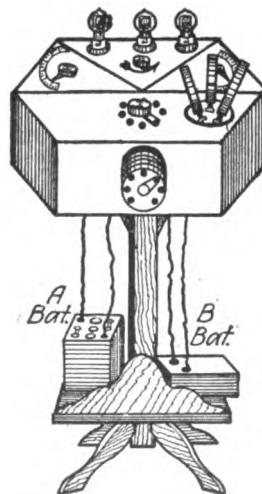
Half of the box will be divided in



Captain Leon Mauriet and the set he constructed for his personal use on board the S. S. "Syria." Note the loop antenna that he uses. The accompanying text and diagrams give a full description. The Captain is an ardent fan and is up-to-date in radio matters.



Top view of the set constructed by Captain Mauriet. Notice the fact that it is in four cabinets, each shaped so that the set will form a hexagon. Each cabinet is separate, connections being made by means of binding posts on the back.



Schematic drawing, showing how the set was mounted to form a small table. The batteries are conveniently located at the base of the table on a space provided for them. Either a loose coupler or honeycomb coils can be used with this set, as may be noted.

3 panels of hard rubber or bakelite. The middle one will be fixed with two hinges.

On the middle one will be fixed the three sockets for vacuum tubes and one paragon rheostat; wire connections to be fixed underneath the panel and inside the box.

One of the side panels will hold a forty-three plates air variable condenser; the other a 23-plate air variable condenser.

Inside of the box, underneath the rheostat, will be screwed a Thordarson amplifying transformer.

In the side panel behind the tubes will be left an open rectangular space for a hard rubber panel that will have:

Two binding posts for A battery;

Two binding posts for B battery.

The grid leak and fixed condenser of 0.0001 mf can be fixed thereto. The other half part of the box will receive the loose coupler in the middle, the secondary coming out in the front panel.

(Continued on next page)

Bureau of Standards to Test Seven Standard Waves

By Carl H. Butman

WASHINGTON, D. C.—All radio fans will be able to test their wave meters on standard wave signals transmitted from the Bureau of Standards, on Tuesday evening, March 6, according to a recent announcement.

Commencing at 11 p. m. Standard Eastern Time, the Bureau of Standards at Washington will send the general call "QST de WWV Standard Wave Signals," followed by the signal "WWV" repeated for five minutes on the following waves: 550, 600, 680, 790, 940, 1150 and 1500 meters.

In the near future it is hoped more wave lengths will be assigned to broadcasters and it will be advantageous for fans to be able to tune in correctly. If the positions of the variable parts of the receiving sets are charted during the tests, the exact position can be predetermined for any of the standard waves used later on.

A Bureau of Standards Test

The tests will virtually furnish a Bureau of Standards test by radio for wave meters. Broadcasting stations should also calibrate their instruments, so as to be able to check their own transmissions when special wave lengths are assigned.

Announcements preceding the sending of the standard test signal "WWV" on the seven different waves will be made on that wave and will state the length of the wave in both code and telephone.

The standard wave signals, the Bureau explains, may be used by anyone having suitable receiving equipment for calibrating a wavemeter or receiving set.

Results from preliminary standard-wave transmission experiments conducted by the Bureau and thirty observers located within 1,000 miles of Washington on January 29 and 30 indicate that such signals are most serviceable after 11 p. m. when broadcasting programs are concluded. The tests also showed that the wave meters of the observers were generally in fair agreement, but some differences were as great as 7 per cent.

If the pending radio bill becomes a law, Bureau officials explain it will be necessary for the Secretary of Commerce to assign carefully selected wave lengths to each radio telephone broadcasting station, as an error as large as 7 per cent. would cause serious interference. In view of this, it is desired that the wavemeters used be in closer accord, and to correct these errors for sending and receiving, standard wave signals will be sent out.

Wave Schedule March 6

The schedule of transmission for March 6 is as follows:

Eastern Time P. M.		Approximate Frequency Kilocycles Per Second	Wave Length Meters
11:00 to 11:05 p. m.	General call	(550)	550
11:05 to 11:10	Standard wave Announcements		
11:10 to 11:15	General call	(500)	600
11:20	Standard wave Announcements		
11:40	General call	(440)	680
	Standard wave Announcements		
12:00	General call	(380)	790
	Standard wave Announcements		
12:20	General call	(320)	940
	Standard wave Announcements		
12:40	General call	(260)	1150
	Standard wave Announcements		
1:00	General call	(200)	1500
	Standard wave Announcements		

About April 1 standard wave signals will be transmitted covering the wave frequency range between 1,000 and 500 kilocycles per second (wave lengths from 300 to 600 meters), and on about May 1 between 2,400 and 1,000 kilocycles per second (125 and 300 meters). The last will be of special interest to amateurs. The exact dates and schedules of transmission will be announced later.

(Continued from preceding page)

Room is left on each side of the loose coupler to place the mounting of 3 inductance honeycomb coils.

The antenna used and shown on diagram is a cage of four wires the cross being two feet in diameter, 75 feet in length.

The entrance of the aerial is an aeration pipe.

An ordinary reflector lighting cable will be insulation enough to bring the aerial to the set.

GROUND. A bolt on an iron beam connected with the hull will make an excellent ground.

A BATTERY. Storage battery of four to six volts will be easily charged with direct current from the ship's dynamo.

B BATTERY. A dry battery of 30 to 80 volts will stand working for several months.

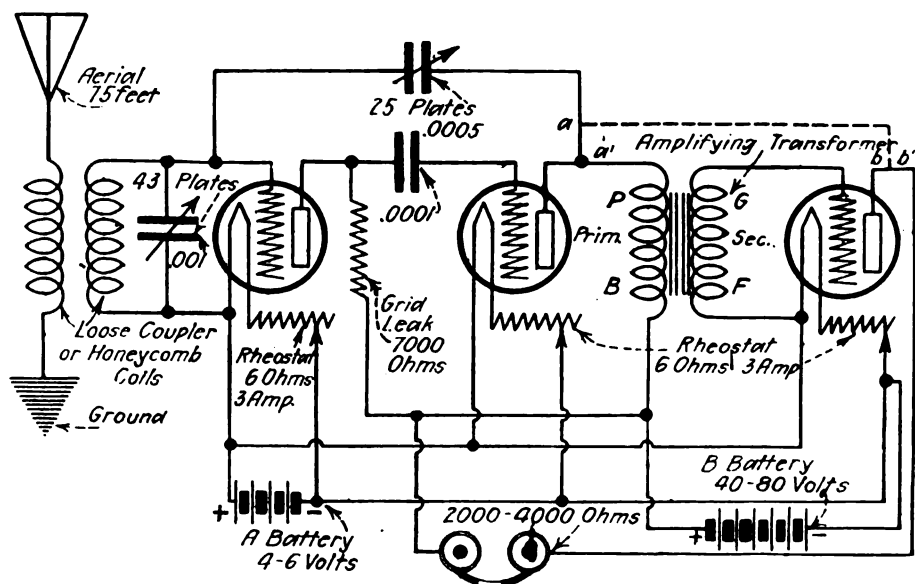


Diagram of connections. One step of resistance coupled amplification and one of transformer coupled amplification is used.

Radiograms

The Latest Important Radio News Briefly Told for the Growing Army of Radio Fans

SINCE they have begun to broadcast in Mexico, President Obregon has become an ardent radio enthusiast. He has had an up-to-date set installed in his home, Chapultepec Castle, to keep him amused in his idle moments. After the manner of most fans he went from idle curiosity to highest ardor.

* * *

GREAT BRITAIN wakes up to the fact that radio broadcasting is a public need, and has opened four stations. Each one operates on a wave length sufficiently different not to cause any interference with any other. That's the stuff, but watch your step when you start to license them by the dozen, or you'll run out of numbers for the wave lengths. The stations licensed and their calls and wave lengths are: 2LO London, 369 meters; 2ZY Manchester, 385 meters; 5NO Newcastle, 400 meters; 5IT Birmingham, 420 meters.

* * *

DUTCH EAST INDIES will not be left behind as far as reception of long distance is concerned. The manager of the radio station at Bandoeng, Java, Dutch East Indies, recently filed a report that he has successfully copied the transmitted signals from the station at Ongar, England, whose call is GLO. This is a distance of 7,500 miles, and the reception was done on an antenna 45 feet long, the receiving set using two vacuum tubes. The work was done on a 4,350-meter wavelength, and is an indication that even in Java, "you can't keep a good man down" when it come to DX work.

* * *

THE purchase of Station WDAP which has been operated by the Drake Hotel, Chicago, was recently made by the Chicago Board of Trade, for the purpose of broadcasting farm service and quotations of interest to farmers.

* * *

THE latest fashions in the way of aeriels is gold plating. Because of the fact that there is a great deal of efficiency lost, because of skin resistance when copper wire corrodes due to the action of the air on the copper, a Chicago amateur,

R. H. G. Mathews, central division manager of the ARRL, one of the best known amateurs in the country, is using gold-plated wire for his antenna system. That's O. K. but don't advertise the fact, or some dark evening you'll be missing some perfectly good antenna wire.

* * *

WHAT is now considered one of the finest stations in the world is WBZ, the Westinghouse radio station at Springfield, Mass. This station was recently rebuilt, and as a result it gives results considerably louder and clearer, and has also increased its range. This station was first opened in the fall of 1921, as a pioneer station in the broadcasting field. At first it was designed to serve only New England and therefore its power was limited. But when broadcasting became popular, the need of a more powerful station was felt, so the old station was dismantled and the new and more powerful one erected.

* * *

IT is now possible for the students of Columbia to include radio in their course of study. The course requires two sessions and is intended for those who are not familiar with the theory and practice of radio.

* * *

DR. LEE DE FOREST, a graduate of the Sheffield Scientific School of Yale University, class of 1906, recently gave a sum of money to be used by the University for the purpose of establishing an up-to-date radio laboratory and library. An annual course of lectures will be provided for students taking the course, and the lecturers will include some of the foremost radio and electrical experts in the country. Beginning with this month, a series of lectures will be given by the following: G. A. Campbell, American Tel. and Tel. Co.; Lloyd Espenscheid, American Tel. and Tel. Co.; S. C. Hooper, United States Navy; Dr. Albert W. Hull, Yale '05, General Electric Co.; John Morecroft, Professor of Electricity, Columbia University, and L. E. Whittemore, Bureau of Standards.

Senator Kellogg Hopes for Action on Radio Bill

By Washington R. Service

WASHINGTON, D. C.—The radio bill, which was referred to the Senate Interstate Commerce Commission recently, may be passed this session of Congress, Senator Frank B. Kellogg of Minnesota believes.

An effort to hold a meeting of the Senate Sub-Committee on Radio a few days ago failed because of lack of a quorum, but the White Bill, which has already passed the House, will, it is said at this writing, be taken up by that committee soon.

Senator Kellogg, who has been interested in radio legislation for over a year, is making every effort to secure passage of this much-needed legislation. He is being aided by Congressman White of Maine, who will meet with the Senate Committee to give the members the benefit of his extensive knowledge gained

through the recent important public hearings in the House.

Senator A. B. Cummins, chairman of the Senate Committee, who has been ill for some time, is expected back in the Senate, and it is believed by the supporters of the White Bill that his presence will aid materially in securing the attention of the Senate.

Considerable difficulty in getting the bill before the Senate, even after it is reported out by the committee, is anticipated in view of the other pending legislation, including the Ship Subsidy, British Debt Settlement and other bills urged for immediate consideration. Supporters believe, however, that within a few days the Senate will have arrived at a position where the legislation for consideration this session will be definitely decided upon, and they believe the radio bill will receive consideration before adjournment on March 4.

NEXT WEEK! CRYSTAL DETECTOR'S DEPARTMENT WILL BE CONTINUED NEXT WEEK!

The Milwaukee Amateurs' Radio Club



Officers and directors of the Milwaukee Amateurs' Radio Club, seated in the front row (left to right): Messrs. L. S. Baird, C. N. Crapo, E. W. Ruppenthal, H. F. Wareing, H. G. Fawcett, E. T. Howell, I. H. Strassman, and A. J. Simandl.

MILWAUKEE, Wisc.—The Milwaukee Amateurs' Radio Club was founded in January, 1917, by L. S. Baird, A. I. R. E., and associates, and became affiliated with the American Radio Relay League, Inc., in 1919. The society is enjoying an active and successful season and meets weekly at 7:45 P. M., on Thursdays, in the Trustees' Room of the Milwaukee Public Museum. Meetings have been well attended, and the membership is increasing.

Meetings are devoted to talks by members and reports from committees. The technical committee, headed by E. T. Howell,

Sc. M., and R. E. Lathrop, 9ATX, has submitted several reports on topics of timely interest. The "S" tube has been discussed; super-regeneration explained; an analogy given for oscillating vacuum tubes; and the Hartley and reverse feed-back C. W. circuits contrasted.

A spirited spark-C. W. debate was put over recently with great success. The argument waxed hot, and the sound of the gavel was frequent. A contest in defining technical radio terms caused many lines to be spelled down, but resulted in adding a large store of words to the members' vocab-

ularies. Several meetings have been devoted in part to the discussion of the proper design and construction of aerials.

Marian Szukalski, Jr., 9AAP, owner of the only Milwaukee amateur station to span the ocean in the recent transatlantic tests of the A. R. R. L., presented a paper on the construction of his transmitter.

Officers of the society this year are: H. F. Wareing, president; H. G. Fawcett, secretary; and L. S. Baird, business manager. All general communications should be addressed to the club's executive office, 601 Enterprise Bldg., Milwaukee, Wis.

My Airplane Antenna

The following letter has been received by one of RADIO WORLD'S contributors:
January 17th, 1923.

Mr. Ortherus Gordon,
87 Smith St., Fall River, Mass.

Dear Sir:

I have read your article in the January 13th issue of the RADIO WORLD. The statements that you made were of considerable interest as the writer is working along the same lines that you are, and the results that I am getting are mighty interesting.

You mention that you can tune out Round Hill station but 20 miles distant. I have only an Aeriola Sr. set—no amplification whatever—using a W. D.-11 tube, lit with a No. 6 Columbia Dry cell—22½ volt Ever-ready No. 766-B battery, and my various aerials.

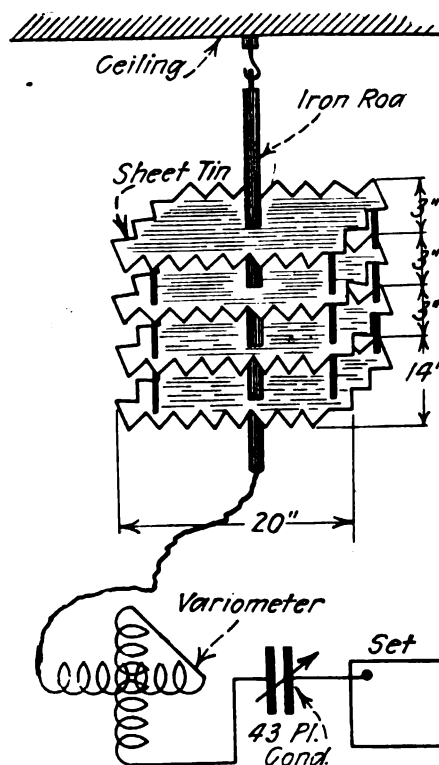
I am located in the Kentucky Hills about 9 miles due south from WHAS, Louisville, Ky.; and when they are coming in, it nearly knocks one's head off. I have several aerials as follows:

(a)—150 ft. outside running due north and south some 30 ft. from the ground.

(b)—150 ft. aerial installed on the roof of an enclosed porch about 11 ft. from the ground. The wire lies in what might be called a rectilinear spiral, following the sides of the porch and the several revolutions are about 18" apart.

(c)—What I call my aeroplane aerial (from the similarity in appearance) made like sketch No. 1 of tin and tuned by the variometer and condenser as shown in sketch.

I use the several aerials from time to



The "air-plane antenna" as constructed by Locke Etheridge, of Louisville, Ky. The results obtained on this antenna are fully described in his interesting letter to Mr. Gordon. The construction of the antenna is shown in full detail.

time, comparing the same station at the same time, one aerial with the other, and in this way get some idea of their comparative value.

Trying to be honest with myself in the observations I really cannot decide that any one is better than the other. They are all excellent. I get New York City, Newark, N. J., Atlanta, Ga., Fort Worth, Texas, Schenectady, N. Y., College Park, Ga., WMAN, Round Hill, S. Darthmouth, Mass., Cleveland, O., Detroit, Mich., Davenport, Ia., Kansas City, Mo., Denver, Col., Dallas, Tex., Havana, Cuba, Minneapolis, Minn., Toronto, Can., East Pittsburgh, Pa., Chicago, Ill.

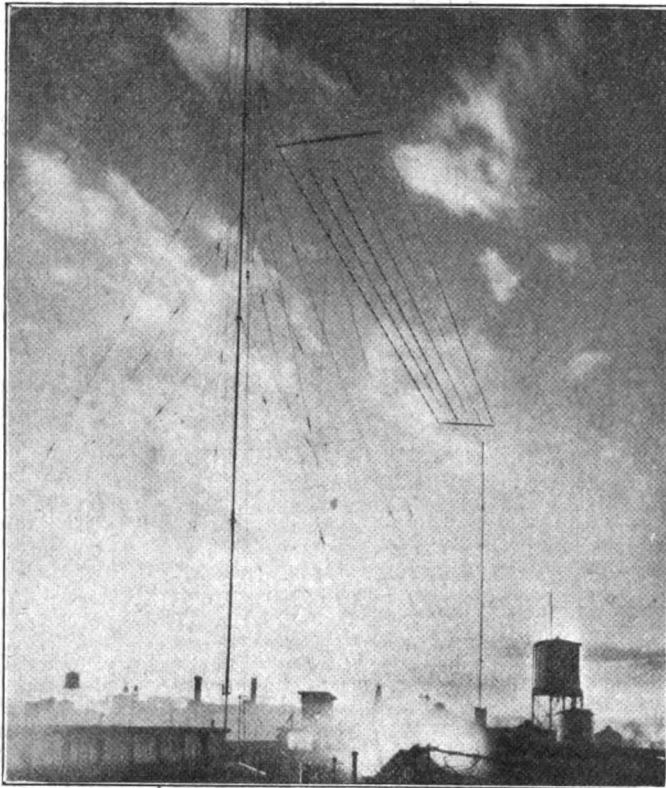
Aerial C consists of four planes of tin, each 14"x20", the edges of which are cut in sharp teeth with the teeth running all around the edges and looks like a rectilinear buzz saw. These four planes are mounted one above the other, forming a 4-plane aeroplane without any tailpiece. They are held about 2½" apart with supports of tin at the four corners and the structure soldered together. The whole combination is supported with an iron rod placed vertically down through the center of the four planes. The upper end of the rod is bent into a hook and insulator so I can hang it on the ceiling of the room over my head. A wire is fastened from the bottom plane for a lead-in wire—and the variometer and condenser are cut in series into this wire. This train of apparatus comprises the aerial C which is connected to the set in the usual way. Try this out and you will be surprised at what you will get from stations 1,000 miles distant.

Yours very truly,
LOCKE ETHERIDGE.

R. R. 2, Kenwood Hill,
Louisville, Ky.

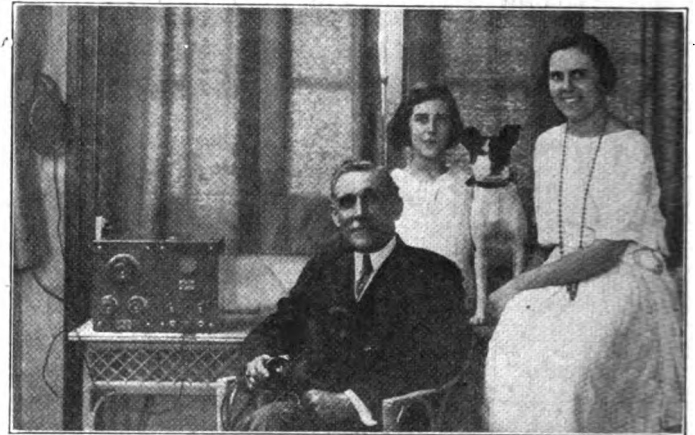
Radio News Photos From Over the World

Captions by Edward Lynn

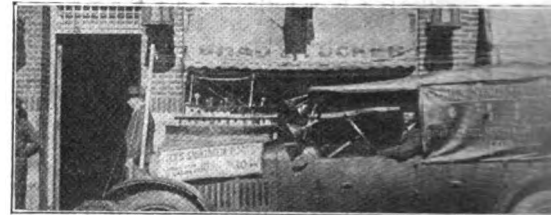


(C. Kadel and Herbert)

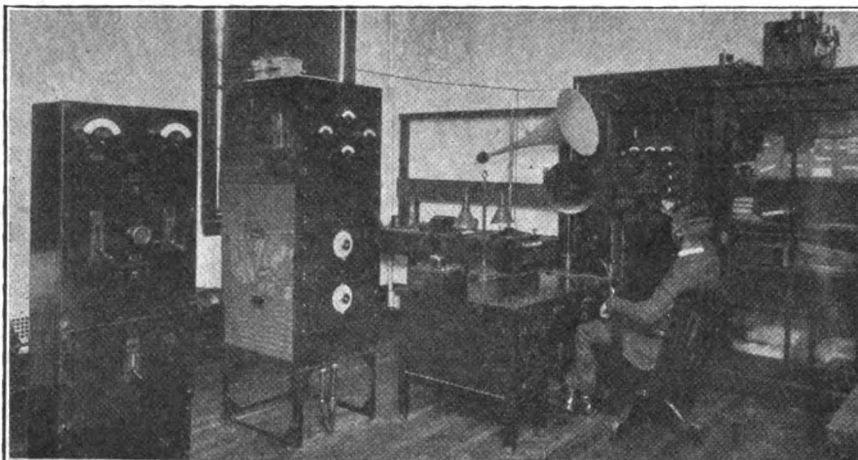
The antenna system of the Radio Corporation-Westinghouse Broadcasting Station, WJZ, located at Newark, N. J. The six-wire antenna is supported between two 120-foot steel masts. It is 150 feet long and is 200 feet above the street level.



(C. Kadel and Herbert)
The family of Jan de Jan family, casting ated in highest in the is opera house Co., an titude Bonafey is situs peak a ing the call of and is Brazilia

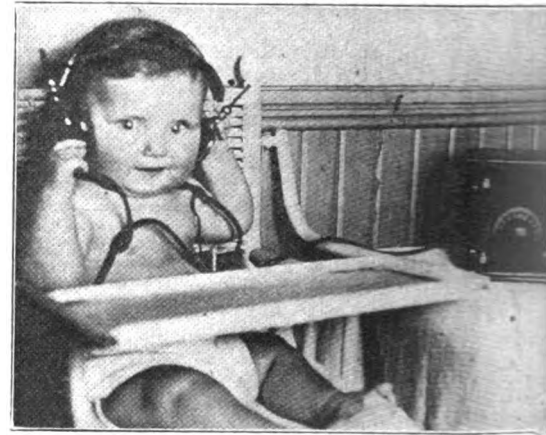


(C. Kadel and Herbert)
A novel way of advertising, which keeps the crowd guessing where the music is coming from.

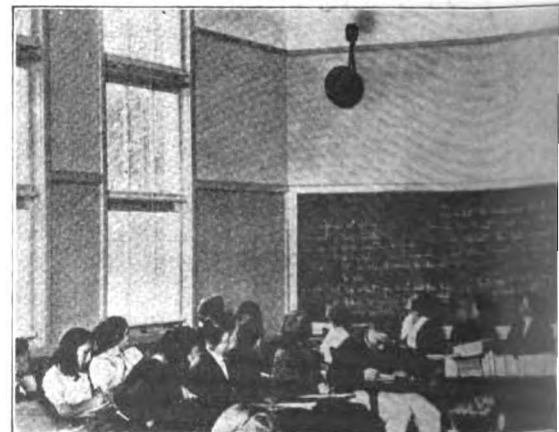


(C. Photos by Boice Studios)

The operating room and studio of one of the largest college broadcasting stations, WHAZ, Rensselaer Polytechnic Institute, Troy, N. Y. This station has just established what is said to be a world record for radio telephony, having successfully maintained two-way phone communication over a distance of two thousand miles between the stations at Troy, N. Y., and Calgary, Canada. WHAZ was successful in transmitting a complete concert to the Hawaiian Islands, a distance of over 5,500 miles.



(C. Keystone Views)
Master John Marvin Ferree, of St. Paul, Minn., breaks the record for playing a game at an early age and gets a quotation on the next milk.



All

and Herbert)
 Mayor of Rio
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 Id. The station
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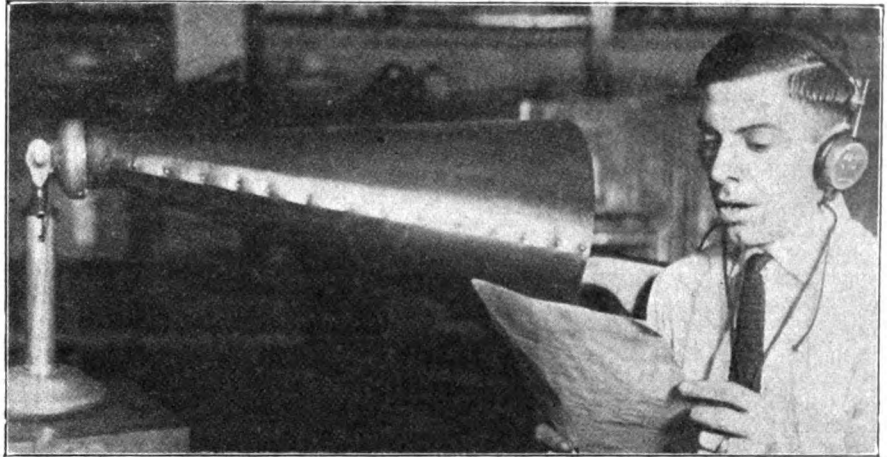


(C. Underwood and Underwood)
 Mr. Tracy T. Hicks, of Kansas City, Mo., and his new pocket wireless receiver, which is unique in that it is self-adjusting and no tuning or batteries are necessary. It is practically complete in itself. All that is necessary is to attach the clips to a suitable ground and aerial.



(C. Kadel and Herbert)
 Miss Henrietta Seek, the "Voice of the Sunny South," and one of the announcers, both well known to listeners of WDAL, the radio broadcasting station at Jacksonville, Fla. This is the only station between Atlanta and Miami, and has been heard distances of over 3,000 miles.

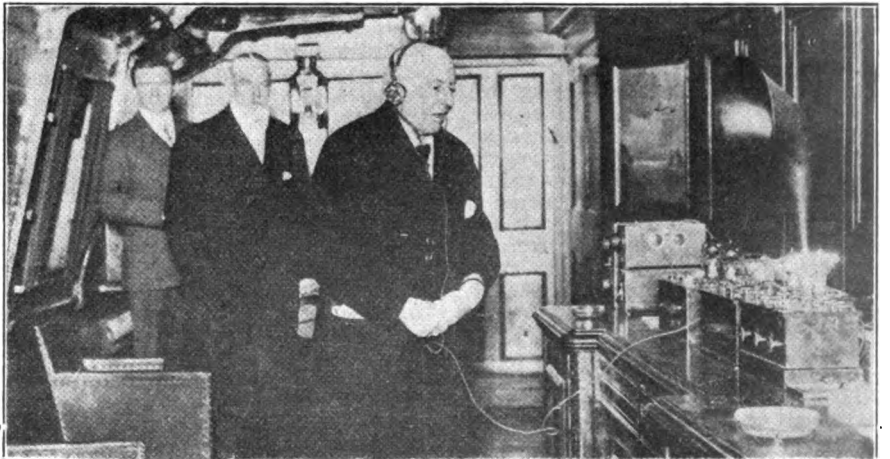
(C. Gilliams Photos)
 The Piedmont High School at Oakland, Cal., has inaugurated a unique innovation in installing a device called the telemagnaphone, by means of which the principal is enabled to get in instant touch with all the class rooms. He is also enabled by this device to control the receiving of the local stations that broadcast educational data and lectures. The loud speaker is seen on the upper left-hand of the accompanying photograph directly over the blackboard.



(C. Underwood and Underwood)
 Radio has been called upon to assist the police in the location of stolen automobiles. The photograph shows Sergt. Ciaverella, of the Washington police force, broadcasting the daily automobile theft reports, with such data as make of car, number and other identification marks. A decided decrease in the number of stolen automobiles has been noticed since this new method went into use.



(C. P. and A. Photo)
 Miss Florence McDonald, sister of the president of Chicago Radio Laboratories, will keep in touch with Chicago while enroute to Europe, on board the S. S. Berengaria, through the aid of radio.



(C. Underwood and Underwood)
 Admiral Sir Edmund Robert Fremantle, England's oldest naval officer, Rear-Admiral of the United Kingdom since 1901, listening in to the phone concert being broadcast from the Eiffel Tower, Paris, in the cabin of H. M. S. Impregnable, his old flagship. The set being used is one of the English type, utilizing both radio frequency and audio frequency.



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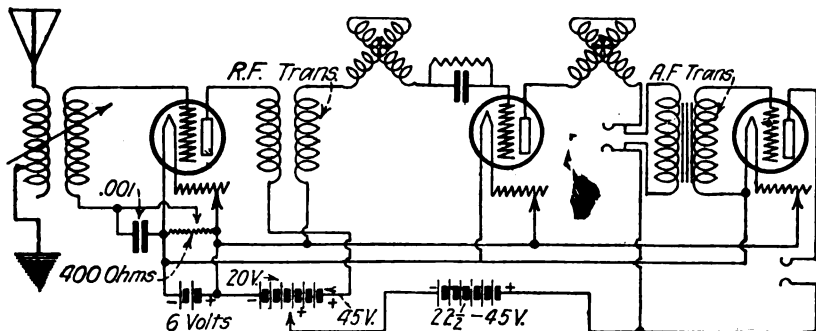
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Answers to Readers

KINDLY give me a hookup embodying one step of radio frequency in the regulation two variometer regenerative set, with one step of audio frequency, as published in RADIO WORLD dated February 3.—Bert Beckhous, 2901 Wasp Road, Fairview, N. J. Hookup you request is published herewith.

Kindly publish a hookup for the following apparatus: Variocoupler, 2 variometers, 1 step of radio frequency detector and one step of audio. I am using two steps of audio at present, but believe that one is sufficient. Is it advisable to use radio frequency in a set of this type?—R. W. Noble,



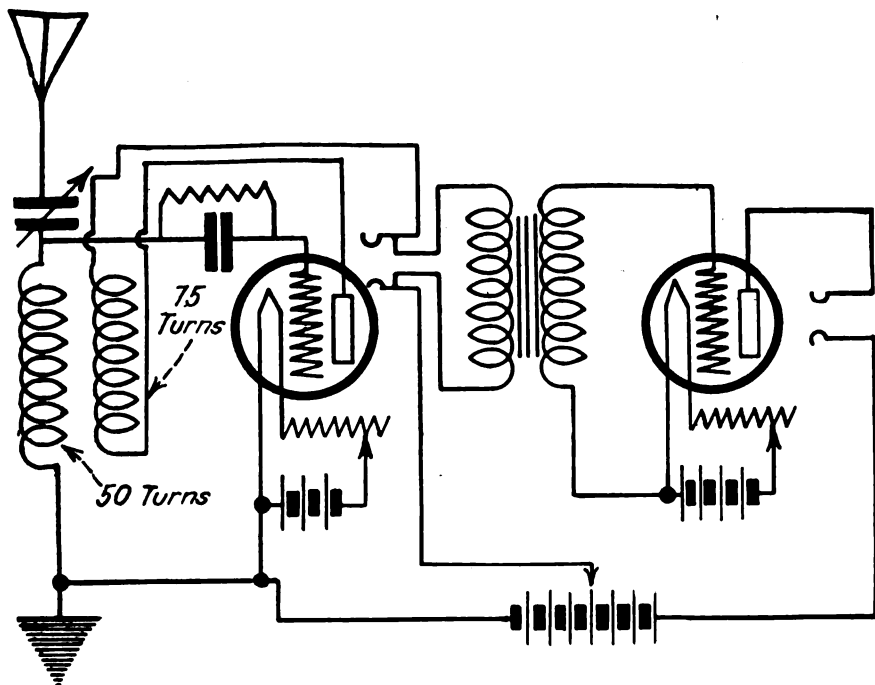
Hookup published in answer to inquiry of Bert Beckhous. The hookup is a regenerative set, with one step of radio and one step of audio-frequency.

Kindly advise me where I can get the wiring diagram of the type of set described by Cranby Meyers in his article "How I Planned My Regenerative Receiver." The article I refer to was a panel layout of a set with detector and two steps of audio frequency.—M. A. Murray, 300 Sturgis St., St. Paul, Minn.

If you will refer to RADIO WORLD dated February 3 you will find a suitable diagram on page 19, in answer to an inquiry by Mr. Anorthy. You will notice that the last tube of this set has no rheostat, the current being controlled from the rheostat of the second tube.

Kindly publish a hookup using detector and one stage of audio frequency in connection with the article by Ortherus Gordon, in RADIO WORLD dated January 20.—George C. Bowen, Box 154, Fond du Lac, Wis.

Hookup you request is herewith published.

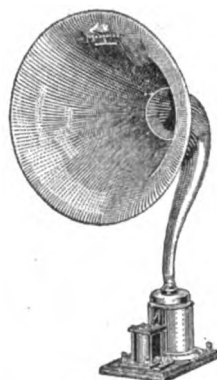


Hookup requested by George C. Bowen. The amplifier uses a separate A battery to light the filament.

MAGNAVOX is "news"

THE constant allusions to Magnavox Radio equipment in the public press, and the numerous illustrations of Magnavox Reproducer in operation, show how profoundly the radio world has been influenced by the Magnavox electro-dynamic principle of sound amplification.

R-2 Magnavox Radio with 18-inch horn



THIS instrument is intended for those who wish the utmost in amplifying power: for large audiences, dance halls, etc., but requires only .6 of an ampere for the field.

R-3 Magnavox Radio with 14-inch horn

SAME in principle and construction throughout as Type R-2. Is ideal for use in homes, offices, amateur stations, etc.

Requires one ampere field current from your filament battery.



Magnavox Power Amplifier—Model C

CAN be used with any "B" Battery voltage which the power tube may require for best amplification.

AC-2-C, 2-Stage and AC-3-C, 3-Stage

The facilities and experience back of each piece of equipment bearing the Magnavox trade mark are unrivalled anywhere in the world.

Magnavox products may be had of good dealers everywhere.

Write to us for illustrated booklet

The Magnavox Company
Oakland, California

New York Office: 370 Seventh Ave.

The DX Nite Owls Break Records

Peanut Tubes and a Home-Made Set

From C. A. Perkins, 342 North Washington, Missoua, Idaho

SINCE several fellows have taken a "crack" at Kenneth Smith at Birmingham, Alabama, I guess I will take one, too, and incidentally step on the toes of M. P. Bailey of this city.

I am using a Reinartz Tuner and one step of amplification. In all I have heard seventy-five different stations. I have heard as high as nineteen different stations during one evening. The following are a few of them: KHJ, Los Angeles; CJCA, Edmondton, Alberta; CJG, Winnipeg; WMAG, Liberal, Kansas; WKY, Oklahoma City; WBAP, Ft. Worth; WFAA, Dallas; WDAF, Kansas City Star; WHB, Sweeney Automobile School, Kansas City; WGF, Des Moines; WLAG, Minneapolis; WOC, Davenport; KSD, St. Louis; KYW, Chicago; WCX, Detroit; WSB, Atlanta; CFCA, Toronto; WGY, Schenectady. Who can beat this with peanut tubes and a home-made set? I have a one-wire aerial sixty feet high and eighty feet long; inverted L.

26 Stations on List

From Norris Johnson, Jr., 96 Prather Avenue, Jamestown, New York

AS a new reader of your publication I wish to state my interest in the department "With the DX Nite Owls." My own records are none too impressive, but they might be of interest to your readers.

My station consists of a vario-coupler, variable condenser of .0005 capacity, V. T. detector and single-stage amplifier. I intend to make a three-circuit regenerative in the near future. The following stations I have heard within the last two months:

New York-Buffalo, WGR; Schenectady, 2XI, WGY; Troy, WHAZ; New York City, WEAJ; New Jersey-Newark, WJZ, WOR; Springfield, Mass., WBZ; Pittsburgh, KDKA; Philadelphia, WIP; Morgantown, W. Va., WHD; Atlanta, Ga., WSB, WGM; Detroit, Mich, WWJ; Indianapolis, Ind., WOH; Chicago, KYW, WAAF, WDAP; Davenport, Ia., WOC; Minneapolis, Minn., WLD, WJAP; St. Louis, Mo., WSD; Kansas City, WHB; D. C. NOF.

In all I have heard 26 stations in 13 states, and the District of Columbia.

On a One-Tube Set

From Jos. Honnors, 134 Wheeler Street, Gloucester, Massachusetts

I AM sending my receiving record for a one-tube set, using a 23-plate variable condenser and a vario-coupler with two switches. The stations I heard are: WNAC, Boston; WGI, Medford; WBZ, Springfield; WGY, Schenectady; WEAJ, New York; WHAZ, Troy, N. Y.; WJZ and WOR, Newark, N. J.; WOO, KDKA, Philadelphia; WWJ, WWI, Michigan; WJAX, Cleveland; WOC, Davenport, Ia.; Montreal, Canada, and many other smaller stations in the East.

We Don't Think So, Either

From Kenyon Duley, 1906 Third Avenue, South Minneapolis, Minnesota

AM a steady reader of the Radio World and have just been reading the DX records of many fans using one tube, so I will send you mine.

WMAC, Cazenova, N. Y.; WDAL, Jacksonville, Fla.; WGY, Schenectady, N. Y.; WGL, Philadelphia; WSB, Atlanta, Ga.;

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

WGAM, Orangeburg, S. C.; WFAA, Dallas, Tex.; WKAF, Wichita Falls, Tex.; WBAP, Fort Worth, Tex.; WPA, Fort Worth, Tex.; CKCD, Vancouver, Can. I also have 16 more under 800 miles. I am using a standard short wave regenerative set consisting of grid and plate variometers, variocoupler and a 43 plate variable condenser. My aerial is a two-wire, inverted T type, twenty-five feet above a three story apartment house. I don't think my record is bad for a home-made set.

Here's What He's Done!

From Frank P. McCullin, 210 West 8th Street, Trenton, New Jersey

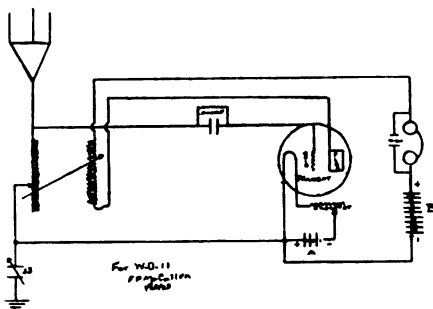
NOT being a DX Nite Owl, as you call them but a fan who has spent considerable time monkeying with radio since it began, and also a regular reader of RADIO WORLD, I am wondering if you would care to see my set, one of three that I use.

This particular set has been giving very wonderful results and considering its simplicity and low cost of construction, there are few who cannot afford to have radio in their home.

One night from 7:15 P. M. until 12:30 A. M., not long ago on the accompanying hook up came KDKA, WJZ, KHJ, WEAJ, WIP, WFAA, KSD, WOR, WCX, WDKF, besides two Trenton local stations. Not only once but numerous times, especially on clear, cool evenings, have I done this.

This set consists of 23-plate variable condenser, Freshman grid leak and condenser combined. Bradley stat (none better on the market and I have tried them all), Essex Bank wound variocoupler, 180°, Atwater Kent socket, WD-11 tube, Red Seal dry battery for the "A," and for the "B" I use a toy transformer I used formerly to run an electric train, and from the house current AC 110 volts, cut down to 22½ volts, with 3-25 watt lamp in series with the socket and the transformer. You'd be surprised!

I would be pleased to give any one any information on this who cares to write to me, for "B" batteries cost money and AC current you use for light anyhow in your room. So it is small expense considering the current used.



One-Tube Circuit of F. P. McCullin

Made It Himself

From Wm. H. Jones, 18 Denver Avenue, Schenectady, New York

HAVE been a Radio World reader for about 6 months now. Three weeks back I make a tube set myself. Detector and one stage amplification. Have received stations at New York and Pennsylvania. The best distance I have made so far is WOS, Jefferson City, Inco., and WOC Davenport, Iowa.

Another Good Crystal Record

From J. R. Young, 663 Pacific Highway, Cottage Grove, Oregon

I DON'T think many can beat my record. I hear KGW in Portland nearly every night they broadcast and KFAC in Eugene loud. On Monday, Jan. 15, I tuned in KFCB in San Francisco, about 500 miles distant. The concert came in fine for about half an hour. My set consists of a vario coupler I made myself and an aeroplane crystal detector, a Murdock condenser and a pair of 3,000 ohm Murdock phones.

25,420 Miles in a Night

From J. E. Bradley, Austin, Texas

LAST night I started working at 5:45 p. m., and was on the air until 3:18 a. m.—9 hours and 33 minutes. I received call letters and names of towns of 41 stations. Had a home assembled set—1 detector and 1 stage A. F. A., using W-D 11 tubes; 16 volts on plate of D tube and 455. on plate of A tube. My farthest point was KPO, San Francisco—an orchestra that was much plainer than several nearer stations. Some of the stations I would get just as they were signing off, and I could work several in short time. I stayed on KSD about 25 minutes. They had the Bell Telephone Orchestra on, and the music was fine. Below is a list of the stations as they were caught.

WAAD, 5:45 p. m., Cincinnati, O., (test), 840; WOC, 5:55 p. m., Davenport, Ia., 700; WSB, 6:45 p. m., Atlanta, Ga., 750; WOAI, 6:50 p. m., San Antonio, Texas, 300; WDAF, 7:00 p. m., Kansas City, Mo., 460; WGM, 7:05 p. m., Atlanta, Ga., 750; WOQ, 7:10 p. m., Kansas City, Mo., 460; WPAC, 7:20 p. m., Okmulgee, Okla., 175; WCAE, 7:30 p. m., Pittsburgh, Pa., 1,100; WCM, 7:32 p. m., Austin, Texas, 175; WAAR, 8:00 p. m., Huntington, W. Va., 940; WEAH, 8:45 p. m., Wichita, Kan., 350; WHAS, 9:00 p. m., Louisville, Ky., 760; KLZ, 9:10 p. m., Denver, Colo., 625; WDAH, 9:15 p. m., El Paso, Texas, 550; WGV, 9:40 p. m., New Orleans, La., 450; KSD, 9:50 p. m., St. Louis, Mo., 575; KFI, 10:20 p. m., Los Angeles, Cal., 1,175; KPO, 10:22 p. m., San Francisco, Cal., 1,425; WLAG, 10:25 p. m., Minneapolis, Minn., 875; WDAP, 10:30 p. m., Chicago, Ill., 825; KDZQ, 11:00 p. m., Denver, Colo., 625; KHJ, 11:20 p. m., Los Angeles, Cal., 1,175; WJAP, 11:40 p. m., Duluth, Minn., 1,025; WJAX, 12:20 a. m., Cleveland, O., 1,000; WJD, 12:45 a. m., Granville, O. (test), 925; WCAL, 1:00 a. m., Northfield, Minn. (test), 850; WDAL, 1:42 a. m., Jacksonville, Fla., 925; WHA, 2:27 a. m., Madison, Wis. (test), 840; 9ZQ, 2:30 a. m., Lincoln, Neb. (test), 550; 8XI, 2:53 a. m., Columbus, O. (test), 940; CFCA, 3:11 a. m., Toronto, Canada, (test), 1,225; WDAJ, 10:47 p. m., College Park, Ga., 750; 2 Waco, 3 Dallas and 2 Ft. Worth stations, which I call local stations. They figure 330 miles. Total, 25,090. Grand total, 25,420.

The Limitless Possibilities of Radio for the American Farmer

By Major-General James G. Harbord

President of the Radio Corporation of America

RADIO and its achievements by General James G. Harbord, President of the Radio Corporation of America, was presented to the listeners-in of the Westinghouse Radio Station KDKA recently. General Harbord's talk in part ran as follows:

"Within the past year and a half a new phase of radio has fascinated the whole civilized world. Radio telephonic broadcasting first successfully initiated on a public service basis by the Westinghouse Electric & Manufacturing Company, though still in its infancy, is already practical. It promises social, political, economic, educational and religious possibilities second only to the art of printing.

"The relations of broadcasting to the farmer group themselves naturally under two heads:

"(1) Utility.

"(2) Entertainment.

"A very casual consideration reveals a much varied application of radio broadcasting to the interests of the farmer. Unquestionably radio emerges from such a survey as a part of the necessary business equipment of the efficiently operated farm. The radio receiving set will be to the farmer what the ticker is to the speculator in farm products. It will be the equipment which will place you on even terms with the manipulator of your markets. The dissemination of market news, weather and market reports stands out obviously as a primary function of broadcasting. It is absurd to argue with an intelligent farmer on the benefit of advance knowledge of weather and markets.

"Radio may perhaps lead to a solution of many of your labor problems. During harvest or other rush seasons when labor supply is of manifest importance to the farmer, broadcasting might well call attention to available labor supply. Acting with your

existing facilities for securing labor, broadcasting will enormously expand their scope. It will contribute to the fluidity of the supply, enabling farmers in need in one region to draw on the labor surplus of another.

"Already through the public health service medical advice is afforded by radio to ships at sea without medical attendance for their passengers and crews, and lives have been saved through such wireless treatment. There is no dearth of information as to proper procedure in case of animal epidemics. The problem is to make such information instantly available. The farmer who in such time of emergency must act promptly either lacks the time or the inclination to consult a distant authority, nor can he safely keep a herd of such steers or cows waiting while he wades through the mass of pamphlets in the hope of finding the particular treatment he wishes. The limiting factor in such cases is accessibility. The same is true of regions where insect pests are devastating crops. By giving the farmer just what he wants when he wants it, broadcasting will widely extend the emergency services of the various agencies which the Government has created to help him.

"Nothing in the farm field is more impressive to an outsider than the extension of co-operative action in recent years. Just as common interest is a powerful motive in co-operation, so the dissemination of common intelligence and the maintenance of contact are conditions which make the promotion of common interest possible. Some of our states have farm bureaus in every county. Information sent out under their auspices would further the purpose of such bureaus, and get their information and their policies to the individual members with the speed of light. One state, for example, has over two hundred grange halls. The state master is investigating radio apparatus with the idea

of placing receiving sets in every such hall. The possibilities of radio broadcasting in facilitating the purposes of farmers' organizations are practically limitless.

"The head of a co-operative group of farm papers has figured that the territory served by his publication includes over five thousand grain elevators, and about the same number of livestock shipping associations. It at once occurs to him that every grain elevator in the region ought to maintain a receiving set in its office for business reasons. It is no less true of the livestock shippers' associations. It is equally true of the intelligent individuals who constitute the membership of such organizations.

"The foregoing are specific applications of broadcasting, meeting specific needs. Perhaps the greatest general utility of radio to the farmer is in tying in with the extension work of the agricultural colleges and schools and the various state organizations devoted to improvement of farm methods. Today a relatively small number of farmers, workers or owners, benefit from such instruction. The exigencies of farm work do not often permit enrollment for full terms. Radio would open the door of the agricultural school to tens of thousands who would otherwise never receive such institutional instruction, and it would enable the student who has been obliged to terminate a short course to continue his studies in many cases under the same faculty. With practical men in charge of such instruction the possibilities of radio in this direction are limitless."

Radio Address by Legion Official

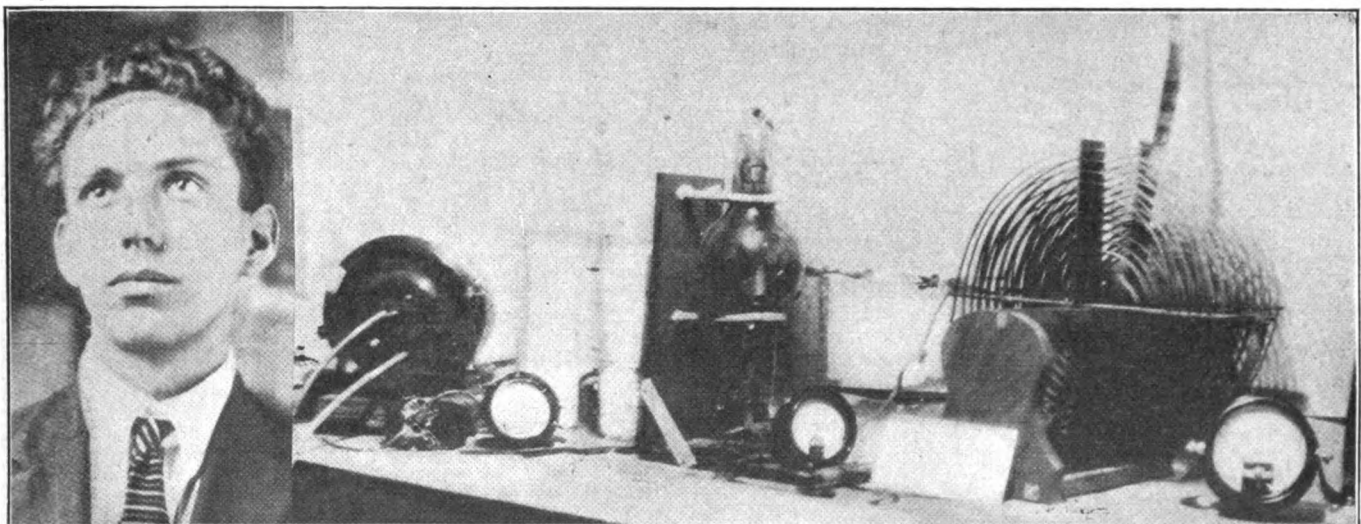
THE United States Veterans of the World War were addressed last week by Lemuel Bolles, National Adjutant of the American Legion, by radio from broadcasting station PWX.

There was a special program of both Cuban and American music, mostly of a military strain, and some of it was reminiscent of war-time days.

The program commenced at 9 o'clock, Eastern Standard Time, and the speech by Mr. Bolles was made about an hour later.

Station PWX has been heard in many parts of the United States and Canada, and as far north as Alaska, with an effective radius of 3,000 to 4,000 miles.

Los Angeles Station Heard in France and China



(C. Kadel and Herbert)

T. E. Nikirk, owner of Station 6KA, located in Los Angeles, and his one tube set. Mr. Nikirk is an old-timer in the game. His pre-war call was 3VU, and his "fist" is well known to a great many amateurs. This station has been heard by ships in the harbor of Yokohama, as well as by stations in France, the calls having been verified by cable and letter. The set shown in the photo is capable of radiating 13 amperes.

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

American Radio Exports Growing

By Washington R. Service

THE exports of wireless and telegraph apparatus from the United States during 1922 showed a very large increase as against the figures for 1921. In 1922 the value was \$3,214,098, compared with \$1,010,891 for 1921.

Radio apparatus exported in 1922 totaled \$2,897,799, and in the month of December, \$163,236 worth of equipment was shipped abroad.

The increase of radio and telegraph apparatus in 1922 was due to the tremendous interest shown in radio throughout the world, appearing even in the most unlikely places. The fascination and appeal of radio appears to be universal, and its development would go forward still more rapidly were better broadcasting facilities provided, the Department of Commerce has announced.

Radio Corp. Granted Temporary Injunctions Against Three Firms

JUDGE AUGUSTUS N. HAND, in the United States District Court for the Southern District of New York, recently handed down decisions in three patent suits brought by the Radio Corporation for infringement of the DeForest audion patents by the manufacture and sale of vacuum tubes for radio purposes. In all three cases Judge Hand granted preliminary injunctions asked for.

The first of these suits was that of the Radio Corporation of America against La France Import & Sales Company, Inc., and others, who are manufacturing and selling a vacuum tube known as the "La France" detector and amplifier.

The second suit was against Harry Rosenthal and others who are manufacturing and selling a vacuum tube detector and amplifier known as the "Perfection" tube.

The third suit was against the Radio Guild, Inc., a dealer in the "Perfection" tubes.

One of the principal defenses urged upon the Court for a denial of the preliminary injunction motions was that Radio Corporation of America had no rights to maintain the suit because the DeForest Radio Telephone & Telegraph Co. was the owner of the DeForest audion patents. This defense, as well as other defenses, were overruled by Judge Hand in granting the preliminary injunctions.

Coming Events

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

FIRST UNIVERSAL EXPOSITION OF INVENTIONS AND PATENTS, Grand Central Palace, New York City, February 17 to 23, inclusive.

FIRST INTERNATIONAL EXPOSITION OF INVENTIONS AND INVESTMENTS, Grand Central Palace, New York City, February 16 to 23, inclusive, 1923.

New Radio Firms

(The new firms and corporations mentioned in these columns can be reached directly or by communicating with the attorneys, whose addresses are given when ever possible.)

Apex Electrical Supply Co., Manhattan, \$20,000; C. M. Lefkowitz, R. Z. Weigbaum, H. Story. (Attorney, B. R. Leinhardt, 44 Court St., Brooklyn.)

Stuyvesant Radio Corp., Manhattan, make electric and wireless specialties, \$10,000; A. Klein, C. W. Hanes, G. M. Jost. (Attorney, I. Cohn, 1540 Broadway.)

H. P. Hauser, Manhattan, make electric supplies, \$10,000; H. P. Hauser, C. J. Schreff. (Attorney, F. W. M. Schreff, 580 Teasdale Place.)

Kaskade Radio Corp., \$250,000; Theodore L. Ernst, S. E. Freeland, Samuel Baras, New York. (American Guaranty & Trust Co.)

Rose & Tomson, Manhattan, electrical contracting, \$10,000; J. Tomson, A. T. Rose. (Attorney, J. P. Bromell, 17 East 42d St.)

Radio Stocks

(Quotations as of February 14, 1923, furnished by Frank T. Stanton & Company, 35 Broad Street, New York City, Specialists in Wireless Securities.)

Stock	Bid	Asked
American Marconi Stamped.....	5c	15c
American Marconi Unstamped.....	\$5	\$7
American Tel. & Tel.....	122½	122½
Canadian Marconi	2½	3½
De Forest Radio.....	7	12
Dubelier Condenser	6	6¼
English Marconi com.....	12	15
English Marconi pfd.....	12¼	15¼
General Electric	188¼	189
Hennessy Publications	9	11
Mackay Company com.....	110	115
Manhattan Elec. Supply.....	53	55
Marconi Int. Marine.....	8	10
Radio Corporation com.....	3¼	3¾
Radio Corporation pfd.....	3¼	3¾
Spanish Marconi	1¼	2¼
Western Union	115	115¾
Westinghouse E & M.....	62¼	63

GOOD-WILL

By DR. FRANK CRANE

Many people regard the "good-will" of a concern as more or less an airy nothing. They are inclined to smile at it.

Looked at one way, it seems quite tenuous. Over a century ago Lord Eldon defined good-will as the "probability that the old customers would resort to the old place."

In the practical business world, however, this mere tendency of mind is of immense and solid value.

Millions of money have been spent for Sheffield cutlery, for Delft pottery, for Venice glass, for Paris fashions, for Gobelin tapestry and for Cremona violins, money which was drawn to these goods simply because of good-will.

Good-will may be intangible and invisible, but so is electricity. And electricity is very powerful.

What is known as "watered stock" has in many instances been nothing but good-will. And this was so powerful that the profits accumulated squeezed out the water, and the public has eventually bought the stocks at a price many times the value of that originally represented by the visible assets.

All business is built on service, and good-will representing public opinion of that service comes near to being the foundation of business.

Great fortunes are built up on good-will which is fed by proper advertising.

In times past monopoly was supposed to be the basis of great merchandising success. In the modern world, however, monopoly is becoming more and more difficult, if it is not becoming impossible. In other words, good-will is eating up monopoly.

Good-will recognizes the public as the final arbiter. It makes a man's success rest not upon a patent right or a government privilege, but upon the favor of the people.

Instead of this foundation being a shifting or an uncertain one, its solidity will be made plain to you if you will step into the next shop and inquire what goods have the greatest sale. You will find that it is those goods which rest upon a strong and vigorous good-will which has been built up by persistent and judicious advertising.

For instead of being a by-product of modern business, advertising is its very basis.

(Copyright, 1923, by Frank Crane in New York Globe.)

Broadcasting Programs of Unusual Attractiveness from Feb. 25 to March 3

WGY

General Electric Co., Schenectady, N. Y.,
Week of Feb. 25, 1923.
Eastern Standard Time
Radio Broadcasting Program of WGY for Sunday, Feb. 25, 1923.
10:30 a. m.—Morning service of Albany Street Methodist Church, Rev. A. D. Angell.
4:30 p. m.—Vesper service, with sermon by Rev. A. F. Marcle, pastor of Lisha's Kill Reformed Church.
7:30 p. m.—Evening service of Albany Street Methodist Church, Rev. A. D. Angell.

MONDAY, FEB. 26

12:00 m.—U. S. Naval Observatory time signals.
12:30 p. m.—Noon stock market quotations.
12:45 p. m.—Weather report on 485 meters.
2:00 p. m.—Music and Household talk, The Decorative Rickrack Braids. (Courtesy of "Modern Priscilla" Magazine.)
6:00 p. m.—Produce market and stock market report and quotations; news bulletins.
7:45 p. m.—Musical program, furnished through the courtesy of Consolidated Car Heating Co., Albany, N. Y.
1. Orchestra selection—"Who Cares"..... Bornstein
..... Consolidated Orchestra
Weldon J. Vall, piano; L. Bomback, violin; S. E. Hevers, violin; G. Weingarten, cornet; R. Stewart, cornet; E. Whitby, French horn; H. Alexander, saxophone; Guy Griffin, banjo; J. F. Hill, banjo; Earl Burns, drums and xylophone; J. M. Colton, clarinet—leader.
2. Selection—"Kentucky Babe"..... Geibel
..... Consolidated Glee Club
Eugene Hart, 1st tenor; G. Pickett, 1st tenor; Clement Serll, 2nd tenor; C. H. Van Leuvan, 2nd tenor; H. J. Male, 2nd tenor, director; Guy Griffin, 1st bass; H. Alexander, 1st bass; Geo. Truesdale, 1st bass; J. F. Hill, 2nd bass; W. Frederick, 2nd bass; Elmer Ludlum, 2nd bass.
3. Piano solo—"Military Polonaise"..... Chopin
..... Catherine Anderson
4. Tenor solo—"Thora"..... Adams
..... Hugh J. Male
5. Waltz—"Moon River"..... David
..... Consolidated Orchestra
6. Mixed Quartet—"Smile Through Your Tears"..... Hamblen
..... Jessica M. B. Male, soprano; Catherine Anderson, alto; H. J. Male, tenor; W. Frederick, bass.
7. Address—"The Kenetron Rectifier"..... General Electric Company
8. Selection—"Smilin' Through"..... Penn
..... Consolidated Glee Club
9. Piano duet—"Third Eroica Symphony"..... Beethoven
..... "Allegro Con Brio"
..... Catherine Anderson and Weldon J. Vall
10. Tenor solo—"If I Were a Rose"..... Hesselberg
..... Hugh J. Male
11. Instrumental selection—"The World Is Waiting for the Sunrise"..... Selts
..... Consolidated Orchestra
12. Selection—"I Shall Meet You"..... Sanderson
..... Mixed Quartet
13. Bass solo—"Out on the Deep"..... Lohr
..... W. Frederick
14. Selection—"Can't Yo' Heah Me Callin', Caroline?"..... Roma
..... Consolidated Glee Club
15. Fox Trot—"Just One More Dance"..... Curtiss
..... Consolidated Orchestra

TUESDAY, FEB. 27

12:00 m.—U. S. Naval Observatory time signals.
12:30 p. m.—Noon stock market quotations.
12:45 p. m.—Weather report on 485 meters.
2:00 p. m.—Music and Household talk.
6:00 p. m.—Produce and stock market quotations; news bulletins.
7:40 p. m.—Fish Raising and Planting. How the Supply is Kept up for New York State Fishermen. Sumner N. Cowden, field superintendent, State Conservation Commission.
7:45 p. m.—Radio Drama, "Why Smith Left Home."
1. Instrumental selection—"Greenwich Village Follies"..... Victoria
..... WGY Orchestra
2. Farce—"Why Smith Left Home"..... George Broadhurst
..... THE CAST
John Smith, who loves his wife and lives in New York—Edward H. Smith
General Villietboux (his wife's second husband)..... Frank Oliver
Count Von Guggenheim (who made them twisted)..... Frank Finch
Major Duncombe (with memories of last night)..... James S. B. Mullarkey

Bob Walton (Mrs. Smith's brother)..... Edward E. St. Louis
Mrs. John Smith (who loves her husband no matter where he lives)..... Viola Karwowska
Miss Smith (a lady in waiting)..... Ida Myrick
Julia..... Mildred Le Tarte
Act I.—In the Smith's Apartment.
Morning.
3. Instrumental selection—"Valse Divine"..... Reynard
..... WGY Orchestra
4. Farce—"Why Smith Left Home"..... Act II.—Same as Act I.—Afternoon
5. Instrumental selection—"Medley Overture"..... Stasny
..... WGY Orchestra
6. Farce—"Why Smith Left Home"..... Act III.—Same as Act I.—Evening
7. Instrumental selection—"Blue Jackets March"..... Emerson
..... WGY Orchestra

WEDNESDAY, FEB. 28

12:00 m.—Time signals.
12:30 p. m.—Stock market quotations.
12:45 p. m.—Weather report on 485 meters.
6:00 p. m.—Produce and stock market quotations; news bulletins.

THURSDAY, MARCH 1

12:00 m.—U. S. Naval Observatory time signals.
12:30 p. m.—Noon stock market quotations.
12:45 p. m.—Weather forecast on 485 meters.
2:00 p. m.—Music and address.
6:00 p. m.—Produce and stock market quotations; news bulletins.
7:45 p. m.—Concert program.
1. Instrumental selection—"York Pageant Music" (Request)..... Noble
..... WGY Orchestra
2. Contralto solo—"Still Wie die Nacht"..... Bohm
..... Emilie Henning
3. Instrumental selection—"A La Bien Aimee"..... Schutt
..... American Trio
4. Piano solo—"Japanese Study"..... Poldini
..... Elmer Tidmarsh
5. Cello solo—"Sarabande"..... Correlli
..... Ernest Burleigh
6. Contralto Aria—"Ombra Mai Fu," from the opera "Serse"..... Handel
..... Emilie Henning
7. Instrumental selection—"Reve Angelique" (Request)..... Rubinsteln
..... American Trio
8. Address—"Dust Explosions"..... (Courtesy of U. S. Dept. of Agriculture.)
9. Instrumental selection—"Serenade, Op. 29"..... Chaminade
..... American Trio
10. Piano solo—"Juba Dance"..... Dett
..... Elmer Tidmarsh
11. Contralto solos—(a) "The Birth of Morn"..... Leoni
..... (b) "The Kerry Dance"..... Molloy
..... Emilie Henning
12. Violin solo—"Sonata"..... Solomonsen
..... "Second Movement"
..... Edward A. Rice
13. Instrumental selection—"Prelude"..... Jarnefelt
..... WGY Orchestra

FRIDAY, MARCH 2

12:00 m.—U. S. Naval Observatory time signals.
12:30 p. m.—Noon stock market quotations.
12:45 p. m.—Weather forecast on 485 meters.
2:00 p. m.—Music and Household talk.
"Finance in the Home," Mrs. Edward P. Presse.
6:00 p. m.—Produce and stock market quotations; news bulletins.
6:30 p. m.—Reading from "Grimms' Fairy Tales," by Kolin Hager.
7:40 p. m.—Health talk.
7:45 p. m.—Concert program.
1. March—"Leyton"..... Atmay
..... Salvation Army Band, Samuel Slater, Director
2. Tenor solo—"My Dreams"..... Tosti
..... Ernest A. Morris
3. Cornet solo—"Tramp, Tramp"..... Goldman
..... Arthur Stone, with band accompaniment
4. Selection—"The Unseen Line"..... Hawkes
..... Salvation Army Band
5. Reading—"The Inventor's Wife"..... Anon
..... Maude Lenox
6. Euphonium solo—"Old Folks at Home"..... Foster
..... Albert Tompkins
7. Tenor solo—"Life"..... Speaks
..... Ernest A. Morris
8. March—"Fielding"..... Scotney
..... Salvation Army Band
9. Brass Quartet—"Franconia"..... Goldsmith
..... Charles Fahye, cornet; John Galloway, euphonium; Fred Fahye, cornet; Albert Tompkins, euphonium.
10. Reading—"Dagobert, The Jester"..... Nesbit
..... Maude Lenox
11. Selection—"Eventide" (by request)..... Rimmer
..... Salvation Army Band
12. Tenor solo—"When You're Near"..... Brown
..... Ernest A. Morris
13. March—"Pensance"..... Langworthy
..... Salvation Army Band

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15. March—"Stand to Arms".....Marshall
..... Salvation Army Band

FRIDAY, MARCH 2
(Late Program)
10:30 p. m.—Musical program.
THE RAGGETY-TAGGETY MINSTREL SHOW
Part I.
Grand Opening Number—Medley of Southland Melodies.....Clarkson
..... WGY Orchestra
"Radiominstrelsy"..... Raggety-Taggety Minstrels
Male Quartet Selection—"My Old Kentucky Home".....Foster
..... Radio Four
Some "Black Trash"..... Raggety-Taggety Minstrels
Tenor Solo—"Faded Love Letters"..... Moore-Dulmadge
..... Rastus Johnson
Orchestral Selection and Finale to Part I. Medley of Recent Poular Southern Songs, including "Lovin' Sam," "Carolina Rolling Stone," "Swanee Cradle," "Away Down South."
..... WGY Orchestra
..... Radio Four
Olio..Novelty Xylophone and Banjo Selections
THE RAGGETY-TAGGETY MINSTREL SHOW
Part II.
Orchestral Selection....."School Days"
..... WGY Orchestra
The Dark Town Village School..... Raggety-Taggety Minstrels
Male Quartet Selections:
(a) "Kentucky Babe".....Geibel
(b) "Hangin' out de Clo'es".....Hall
..... Radio Four
Driving Away the Blues..... Raggety-Taggety Minstrels
End Man Song—"When My Shoes Wear Out from Walkin', I'll Be on My Feet Again"
..... Schroeder
..... Lew Washington
Humorous Dialogue..... Lew Washington and George
..... Lew Washington and George
Orchestral Selection—Medley—"Echoes from Dixie".....Rochford
..... WGY Orchestra
Male Quartet Selection—"Carry Me Back to Old Virginny".....Foster
..... Radio Four
"Jokefest".....Raggety-Taggety Minstrels
Bass Solo—"Asleep in the Deep".....Petrie
..... Nichodemus Samson
Grand Finale.....Minstrels and Orchestra

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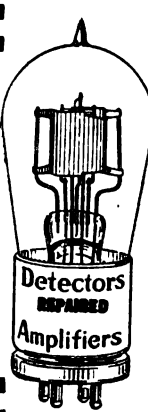
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Radio Beacons Guide in New York Harbor

THE three radio beacons used to guide ships into New York Harbor and to keep coastwise steamers in their course are on Fire Island Lightship, Ambrose Lightship and Sea Girt Light station, says the New York "Times." The radio apparatus of each beacon sends out a definite signal at regular intervals, enabling the radio compass operator on board a vessel to take a bearing or determine the position of the ship. To eliminate interference time schedules have been arranged for each beacon. The Sea Girt beacon sends a group of three dashes for sixty seconds, with a short interval between each group, and then is silent for six minutes.

Fire Island sends a series of two dashes for twenty-five seconds and is silent twenty-five seconds. Ambrose beacon broadcasts a series of one dash for twenty seconds and remains silent for twenty seconds before sending the next series of dashes. The signals are repeated rapidly, so a vessel can quickly find its hearing. Sea Girt, for example, transmits about forty groups of dashes a minute. The beacons operate on schedule continuously during foggy or hazy weather on a wave length of 1,000 meters. The power of a beacon is approximately one kilowatt. An automatic motor-driven timing switch is provided to produce the desired signal at regular intervals.

Spring Radio Survey in Alaska

THIS spring when a field party from the Coast and Geodetic Survey journeys to Alaska to make a longitudinal survey, radio will play an important role. Previously the line telegraph has been used to secure standard time signals for surveys of this sort, but in remote places beyond the ordinary confines of habitation, telegraph lines do not always extend.

In order to receive at any desired point, the party will be equipped with a special portable radio receiving set built at the Bureau of Standards, which with the aid of relays will record saw-tooth lines on a revolving drum, indicating the pulsations of the standard time clocks at Annapolis and San Diego, three and two thousand miles distant. At eight temporary stations on the shores of Alaska from Dixon Entrance to Skagway, the portable station will be erected and the time signals received by wireless for comparison with local astronomical time in checking the exact longitude. Previous experiments in the southwest in radio reception showed that it was possible to record time signals with an error of less than 100th of a second. The Navy will send out special signals at a time convenient for their reception by the scientists.

To many anxious inquirers: **RADIO WORLD** has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade

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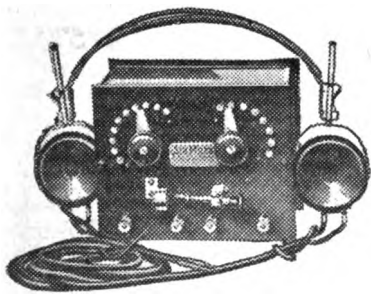
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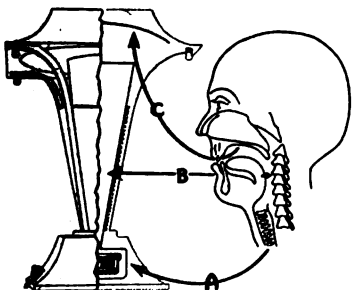
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Robert L. Dougherty

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Microphone Connection in the Waldorf-Astoria Hotel

THE radio broadcasting apparatus of station WJZ, Newark, is now connected to a microphone in the turret on the northeast corner of the Waldorf-Astoria Hotel. And, as explained by the New York "Times," inconvenience and loss of time resulting from a trip to Newark prevented many entertainers from going there. The wires connecting the microphone run under ground to Sixth Avenue, where they emerge and join with WJZ'S extension to St. Thomas' Church, and then run to Walker Street, where they pass through a switchboard used exclusively for WJZ'S extensions. Three copper wire cables lead from the switchboard through the tunnel to New Jersey, where they mount the Western Union poles and continue to the Westinghouse radio station at Newark to be broadcast to the many thousands of listeners.

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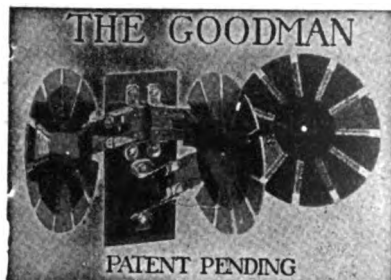
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"The One Outstanding Problem Is That of Broadcasting"

So Says Hon. Ralph C. Watrous, Former Lieut. Governor of Rhode Island, in an Analysis of a Questionnaire Conducted by the National Radio Chamber of Commerce

ACCORDING to the results of a nationwide inquiry, conducted by the National Radio Chamber of Commerce, for the purpose of establishing a standard on

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which radio broadcasting can hereafter be based, certain outstanding facts were brought forward. Foremost among them is that fewer and better stations should be established. An important drawback to present-day broadcasting is the number of stations that are working on a narrow band of wave lengths and consequently interfering with one another to an extent that it is a nuisance.

The Chamber of Commerce sent a questionnaire to persons representing various phases of the broadcasting art, from manufacturer to listener. The replies were analyzed in a statement made public by former Lieut.-Governor of Rhode Island, Ralph C. Watrous, who is now a member of the Special Committee of the Chamber of Commerce, appointed to make a study of the situation, and to make recommendations that would benefit the greatest number of people.

The Chamber warns that a serious economic question exists and asserts its purpose "to keep broadcasting within the hands of the public, to whom this means of new communication belongs." Passage of the White Bill giving greater power to the Department of Commerce is urged.

Response to the Questionnaire

"The one outstanding problem is that of broadcasting," says the statement. "The response to the questionnaire was very gratifying and pointed the way in several directions very clearly. Most prominent of all was the idea of 'fewer broadcasting stations with better programs.' No exact number of stations was generally recommended; and this could not well be as the range of stations is so rapidly changing, both as to their efficiency and also as to the steadily increasing receiving range of more efficient receiving sets. But that progress would be more rapid when we realized the necessity for fewer stations seems a perfectly safe deduction from the answers to the questionnaire.

"The matter of 'better programs' seems to be very naturally related in the minds of those answering to the expense of furnishing really good programs, but it does not seem to matter who pays for it or how. The more people who can be served by a single station the less, of course, the expense per listener! This economic question is a very serious one and in the interests of the general radio public must be dealt with very carefully. However, of course, the people as a whole interested in radio must finally in some way pay the bill.

"Another matter clearly brought out by the questionnaire was that proper legislation should be enacted in Congress that would not only safeguard our Federal departments but give to Secretary Hoover's department the power to so regulate radio, and broadcasting in particular, that the greatest service shall be realized by the greatest number.

"It would seem that the questionnaire also clearly indicates a line separation between

public broadcasting stations from the stations operated largely in experimental work by our amateurs who served such a useful purpose during the war and who have done much constructive work. They must have a place, but their power and range must not be allowed to interfere with the public's use of this new means of communication to an unreasonable extent.

"The question of wave lengths was dealt with in the questionnaire but this is a matter that will have to have much thorough study and any solution of this problem can only be covered temporarily as changing conditions will make necessary frequent changes in any provision inserted in the new law.

"The White Bill now pending in Congress provides for a Radio Council and the selection of this Council made in a way to really represent the whole radio public is about as important a matter as confronts us. We frequently hear the idea expressed that the more broadcasting stations the better, for a great number will sooner awaken the public to the impossibility of satisfactory service under a system of numerous stations.

"This is absolutely wrong and the National Radio Chamber of Commerce believes that all that is needed is to call attention to the necessity of reduction and the American public will respond and make its wants known in no uncertain way.

Not Favoring Any Group

"It was made clear in the questionnaire that answers were not desired if they were to be given with the spirit and intent of favoring any group, class or corporation; but rather that the matter shall be so considered and the answers so given that it would be apparent the interests of the government and the entire radio public were paramount."

The number of radiophone sets licensed by the Department of Commerce for transmitting purposes in the United States totals approximately 570, it was said. Data covering 340 of the broadcasting stations has been gathered by the Chamber in a study of transmitting range.

It was found that forty stations have a range of fifty miles, sixty-nine stations a range of 100 miles, seventy-three of 200 miles, forty-three of 300 miles, eight of 400 miles, sixty-one of 500 miles, eight of 700 miles, seventeen of 1000 miles, nineteen of 1500 miles, and two of 2000 miles. The weighted mean transmitting range of all broadcasting stations in the United States was given as 368 miles.

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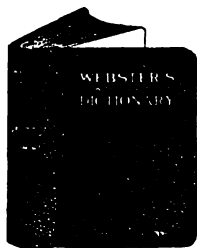
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Answers to Readers

(Continued from page 19)

1. In January 27 issue of RADIO WORLD you published an article by John Kent. Where are the phones to be connected in the diagram?

2. How many volts should the A battery be?

3. What is a jack?

4. What ohmage should the phones be?

5. How high should my antenna be in order to get good results?

6. How far is it possible to receive with this set?

7. What is a vernier?

8. Which should be the positive and negative connections on the batteries?

9. How high will this set tune?

10. Can a loud speaker be used with this set?—Antony Loscalzo, 327 East 12th St., New York.

1. The phones are connected at 6 and 9 in the diagram, by means of jacks and plugs.

2. The A battery should be 1 1/2 volts. Connect 2 dry cells in parallel for this circuit, so that each tube will get 1 1/2 volts.

3. A jack is a mechanical device which makes it possible to connect and disconnect the phones, without changing wires, or using any switches. They are made in single circuit, double circuit, single circuit filament. The last mentioned automatically shuts off control, and double circuit filament control. The current from the filament when the plug is disconnected from the set.

4. There is no set ohmage for phones, but either 2000 or 3000 ohms is the most popular, and is recommended.

5. About 50 feet will be O. K., but it is not absolutely necessary. Good results have been obtained with antenna strung 10 to 12 feet above ground. Erect your antenna as high as you can, and don't worry about it.

6. You should have no trouble in receiving upwards of 100 miles with this set, if care is taken in the construction, and you have a good ground.

7. A vernier is a mechanical device which makes it possible to obtain very minute and fine adjustments. In the case of a condenser, it is generally an extra plate, which is operated independently of the rest of the movable plates, and with which it is possible to get much finer adjustment than by the use of the regular plates. Some condensers have additional attachment on the dial, by which it is possible to turn the entire plate section, a minute adjustment. In a rheostat, it is generally an extra turn of resistance wire, worked on the same principle.

8. The positive (+), which was omitted in the diagram you mention, should be the connection on the right hand side of the drawing, or the small plate in the drawing. For the detector, it is the tap with the arrow. The filament battery is optional, but it is better if the right hand connection in the drawing is made the positive.

9. With the ordinary variometer, this set will tune to approximately 600 meters.

10. A loud speaker can be used with this set.

* * *

I have considerable trouble with local interference. I have a Westinghouse RA combination receiver and amplifier. It has been suggested that I make two coils and use condensers and put same in parallel with the antenna and ground. Must I use the same size condensers as those used in the set, and what should be the size of the coils?—Henry F. Umer, Norwich, Conn.

We refer you to the article on filter circuits by Frederick J. Rumford, in Radio World No. 44, dated Jan. 27. It gives a complete description of all coils used as well as capacities of condensers. It is not necessary to use two filter circuits in one receiving circuit. One is sufficient. The value of the condenser capacity should be approximately .001.

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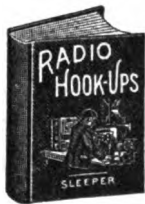
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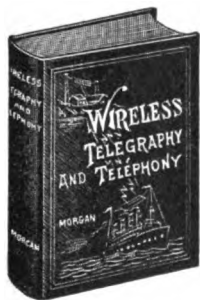
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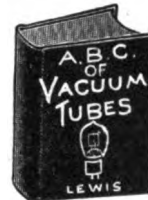
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By ARTHUR J. WHEED. A practical treatise showing in detail the construction of a small dynamo or motor, the entire machine work of which can be done on small foot lathes. Dimensioned working drawings are given for each piece of machine work, and each operation is clearly described. This machine, when used as a dynamo, has an output of fifty watts; when used as a motor it will drive a small drill press or lathe. It can be used to drive a sewing machine on any and all ordinary work. The book is illustrated with more than sixty original engravings showing the actual construction of the different parts. Price, \$1.00

Any of These Books Sent Prepaid on Receipt of Price.
The 11 Books for \$10.00, to One or Different Addresses.

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ROOM 326, NO. 1493 BROADWAY, NEW YORK

Credit Where Due

I have received RADIO WORLD in which you printed my little article. I did not intend to convey the impression that the hook-up of which I sent diagram was original with me. It is one used by the Electrical Research Corporation of Chicago. If necessary, or expected from a standpoint of cour-

tesy, kindly give the credit for the hookup to the proper persons. The only thing original about the set is in the variety of instruments used and the method of incorporating them on a panel.

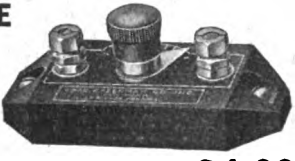
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H. H. FULLERTON,
Waterbury, Vt.

White's "Varloment" Cement
Make your own cells. Construct variometers, vario-couplers, etc. No distributed capacity. Holds windings securely and permanently.
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GALENA CRYSTAL
mounted in special prepared metal 80c. Unmounted 35c. All guaranteed. Manufacturers, dealers and jobbers write for quantity prices.
We also manufacture Radio parts to order.
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FREE DIAGRAM AT YOUR DEALER
of the Flewelling Super Circuit
FRESHMAN PRODUCTS Especially Adaptable for this Circuit

VARIABLE RESIST-LEAK



With .00025 mfd. Micon Condenser Combined **\$1.00**
Without Condenser **75c**

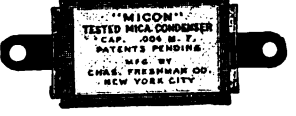
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No antenna or aerial needed. Eliminates all the inconveniences in radio; operates from any light socket. Price only..... **\$2.00**

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"MICON"



.006 Mica Condenser **\$1.00**
.001 Mica Condenser **40c**

OTHER "MICON" SIZES

Size	Price	Size	Price
.00025	\$.35	.0025	\$.50
.0005	.35	.005	.75
.002	.40	.01	1.50

At your dealer's—otherwise send purchase price and you will be supplied without further charge. A diagram of the Flewelling "Super" Circuit sent free if your dealer can't supply you.

First Radio Music for An Indian Dance

TROY, N. Y.—Sioux Indians to the number of 160—many of them ex-warriors of the Custer Battle of June 25, 1876, and a number of former Carlisle, Pa., students—gathered one evening last week at Lone Eagle's ranch at Winnett, Montana, and danced to music of the Rensselaer Polytechnic Institute Students Orchestra, broadcast from radiophone station WHAZ at Troy, N. Y., approximately 2,500 miles distant. And at the request of Lone Eagle—who discovered when he first "listened in" a month ago that "Big Chief WHAZ with the Mighty Voice" could be heard clearly three-fourths of the way across the continent—the Students Orchestra played "In the Land of the Sky Blue Waters" and other modern Indian airs for the entertainment of the descendants of the first Americans.

It came about thus that the oldest engineering college, which has developed the art of broadcasting to the furthest reaches of the continent from Alaska to Panama in a few months, provided radio music for the first time for an Indian dance last month.

The Troy Polytechnic inaugurated this winter an international radio program from midnight to 1:30 A. M. on the second Monday night of each month. Immediate response came from remote points in all the Western States, Canada, Alaska, Mexico, Cuba and Panama.

"Hard and Soft" Vacuum Tubes

WHY are some vacuum tubes termed "hard" and others "soft"? A "soft" tube, the type recommended for use as a detector, does not have a high vacuum and contains some gas or gases. So explains the New York "Times." The "hard" tube, used as an amplifier, contains a high vacuum and requires a higher B battery voltage for successful operation. The X-ray developed the terms "soft" and "hard" as descriptive of vacuum tubes. It has been explained by X-ray specialists that a "soft" X-ray tube contains gases and produces feeble rays. A "hard" tube has a higher vacuum and requires a higher plate voltage for its operation. The rays of such a tube are very penetrative and are known as "hard" rays. The "soft" detector tube generally requires 22½ volts, and the "hard" amplifying tube 45 to 60 volts, B battery.

Young's Seminars **Greenwich Radio Co.**
185 GREENWICH STREET NEW YORK, N. Y.

TUBES IN STOCK

WESTERN ELEC. VT1	DETECTOR UV 200
WESTERN ELEC. VT2	AMPLIFIER UV 201

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Brandes Superior \$5.50
Original Baldwin 8.95
Original Single Baldwin 4.50
New Murdock, 3000 Ohms 4.25

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Sleeper, 23 pl. Vernier \$3.75
Sleeper, 43 pl. Vernier 4.45
Eagle Moulded Genuine Bakelite Variometer 4.95
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SLEEPER RHEOSTAT, List Price, \$1.00; OUR PRICE..... .29
W. D. II TRANSFORMERS..... 3.25

BRISTOL LOUD SPEAKER..... \$18.00

CROWN TRIPLE COIL MOUNTINGS..... \$3.25
Honeycomb Coils in all sizes.

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STANDARD RADIO APPARATUS BARGAIN PRICES —AT—

Every item listed in this advt. is guaranteed by us to be new and in original cases. Our guarantee of satisfaction or money refunded still prevails.

BARGAINS EVERY DAY



SUNBEAM

Dictograph Loud Speakers	..... \$15.00	Koehler Condensers—	
Dictograph Phones	..... 5.60	23 Plate Vernier	..... \$3.50
Federal Phones	..... 5.25	43 Plate Vernier	..... 4.00
Brandes Phones	..... 5.40	A. B. C. Condensers—	
\$7.50 Murdock Phones, No. 57,		43 Plate	..... 2.25
3000 Ohms	..... 4.75	Baldwin Phones, Type "C"	..... 9.50
Radio Corporation Transformers	..... 5.80	Master Baldwin Loud Speaker	..... 5.50
U. V. 712	..... 5.80	Acme Transformers	..... 4.25
Radio Corporation Transformers	..... 5.45	Columbia Moulded Variometers	..... 3.85
U. V. 1714	..... 1.40	Anderson Glass Enclosed Variable Condensers for table or panel mounting.	
Federal Potentiometers	..... .79	43 Plate	..... 2.75
Klonsner Vernier Rheostats	..... .76	23 Plate	..... 2.35
Fitzgerald Rheostats with dial	..... 1.25	Triple Bank Wound Coil for N. A. A. 150 to 3000 meters.	..... \$2.75
Cutter Hammer Vernier Rheostats	..... .85	Silk Wire on Bakelite Tube	..... \$2.75
Cutter Hammer Plain Rheostats	..... 4.10	Hook-up using this coil, which has brought in Havana, furnished upon request.	
Radio Stores Variable Condensers, Balanced Shaft, Bakelite Ends with knob and dial.	..... 3.75		

MONEY ORDER OR CERTIFIED CHECK MUST ACCOMPANY ALL ORDERS

SUNBEAM ELECTRIC CO.
71 THIRD AVE. (Bet. 11th and 12th Sts.) NEW YORK
Farm Lighting Plants at Bargain Prices.

Complete List of Broadcasting Stations

READERS of RADIO WORLD will be interested in the fact that a complete list of all the broadcasting stations has been prepared in the form of a handy booklet, showing all the particulars of the stations. It can be had for the asking by simply sending a letter, enclosing your address and a two-cent stamp to cover return postage, to Modell's, 58 Church Street, New York City. It is a most complete little volume and there are many amateurs who can use it.

On Thursday evening, February 22, the WGY Players will produce William Gillette's melodrama, "Secret Service."

Radio a Blessing for the Shut-Ins

SURROUNDED by snow from twenty-five to thirty feet deep, and in a country reached but once in six months by mail, E. E. Carter writes WGY, the Schenectady radio station of the General Electric Company, that the deadly loneliness of the past has been dissipated by music-laden waves which nightly pass his antenna. He gets each day's news as early as the man in the city gets his; the voices of men and women in song and speech seek him out, and the music of many instruments penetrates his cabin walls.

The man in the city has the choice of many forms of pleasure; his radio set is a diversion for the "evening at home." There are many lonely men and women who have no choice of pleasures, and for whom broadcast music is the only relief from a monotonous existence.

Every broadcasting station receives letters from the lonely people of the country, who find it difficult to express the pleasure that has been put into their lives. WGY has received letters from bedridden people, who say their only relief from suffering comes during the hours of radio reception. In addition to the invalids who have been imprisoned in a single room for years there are the patients and inmates of institutions, as well as those confined behind stone walls and barred doors and windows.

Then there are the lonely men whose work keeps them from centers of population and attendant pleasures. Keepers of lighthouses and lightships along our sea-coast, fire and game wardens in our forests and on our mountains, and men in lumber camps and in mines.

Mr. Carter, referred to in the opening paragraph, writes WGY:

"We are located well away from all electric disturbances and at an altitude of over 7,000 feet. We are about fifty miles north of Payette Lakes and well back in the mountains. We get mail only by dog-team and only about once in six months, and have from twenty-five to thirty feet of snow. Radio service such as yours is fully appreciated under such circumstances." Mr. Carter is located at Holte Mine, McCall, Idaho.

H. L. Thomas, a lighthouse keeper at Cape Poge Light Station, Edgartown, Mass., writes: "I am writing you with a great deal of gratitude and pleasure. I am a light keeper, and am classed among the shut-ins. We look forward to your Sunday services, and enjoy your musical programs, especially the dramas. We are located three miles from a small town and are practically alone all of the time, and the radio has indeed proved a blessing."

National Radio Exhibit Planned

AN exhibit commencing with the first efforts of the human race to communicate with each other and extending down to the latest inventions in radio transmitting and receiving apparatus is being planned by the U. S. National Museum at Washington, D. C.

Through the co-operation of the Signal Corps of the Army, experts of the Museum are outlining a series of exhibits showing the development of mechanical means for transmitting intelligence. Starting back in the days of runners, the series of models will illustrate the mounted messenger, the postal service, visual signalling, the heliograph, wire communications, and finally the modern methods of radio telegraph and telephone communication. Many of the exhibits will be actual pieces of apparatus used in this country and abroad which will show graphically the history and development of our present communication systems.



WALCON Radio Frequency Transformers

Brings in distant stations on a loop—perfect reproduction. No distortion.

THE BEST YOU CAN BUY

WALCON Transformers are tested and guaranteed. Particularly adapted for use with W.D.11 tubes.

Four new hook-ups, including a new reflex circuit furnished without charge with each transformer.

Price, \$4.00. We pay postage.

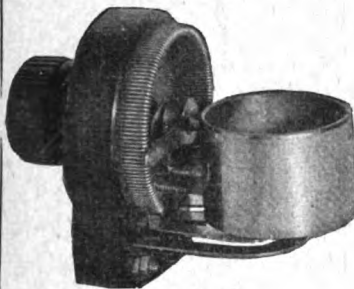
Dealers and jobbers: Write for our attractive sales proposition, backed by national advertising.

Manufactured by

THE RADIO CENTRE, 2 W. Broadway, N.Y., N.Y.

Radio Perfection

is attained only by the use of mechanically and scientifically perfect parts.



Ajax Socket Rheostat

A combination V-T Socket and Rheostat for panel mounting. Entirely eliminates separate leads between socket and Rheostat and provides a panel-mounted socket without the use of additional brackets. Simplifies the installation and hook-up. Strongly constructed. Metal parts heavily nickel-plated.

Type A-1, 5 Ohms—with knob and pointer, each \$2.00. Type A-2, 5 Ohms— $\frac{1}{4}$ inch shaft without dial, list each \$2.00

Now, more than ever, when the market is flooded with inferior goods, one cannot be too careful in the selection of standard, trade-marked articles, and in purchasing from a reliable source.

It is our aim to supply the highest standard radio specialties, thus insuring perfect results and satisfaction.

Every article we sell is unconditionally guaranteed both by the manufacturer and this organization.

FREDERICK H. PRUDEN

Incorporated



993 Bergen Avenue
Jersey City, N. J.

DO NOT BE CONFINED TO LISTENING IN ON THE NEARBY STATIONS, WHEN BY INSTALLING THE

Genuine and Guaranteed Capitol

"ALL WAVE" COUPLER

(Trade Mark)

Patents Granted

in your set

you can receive remarkably clear and selective broadcast entertainment

from Stations

THOUSANDS OF MILES AWAY

and on any

Wavelength from 150 to 3000 Meters

without the use of variometers, variocouplers, and loading coils.



Eventually—Why Not Now? If your dealer cannot supply you, send us your order and remittance together with his name.

Price \$9.00

Beware of Imitations Look for the Trade Mark "ALL WAVE" on the rotor, and the six efficient hook-ups packed in every box.

Six efficient and simple hook-ups sent free upon receipt of ten cents to cover cost of mailing.

Capitol Phonolier Corporation 60 Lafayette St., New York

FREE ADVERTISING PRIZE CONTEST FREE

FOR RADIO FANS

FIRST PRIZE—

\$250.00 Radio Set Free
Six Tube Radio-Audio Frequency Set

SECOND PRIZE—

\$150.00 Radio Set Free
Four Tube Set, Detector and 3 stages Amplification

THIRD PRIZE—

\$100.00 Radio Set Free
Three Tube Set, Detector and 2 stages Amplification

To advertise our business we will give the above prizes to the three persons sending us a list of five or more names of Radio fans and who compose the best slogan or phrase of words we can use for our advertising matter. We are interested in sending our catalogue and price lists to Radio fans.

If you are interested in Radio and in its future possibilities don't overlook this opportunity to get acquainted with us, secure low prices on your purchases and an opportunity to win one of the above prizes free of charge.

In the event of two or more persons submitting the slogan judged the best, second best, or third best, each will receive the full amount of the prize tied for. All entries must be received by us not later than March 31, 1923.

**We retail at wholesale prices.
Lowest prices on standard radio goods in the U. S. A.**

THIS WEEK'S SPECIALS

VERNIER CONDENSERS

11 Plate	List \$4.00, now \$3.00
23 Plate	" 5.00, " 4.00
43 Plate	" 6.50, " 5.00
Freshman Grid Leak and Condenser for Flewelling Circuit	" 1.00, " .75

VERNIER RHEOSTATS

Thordasen	List \$1.50, now \$1.00
Klosner	" 1.00, " 1.25
National	" 1.50, " 1.00

VACUUM TUBES

U. V. 200 Detector	\$4.25
U. V. 201 Amplifier	5.25
U. V. 201 Amplifier	5.50
WD-11 1½ Volt	6.50
Cunningham Detector	4.25
Amplifier	5.25
Vacuum Tubes repaired. Broken and burned out tubes repaired. Mail them parcel post. Tubes returned parcel post C. O. D. in 10 days. We guarantee them to burn equal to new tubes. Price, \$2.75 each.	

PANELS

Hard Rubber, U. S. Navy Specifications, per square inch	\$6.015
Bakelite, per square inch .....	.62

HEADSETS

2200 Ohm, equals best \$3.00 phones on market, now	\$4.50
Brandes-2000 Ohm	5.00
Dictograph	5.00
Federal	5.50

VARIOMETERS

Atwater Kent	\$6.25
Moulded	4.00
Fischer, Jr., Type	3.00
Baldwin	4.00

VARIOCOUPERS

Moulded	\$4.00
Atwater Kent	6.25
Fischer, Jr., Type	3.00
W. D. 11 Adapters	List \$1.00, now \$0.75

TRANSFORMERS

Thordasen	List \$4.50, now \$3.00
Atwater Kent	" 5.00, " 3.75
Acme	" 5.00, " 3.75
WD-11	" 5.00, " 3.75

HOW TO ORDER

All goods forwarded by Parcel Post. Send Money Order with order, and include the following rates with same for postage:

On Purchases \$1.00 to \$5.00, 6 Cents Postage
On Purchases \$5.00 to \$10.00, 15 Cents Postage

On Purchases \$10.00 to \$20.00, 20 Cents Postage
On Purchases \$25.00 to \$50.00, 35 Cents Postage

Space being limited, we are obliged to omit other money-saving items. Write for quotations or ask for our latest Price Sheet Catalog.

National Radio Products Corporation
Mail Order Dept., 509 FIFTH AVENUE NEW YORK

15c. a Copy

March 3

\$6.00 a Year

52 Numbers

RADIO

(Title Reg. U. S. Pat. Off.)

WORLD

ILLUSTRATED

WEEKLY

RADIO HOUR ABOARD SHIP



(C. Photo News)

Many times while a ship is in port the officers and men have a lot of time on their hands. In the old days, they, of course, would go "around the corner," but since Mr. Volstead has put "the corner" out of style, it is hard for some of them to fill the weary hours. In that case, they just go up and "listen in" to the many programs that are being broadcast from the various stations. This photograph shows Operator H. Gilder and T. Knox listening to the Sunday sermon broadcast from St. Thomas Church, while the S. S. Megantic lay in port. Visiting the operators has come to be quite an institution of late, if reports circulated to that effect hold any truth, and it certainly must be a pleasure to listen in when apparatus such as shown herewith can be used. The set is of English make, and, as can be seen, utilizes 6 tubes, which are quite different from those of American make, resembling an overgrown glass grid leak more than anything, but they are said to be wonderful detectors and amplifiers. Operator Knox is seen tuning in.

JACKIE PHONES



(C. Kadel and Herbert)

One of the recent treats for the listening public was an address over the radio telephone by Jackie Coogan, the world's highest paid juvenile star. The talk was given from the broadcasting station WOR of L. Bamberger & Co., Newark, N. J. Master Coogan gave a very interesting talk to the boys and girls, and was literally flooded with letters in answer to the request made over the phone that all who heard should communicate by letter. The incident impressed Jackie so much he insisted that his father buy him a radio outfit so that he could hear the stories and news of the day.

FREE ADVERTISING PRIZE CONTEST FREE FOR RADIO FANS

FIRST PRIZE—

\$250.00 Radio Set Free—Six Tube Radio-Audio Frequency Set

SECOND PRIZE—

\$150.00 Radio Set Free—Four Tube Set, Detector and 3 stages Amplification

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We Retail at Wholesale Prices.

Lowest Prices on Standard Radio Goods in the U. S. A.

Our Peanut Tube Does the Work of W D -11

For Detector and Amplifying uses. Can be used on 1 1/2 volt dry cells or regular 6 volt A Batteries. Fits standard V.T. socket. Uses about 1/10 ampere, on two 1 1/2 volt dry batteries. Price of tube, \$2.50, includes adapter.

1 1/2 VOLT TUBE (not WD-11, but for same use)\$5.00

THIS WEEK'S SPECIALS

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- U. S. Navy (Plotron) used as a detector, amplifier and transmitting tube, all in one, type V. T. 14. List \$8.00, now \$4.00
U. V. 200 Detector 4.25
U. V. 201 Amplifier 9.25
U. V. 201A Amplifier 8.50
WD-11 1 1/2 Volt 6.50
Cunningham Detector 4.25
Cunningham Amplifier 5.25
Myers Audion High-Mu 4.50
Vacuum Tubes Repaired. Broken and burned out tubes repaired. Mail them parcel post insured. Price, \$2.75 each, cash with your order. Tubes returned by Parcel Post, prepaid. We guarantee them to burn equal to new tubes.

VERNIER CONDENSERS

- 11 Plate List \$4.00, now \$3.00
23 Plate " 5.00, " 4.00
43 Plate " 6.50, " 5.00
Freshman Grid Leak and Condenser for Flewelling Circuit " 1.00, " .75

PANELS

- Hard Rubber, U. S. Navy Specifications, per square inch \$0.015
Bakelite, per square inch .02

HEADSETS

- 2200 Ohm, equals best \$8.00 phones on market, now \$4.50
Brandes—2000 Ohm 5.00
Dictograph 5.00
Federal 4.50

VARIOMETERS

- Atwater Kent 90.25
Moulded 4.00
Fischer, Jr., Type 3.50
Baldwin 4.00

VARIOCOUPERS

- Moulded 4.50
Atwater Kent 6.25
Fischer, Jr., Type 3.00
WD-11 Adapters List \$1.00, now \$0.75

TRANSFORMERS

- Thordasen List \$4.50, now \$3.00
Atwater Kent " 5.00, " 3.75
Acme " 5.00, " 3.75
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On Purchases \$5.00 to \$10.00, 15 Cents Postage
On Purchases \$10.00 to \$20.00, 20 Cents Postage
On Purchases \$25.00 to \$50.00, 35 Cents Postage

Space being limited, we are obliged to omit other money-saving items. Write for quotations or ask for our latest Price Sheet Catalog.

National Radio Products Corporation
Mail Order Dept., 509 FIFTH AVENUE NEW YORK

VOLUME TWO OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessey Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone; Bryant 4796.

Vol. II, No. 23. Whole No. 49

March 3, 1923

15c per copy, \$6.00 a year

Intricate Receiving Set Embodies Both Crystal and Tube Detector

By Louis S. Fielder

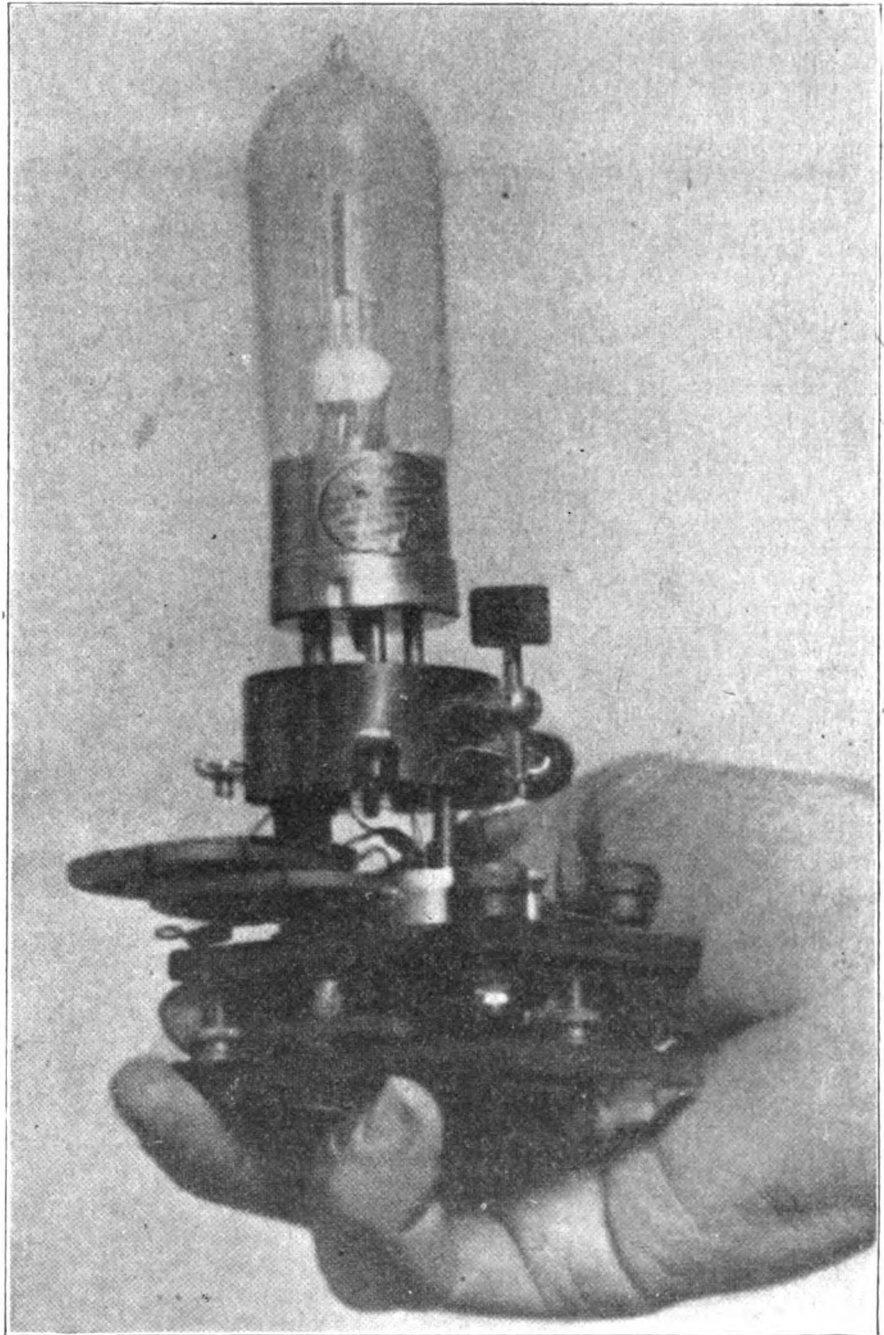
ONE of the features of the amateur contest at the Permanent Radio Fair at the Hotel Imperial, New York City, and one which created much interest, was a miniature set so small that it was easily held in the palm of the hand and yet was a most complete receiving set. The set embodies both a tube and crystal detector, either of which may be used at the operator's desire. The set proper consists of spider web inductances, the relation of which is varied in a sliding motion, somewhat like sliding doors. The inductance is varied by a tiny switch, and has 13 switch points. One of the detectors used is a regulation WD-11 with a specially made socket which takes up very little space. There is also a crystal detector, to be used for local work and when batteries are not available.

This set is so extremely small and compact that it is a constant source of wonder to the layman that it can be made to work. But when the set is closely examined it is found to have been constructed with all the care that a watchmaker would take in making a small wrist watch. When the small space that the maker had to use in the construction is taken into consideration, it surely is a wonder that any man had patience enough even to attempt to make such a small machine.

Its excellent receiving qualities were demonstrated, and although an allowance was made for the smallness, wonderful results were obtained.

This set is extremely efficient on short waves due to the fact that it is so compact that short leads are possible.

This set is one of many which various builders have made to illustrate the fact that a set does not have to occupy half a table in order to work successfully, and is one of the smallest and most compact yet seen. Of course, this small set while practical, cannot be expected to accomplish the work of one of its larger brothers. These miniature sets seem to crop up overnight, and more models will be shown in these columns in the near future.



(C. Photonews)

One of the most intricate miniature radio receiving sets made by an amateur. The set is equipped with both crystal and vacuum tubes, as can be seen in the photo. Tuning is accomplished by sliding the spider web inductances and by means of a small 13 point switch. This set is extremely small and compact, as can be seen by comparison with the size of the man's hand.

Multitube Reflex Circuits

By *W. S. Thompson, E. E.*

IN the multitube reflex sets the importance of the by-pass condenser cannot be too strongly emphasized. There must be a path for the radio-frequency oscillations, or waves, so when using two audio-frequency transformers and phones they must be shunted by condensers to make the impedance of the circuit as near zero as possible.

The inductance of the windings of the transformers and phones is very high so we must place in the same circuit a capacity to counteract the inductance. This is accomplished by shunting a condenser around every winding that would act as a choke coil. No choking effect will be caused by the radio-frequency transformers because they are designed to pass the high-frequency waves.

As we add tubes to our set the precautions taken to prevent oscillations must be greater, for there is more chance that one of the tubes will start local oscillations. The proper use of the potentiometer will go a long way towards preventing this disturbing factor, but the further precaution of a high resistance in the plate circuits will have to be resorted to in some cases. If the operator can get results from the set by proper tuning and use of the potentiometer

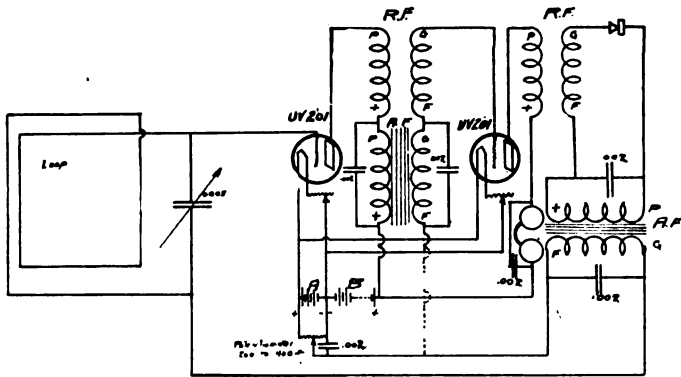


Fig. 1. Diagram of a reflex circuit using two tubes with crystal detector. This circuit is equal to two stages of radio frequency and two of audio frequency amplification.

he will not need any additional apparatus, but the grids work best when they have a normal negative potential and in this condition the tubes are very liable to start oscillating. For this reason the author believes that time in tuning will often be saved and results almost equal will be obtained by inserting these resistances. For a high resistance the author used noninductive coils of very fine German silver wire, but has since seen advertised a B battery potentiometer that would be of great help for this purpose.

The author has not tried every hook-up given, but is giving them here to enable a reader to pick out the ones that he wishes to try, or the ones, the apparatus for which, he already has on hand.

There is nothing particularly new about the reflex circuits for they have been known for some time and have been used by French and English amateurs. The reason we have not used this hook-up or radio-frequency amplification more than we have is probably because there has not been any proper coupling apparatus and because our American tubes have a high internal capacity. To-day there are on the market several very good transformers, so there is no reason why any amateur who is using two or more tubes should not be having the added advantages of two or more stages of radio-frequency amplification. It is a great DX getter and is a static eliminator when using a loop. The loop shown in the hook-up may be replaced by any antennae tuning arrangement such as a single slide tuning coil, variometer, loose-coupler, and other parts.

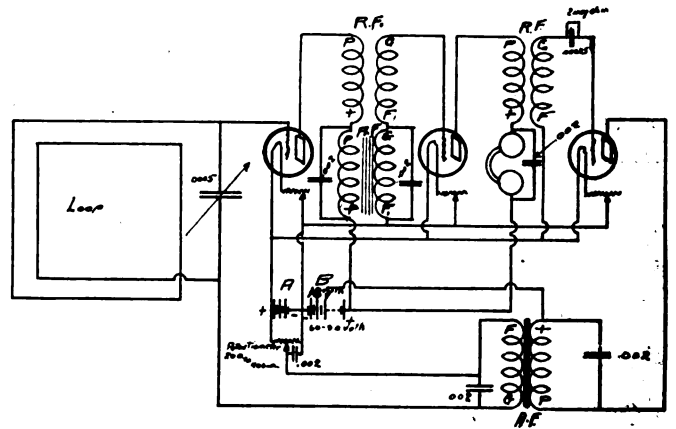


Fig. 2. Diagram of reflex circuit using a tube detector. This is exactly the same as Fig. 1, but a tube is used as a detector.

Figure 1

This two-tube set is the equivalent of two stages of radio-frequency amplification, detector and two stages of audio-frequency amplification. Using this set with a loop the signals come in clear and strong with a range that will delight the user. The only additional feature is the use of a by-pass condenser around the potentiometer. This is to provide a low resistance path for the radio-frequency waves in the grid circuits of both tubes. The dotted line in the grid circuit is an optional connection which may be used or not as suits the builder. The difference lies in the fact that if connected as shown the grid potential of the second tube is always negative, while dotted connection would allow the grid potential to be varied.

Figure 2

This is a modification of the above circuit using a tube as a detector or rectifier. The tracing of circuits for this hook-up is exactly similar to that of the one tube set. The wave is amplified twice by the two hard tubes through the radio-frequency amplifying transformers, and goes to the grid of the detector tube in the plate circuit of which audio-frequency waves are set up. This plate circuit is coupled to the grid circuit of the first tube by an audio-frequency amplifying transformer and the two hard tubes again amplify the signal, this time in the form of an audio-frequency wave, so a very loud response is obtained in the phones which are placed in the plate circuit of the second

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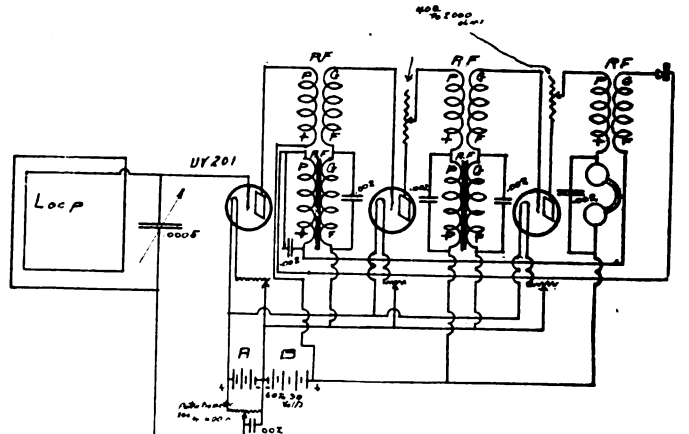
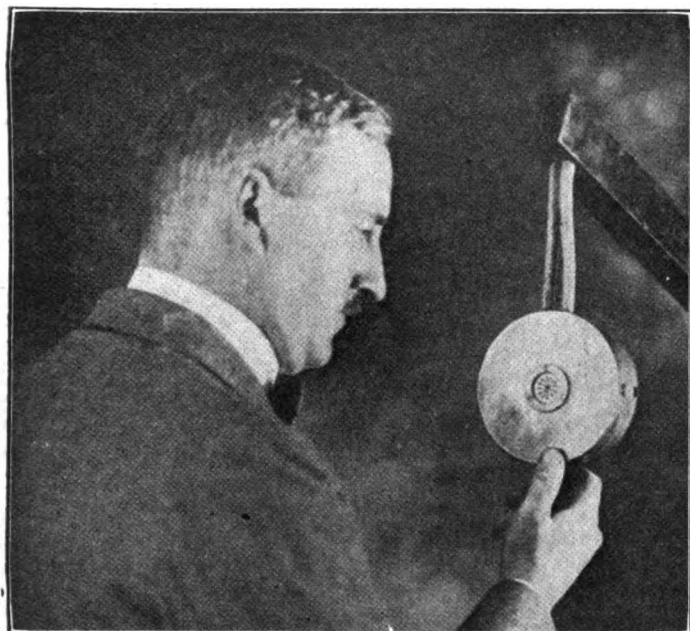


Fig. 3. Diagram of a reflex circuit using three tubes and crystal detector. This circuit is equal to three stages of both radio and audio frequency amplification.

Perfect Broadcasting Now Possible

By Peter A. Sensemig



Dr. Phillips Thomas and his newest invention, the "Glow Discharge" Transmitter. This device has been thoroughly tested out, and has been found to eliminate many of the troubles that are now attendant upon broadcasting, due to microphonic noises. The old type of microphone was the cause of spoiling many fine programs, due to the fact that it would pick up and magnify all small noises, such as a person's footsteps across the floor. This new device, which is thoroughly explained in the accompanying text, does away with all this trouble and provides a means for absolutely perfect broadcasting.

not transmit extremely high and extremely low notes satisfactorily. The piano is a case in point. The radio audience hears the highest notes as a series of clicks and the very bass notes as a roar.

In the Thomas transmitter, a minute electrical discharge takes the place of the mechanical disk. This discharge flows between two points, separated by a very small fraction of an inch. It is affected by sound waves, just like the diaphragm, but being non-material and having no perceptible inertia, it responds equally well to all vibrations. Hence music broadcasted, by means of it, is transmitted in all its original purity.

Dr. Thomas has recently been experimenting with his transmitter at the Westinghouse Pittsburgh Station, KDKA. Listeners all over the country have noticed from time to time the great improvement in the quality of the voice of this station, but have naturally been unaware of the cause. Within the near future all Westinghouse stations will be regularly equipped with this device, and the art of broadcasting will take another step forward.

In appearance, the Thomas transmitter resembles a large watch, with the front and back covered by wire gauze. On looking into it, a point of light can be seen, caused by the flow of the electric energy against one of the terminals. From this fact it is called the Glow-Discharge Transmitter.

PITTSBURGH, PA.—Millions of radio fans will be benefited by a new radio transmitter invented by Dr. Phillips Thomas, research engineer of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The new transmitter makes possible the broadcasting of music and other sounds exactly as produced. It has been used at the Westinghouse broadcasting station KDKA within the past few months, which explains the clarity and strength of this station's signals.

The basis of Dr. Thomas's inven-

tion is the elimination of the diaphragm now used in all transmitters in practical service. This diaphragm consists of a thin disk of metal or other substance and operates by being vibrated by the sound waves which strike it. But because of its inherent inertia, no material diaphragm is capable of vibrating in perfect sympathy with the entire range of audible sounds. If it can transmit low notes successfully, it will fail on high notes; and vice versa. The ordinary diaphragm is designed with reference to the middle register, and it therefore does

(Continued from preceding page)

tube. Bypass condensers are used in shunting any high impedance coils as in all other circuits. The signal strengths obtained in this set are as loud as can be obtained unless more external stages of audio-frequency amplification are added. This set is recommended for good, clear, strong signals, where maximum DX is not desired.

Figure 3

Circuit 3 is the most popular reflex set that is in use today and is recommended as one of the best sets for the average amateur. It is the equivalent of three stages of radio-frequency amplification, detector and two stages of audio-frequency amplification. Any further addition to this set would have to consist of more stages of straight radio or audio-frequency amplification. In fact, the first tube of this set is used but once, the hook-up being given to enable any reader to build this set if he desires one of the best sets for long-distance work.

This set incorporates radio-frequency amplifying transformers as have all hook-ups so far given. The results obtained by circuits to follow were not sufficiently better to warrant using them unless existing conditions would make their use advisable or unless some experimenter wishes to try them.

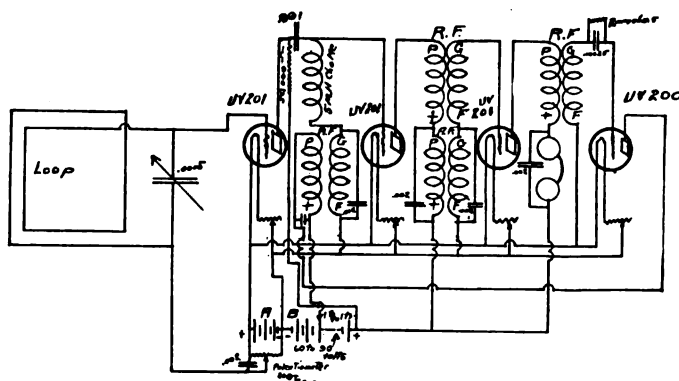


Figure 4. Commercial type reflex circuit, using one stage of resistance-coupled radio frequency amplification, and two stages of transformer coupled amplification.

Plate resistances are shown in the preceding hook-up, and it is recommended that they be used, for it adds to the ease of tuning. The set will be very selective and easy to tune if resistances, variable from 500 to 2,000 ohms, are used. When this set is used with an outdoor antenna the range will be greatest and will depend almost entirely upon the skill of the operator for it is a DX getter.

How I Received the American Signals in France

By *Marius Thouvais, President Radio Club of Salogne, France*

THE receiving set which I used during the transatlantic tests was not at all designed in anticipation of such DX work. The tuning is effected by means of interchangeable coils of various sizes covering the whole range of 150 m. to 2400 m. As it stood, I believed it to be far less efficient than a Grebe, a Paragon, or any standard two-variometer regenerative receiver, and I believed also it was absolutely unable to give such a performance.

My aerial is not high, having been erected between the chimney of my house and a wooden mast in the garden. It is 27 feet high at each end, and hardly 23 feet in the middle, as the wires stretched three years ago and form a graceful curve now. It is a three-wire antenna, 120 feet long. The lead in is shaped as Fig. 1. The fundamental wave length of the whole is something like 230 meters.

This aerial has proved rather efficient, as immediately after the war, when audions were not obtainable, I was able to read, regularly, on a crystal detector, many DX spark stations such as Lisbon, Gibraltar, Bizerte, Malta, Vienna, Budapest, Copenhagen, Karlsborg, etc., and I even picked up the First Chelmsford telephony in February and March, 1920, and always on galena.

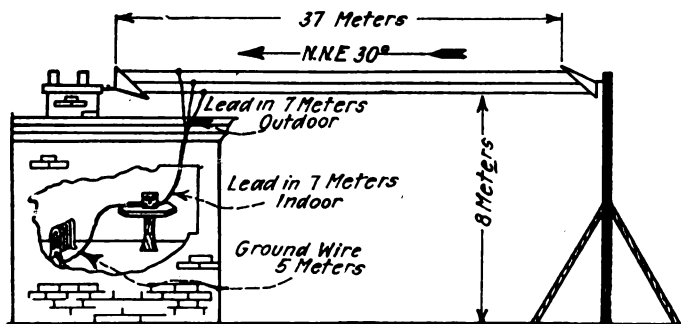


Fig. 1. The antenna system, with measurements, used by the author in receiving American amateur signals. The antenna was 8 meters, or 25 feet, high at each end, but due to the wire stretching was only 23 feet high in the center. Suggested by M. Thouvais. Drawn by S. Newman.

My actual equipment, entirely home made, consists of a single audion receiver, a separate heterodyne and a single stage audio frequency amplifier.

The accompanying diagram (Fig. 2), shows the three pieces of apparatus. The single audion receiver and the heterodyne unit have the same appearance, as they are each housed within a similar wooden box. The only difference between the two sets is that the receiver is fitted with a grid leak and condenser for detection. Each box contains a regular .0001 mfd. variable condenser, a small vernier condenser, and a filament rheostat. Both sets use basket (spider web) coils for short and mean waves and flat pancake or honeycomb coils for longer ones. The heterodyne is used for long waves only, from 10,000 to 24,000 meters. It becomes unnecessary below 5,000 meters and is practically useless for really short waves.

The single audion receiver is the usual single circuit tuner with tickler coil. It has allowed me to receive with a fair intensity, sufficient for reading, all the high power United States stations such as USS, WSO, WII, WGG, WGK, etc.

The single stage low frequency amplifier does not greatly increase the weak signals, as everyone knows. I believed that it required a tremendous amount of radio frequency amplification to get such DX signals, and believed my

much simpler material quite unable to receive the easiest test.

On the WL 350-450 meter I heard three British broadcasting stations with very great intensity, both music and speech being too loud to be comfortable when wearing the headset, and it could be almost continuously heard in the whole room without any loud speaking device.

A little while later, that is, barely a week before the commencement of the tests, I at last succeeded in getting my receiver oscillating freely on as short a wave as 200 meters. I got this result by using a special type of winding of my own design. This type of inductance is somewhat like the well-known spider web coils, but over which it is an improvement. The different manner in which it is wound gives a still lower self-capacity and a greater inductance for a given number of turns, thus making it especially efficient for short wave work. As previously stated, I used simple single circuit—a fixed coil in series with a variable condenser. This method is doubtless less selective than using a variocoupler, but it is really efficient, and is much simpler to manage. With the aerial described and the variable condenser in series, a 30 turn coil tunes from 180 to 300 meters, while a 50 turn one covers the WL range—250 to 500. In either case a 30 turn inductance is quite suitable as tickler coil.

Before the tests I had only heard two French amateurs, 8AG and 8AB, the latter extremely loud, although located about 375 miles away. British amateurs, 2AW, 2OD and 2YZ, were also received with excellent intensity, as well as several telephones from British amateurs. These results decided me to spend one night in listening in to try if I could pick up anything during the tests. I was not at all confident, to say the least, and it was on the fifth day only of the tests that I tried. During the nights of December 16th and 17th I only was able to enjoy the concerts sent out on 360 meters by several American broadcasters, among which is WJZ. It was on my third night, December 18th, that I caught two American amateurs in addition to the usual broadcasting.

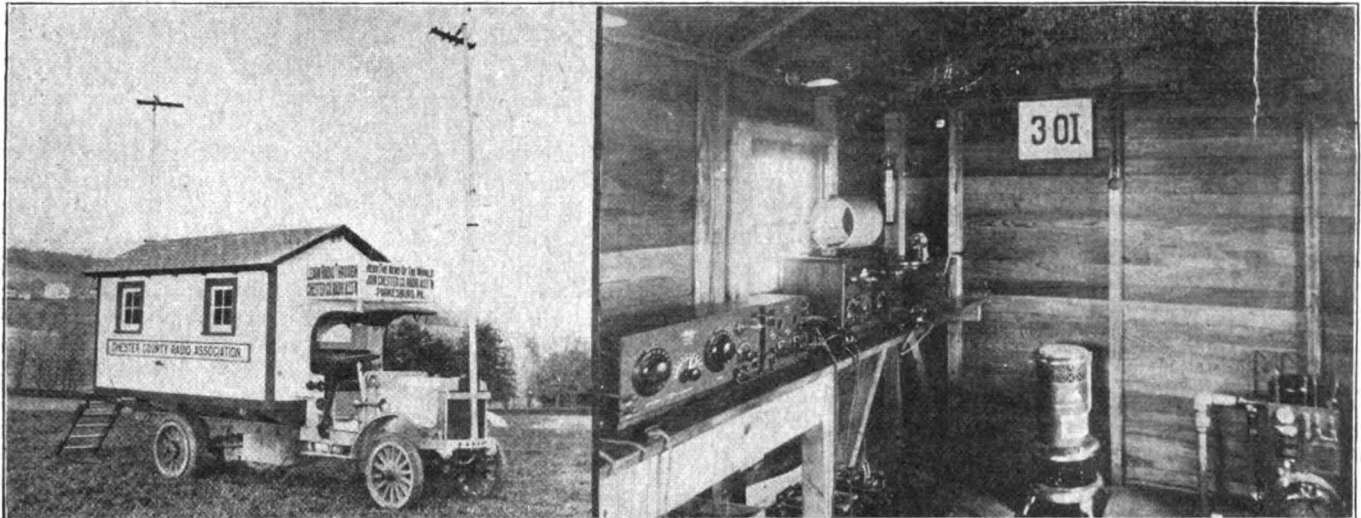
It was then that I realized that my set worked much worse on 200 meters than on 360 meters. To remedy this on the following days I built a new variable condenser of the air dielectric type to replace my inefficient paper-insulated condenser. Also, in view of lowering the radio frequency resistance of the whole, I tripled the single ground wire. Immediately my apparatus oscillated much more freely on as short a wavelength as 150 meters, and the efficiency on the band—180-250—was very greatly increased. I was enabled to receive ten additional call letters on the following night. The next day, having again found time to improve several details—increasing my plate battery voltage to 80 volts and removing the aerial lead in a little further from the wall—I was quickly rewarded for my trouble on December 20 by picking up not less than twenty-five calls from the United States amateurs within a period of less than two hours.

For the last night, being no longer afraid of lack of filament current, I decided to listen in up to the end, and, fighting against sleep, I worked continuously from midnight up to and after 5 A. M. (G. M. T.). But this last night was certainly among the worst on which I had experimented. The static was very bad and arc jamming at

(Continued on next page)

Radio Broadcasting Station on Wheels

By John Kent



(C. Kadel & Herbert)

Exterior view of the traveling broadcasting station. The antenna is strung on poles from the front of the radiator to the back of the portable house, which serves as an operating room. It is a great stimulator for radio, and numerous people who have never taken interest in radio have become "fans" through the agency of this novel station.

Interior of the traveling broadcasting station. Both the receiving and transmitting sets are arranged on the table at the left. Current is furnished by the little generator shown in the lower right hand corner. The station is a fully licensed station and operates through the rural district of Parkesburgh, Pennsylvania.

WHAT is probably the most unique broadcasting station in the world, was recently built by Horace A. Beale of Parkesburgh, Pa. It is a complete broadcasting and up-to-date receiving station on wheels. It is called the Chester County Radio Association, and travels from place to place in the different townships, giving instruction in radio, as well as allowing the people in the rural districts to see just what broadcasting is.

Many people listen to broadcasting but do not understand exactly how it is accomplished. When the "station on wheels" comes around, they have a chance to "peek at the innards" of such a station.

As can be seen from the photographs, which show both

the exterior and interior, it is a most complete station. The current for the operation of the transmitting set is furnished by the little gasoline engine driven generator, shown in the lower right hand corner of the composite picture. The receiving set is shown in the center of the illustration and as can be seen is of the well known regenerative type with two stages of audio frequency. The transmitter is located directly next to it, with the tuning inductance on top of the set proper. It is a tube transmitter, using one tube as an oscillator, and one as a modulator. The phonograph is situated directly to the right of it. The call of this traveling broadcasting station is 30I, and is registered as Parkesburgh, Pa.

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times made reception impossible over a wide band of wavelength. The usual jamming from ship and coast stations covered the rest, so that I received only two or three calls during the free-for-all period.

The latter part of the final night was a little better. The arc jamming having disappeared, I was enabled to log a dozen more calls.

In conclusion, I wish to point out that I listened in six days, and that on the first three my set worked badly on 200 meters. Further, it was only on the last night that I worked for as long as five hours. On all previous nights I had spent only three hours on account of my attending to business throughout the day. Also, I dare say, that if I had shown more confidence in my set and had started to listen in from the first night of the tests, and if my apparatus had been carefully prepared to work right down to as short as 180 meters, a little while before the outset of the tests, I honestly believe that I should have been enabled to receive most of the stations heard throughout Europe, as most of the calls that I logged were strong enough and would have been received as well without the second tube, that is, with the detector tube alone. The second audion acting as an audio frequency amplifier is by no means an element of sensitivity. It was only useful on particularly good nights, as it gave body to the signals

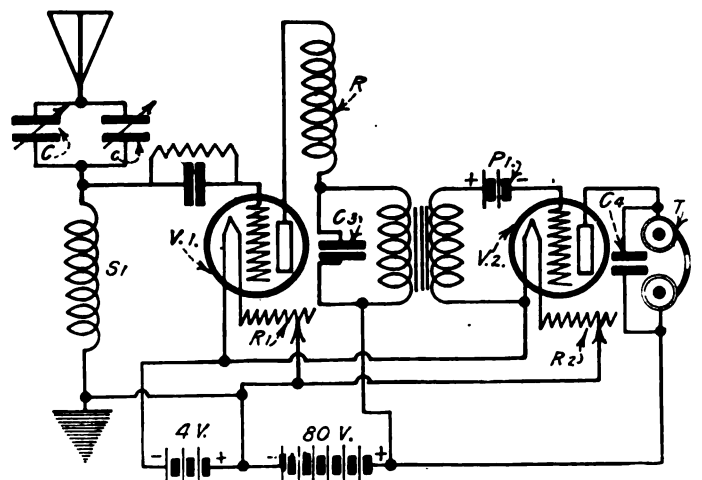


Fig. 2. Circuit used by Marius Thouvals in the reception of American amateur signals. The condenser in the antenna circuit C2 is a vernier. As can be seen, it is a single circuit hookup, and testifies to the efficiency of single circuits in long distance reception. Suggested by M. Thouvals. Drawn by S. Newman.

and to some extent facilitated reading, but on bad nights when there was heavy static and jamming it was rather a bother than a help.

Department of Communications Suggested

By *Carl H. Butman*

WASHINGTON, D. C.—The creation of a Department of Communications including radio is suggested in the report on the Reorganization of the Executive Departments submitted to the joint Committee of Congress by the President a few days ago.

The committee, headed by Walter F. Brown, suggests that the Post Office Department be renamed the Department of Communications and that it include an Assistant Secretary for Telephone and Telegraph, including radio.

In the report Mr. Brown says in part:

"The only important change contemplated is the addition of a bureau (to the Post Office) to develop and extend telephone and telegraph communications, including wireless, for the general public benefit."

Apparently the Navy would retain its communication system as would the Signal Corps, but it is evident that radio regulation would be transferred from the Commerce Department to the Department of Communications, although the Bureau of Navigation, under which the radio section operates today, is left in the Commerce Department.

Although the report is labeled as recommended by the President, his letter of transmittal states that with few exceptions, the changes have the sanction of the Cabinet, and adds that it is his hope that the suggestions will be of assistance to the committee. Further than that, the President does not appear to urge its adoption and he has refused up to date to state any of his views on the subject, outside of stating his recommendation.

There's a Town Called Radio

By *Washington R. Service*

WASHINGTON—Radio is the name of a town in Virginia, just across the Potomac from Washington. It is there that the gigantic towers of the Naval Radio Station, from which the name came, is situated.

Usually it is known as Arlington, being near the great National Cemetery, but the call letters of the station NAA are known almost around the world. In the Postal Guide the tiny village at the foot of the three great towers, one of which is 600 feet high, is listed as Radio.

This naval radio station was put in operation in 1912 and was the first of the navy's chain of high-powered radio stations to be established. It has only become well known to American fans since the government broadcasting was

transferred there in January, but today many thousands of radio owners listen in on 710 when NAA speaks.

When the station was first put in operation only code signals were sent and received. Ten years ago, all operations were conducted on a single set from a little hut nearby under the direction of a superintendent of communications. To-day it is different; seven separate transmitting circuits are operated by remote control from the Naval and Munitions buildings in Washington, from which wire lines link up with the radio circuits for both army and naval use. All receiving is done in Washington by special antenna and loops. Simultaneous operation is permitted with six sending sets without interference, thanks to "duplex operation."

Back in Early Days

WASHINGTON, D. C.—Back in the early days, Chief J. W. Scanlin was listening in one night—on Dec. 29, 1912, to be exact. He heard a curious series of numerals and letters forming words unintelligible to him. He had heard similar characters in code for several nights, but on the night mentioned he copied the message and told his superior officers in Washington that he had heard and copied "FL." He was laughed at. FL was the call of the Eiffel Tower in Paris, and no one believed he could pick up a message from that distant station. He insisted, however, and a report containing the copied message was transmitted to Paris through the Department of State. The reply proved that he was correct. He had copied Eiffel Tower, and correctly except for a few characters. For the first time, an American naval station had caught a European radio station.

The message dealt with longitudes, and was sent to a small French expedition in Egypt. It was partly an experiment to learn how far inland an expedition could go and

copy on a portable set the messages from home. Curiously the message copied nearly got the transmitting officer into trouble with his Government. He had added a personal postscript to a fellow officer on the expedition, which was against the French regulations, but he escaped court martial and is now very near the head of the French Army communication service. Soon thereafter experiments were undertaken between NAA and the Eiffel Tower and direct two-way communication was established in 1913.

Seven Sets at Arlington

With the old 100 K.W Fessenden spark set, put in operation in 1913, some remarkable long distance results were achieved. Naval vessels in the Mediterranean have copied the time signals, which are still sent out from NAA on this set, after nineteen years of service. An amateur in Brazil heard NAA as long ago as 1914, but this is not uncommon today.

Some of the first radio telephone experiments were conducted from Arlington in 1915 with Western Electric apparatus, and the announcements were received in Pearl Harbor, Honolulu.

A Simple and Improved WD-11 Receiver

By C. White, Consulting Engineer

NOT so very many months ago amateurs were striving to build as small a radio receiver as possible and still be able to get fairly good results when near a large station. Many of the sets developed certainly were as small as one could possibly imagine a radio set could be, but other than that they were of little practical use.

Things have changed and the ambitious amateur is no longer spending his time trying to get miniature curiosities and is, on the contrary, trying to evolve radio apparatus that is capable, under normal conditions, of receiving from distant stations with ease. Not only are radio fans trying to accomplish this feat in designing, but they are trying also to accomplish it in the simplest possible manner. They are not using any very complicated circuits, but they are using simple circuit receivers that are built in the right way.

Simplicity is often the keynote to success. In designing and constructing sets it is always good to bear in mind that the fewer the controls and circuits the better the results in the average case. In the construction of the receiver that I describe herewith I wish to call special attention to the fact that there are absolutely no switchpoints used, and there are only three variable controls, two variable condensers, and the filament rheostat. The tuning and tickler coils are rather small and compact, thus conserving on cabinet space as well as panel space. Nevertheless, despite the small size, the controls on this set fully allow flexibility in tuning since they are associated with inductance coils that are calculated according to the right size for broadcasting and general amateur work.

The diagram herewith illustrates the schematic hook-up. In theory it is very little different from the standard single circuit regenerative hook-up, except in the fact that the coupling between the tickler coil F and the main tuning inductance coil E is not variable mechanically, since the coils E and F are wound together on the same 3-inch tube. However, the coupling is variable from the electrical standpoint by means of the condenser C-2. Hence since C-2 is a small size of condenser it is possible to adjust for the right point of regeneration by a slow movement of the condenser plates. With this type of coupling it is not as hard to adjust to the point where the tube is on the verge of oscillating, as in the case with an inductance type where the tube is thrown suddenly into oscillation by the slightest change of the tickler coupling.

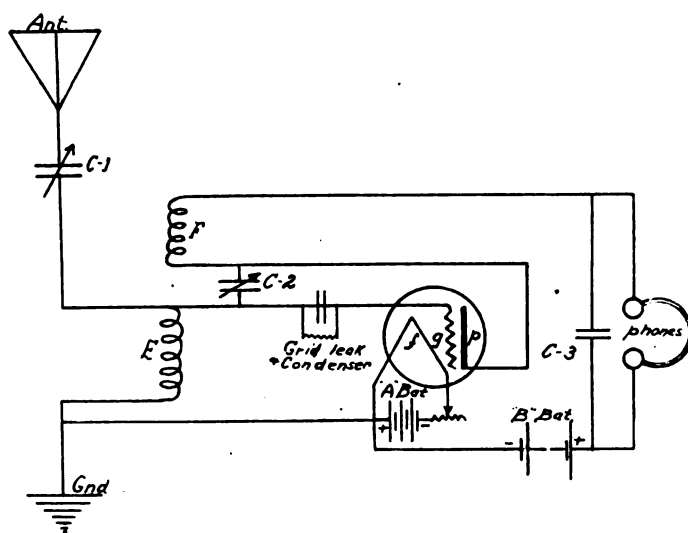
The receiver is designed to work efficiently within the normal amateur and broadcasting range. The best operation is at the broadcasting range; that is, from 300 to 450 meters wave-length. If it is wished to use the receiver frequently on the lower wave-lengths it would be better to either tap the winding E at a midpoint or use a smaller condenser in the antenna ground circuit.

The constants for the circuits are as follows: C-1 is a 13-plate air variable condenser. C-2 is an air variable of the 11-plate type. C-3 is a mica condenser of .001 mfd. capacity used solely as a bypass for the phones. The grid leak has a resistance of one megohm and a capacity of .00025 mfd. The coils E and F are wound on the same 3-inch tube with No. 22 D. C. C. magnet wire, coil E having 70 turns, and F, 40 turns. The spacing between the end of E and the beginning of F should be about $\frac{1}{4}$ of an inch, and the total length of tube required will be six inches.

It is advisable to purchase the standard type of tube socket and then an adapter for the WD-11 tube. This will enable the constructor to change rapidly to any other style or make of tubes if the owner so desires. It is better to

mount the tube socket on a pad of $\frac{3}{4}$ -inch felt so as to avoid serious microphone hums that are transmitted to a sensitive dry cell tube when the tube is firmly attached to a metal holder. Owing to the fact that only two dials and the filament control knob are to be mounted on the panel, this set can be easily laid out on a panel 6x10 inches without any undue crowding.

This set is simplicity itself, and still it works with great ease and brings in results that veritably make you believe it is a mystery box. It is possible to assemble this tuner complete in a good cabinet for less than \$15, because there are no expensive variometers or vario-couplers to be purchased. For the man who wants to bring in just the broadcasting stations this set will find no equal for cost and efficiency. With a dry cell vacuum tube it is capable of operating for more than two weeks on a single No. 6 dry cell.



The coupling of the coils in this circuit is fixed, the variation of the circuit to produce oscillation is accomplished by means of the condenser C2, which is of small capacity.

A good reliable make of B battery will last about a year with one tube, if it is not abused. The construction is so simple that a complete assembly can be readily made in half a day. Only three holes have to be drilled for controls, and about three more for peep holes for the bulb. Shielding the inner side of the panel and the cabinet is recommended. If it is not desired to shield the whole cabinet and panel, then it is advisable to at least shield the panel in the vicinity of the two variable condensers, so that disagreeable body capacity effects can be eliminated. The shielding should be copper foil and grounded.

To Radioize Atlantic City Boardwalk

According to plans of the Western Electric Company, a test has been carried out as to the practicability of broadcasting concerts and operas by special apparatus installed along the walk at Atlantic City.

This plan would, when carried out and completed, permit concerts given in Chicago and other large cities in the United States to be heard while strolling or wheeling along the Boardwalk. If plans are fully carried out, Atlantic City will be known as one of the largest radio centers of the world.

The Radio Primer

*For Thousands of Beginners Who
Are Coming Into Radio Circles*

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

HOW many times can a signal be amplified? While there is no set number of stages that can be used in the amplification of radio signals, where audio frequency is used (signals amplified after they have been rectified or detected), there is, of course, a practical limit. This has generally been set to two or three stages at the most. This is because of the fact that when more than 3 stages are used, the inter-tube noises and coupling cause such a great amount of distortion that they often render the signals indistinguishable, and may entirely kill them. In the use of radio frequency (amplifying the signals before they are rectified) any number of stages can be used up to six or seven. Due to the fact that it is extremely expensive both from the operating standpoint and from the initial cost, not more than three stages are advisable, although more can be used.

* * *

Which is the most practical form of amplification?

In the amplification of radio signals there are two different methods that can be used—namely, radio and audio frequency. In the first-mentioned method, the signals are amplified while they are still inaudible to the ear. That is, they are amplified while they are still in the form of high frequency energy. This method allows greater detection strengths, because of the fact that the detector cannot rectify any signal that is inaudible or too weak to be heard after the rectification. Thus it is seen that in order to get better results from a set, it should embody both radio and audio frequency amplification.

* * *

Is radio frequency advisable with regeneration?

Radio frequency is advisable with regeneration, but, due to the fact that the principle of regeneration tends to amplify signals itself, it is not necessary. In a set embodying both radio frequency and regeneration, there is likely to be a lot of extraneous noise, due to the use of radio frequency and regeneration. Regeneration itself is noisy, and as radio frequency is absolutely quiet, the advantage of the latter is somewhat lost, due to the noise.

* * *

Which is the best detector to use when using radio frequency?

On account of the fact that radio frequency allows more energy to be put in the detector circuit than if a detector had been used alone, it is possible to use a crystal detector. A crystal detector is by nature one of the quietest detectors known. It is also distortionless, rectifying the signals clearly. Thus it is seen that if a crystal detector is used with radio frequency, ideal reception will be possible.

* * *

What tubes should be used when using radio frequency, and why?

In the use of radio frequency hard tubes (not gas filled) should be used. This is because they perform the work of amplifiers and are therefore necessarily hard tubes.

* * *

Can 1½-volt tubes be used for radio frequency?

To a certain extent the popular 1½-volt tubes can be used for radio frequency. That is, not over four stages of

radio frequency should be attempted when using the tubes. Due to the nature of their construction they will not stand too much current, and if more than four stages are used there is a great liability of their "breaking down."

* * *

What voltage should be applied to the plate of the 1½-volt tube for radio frequency?

In the use of the 1½-volt tube as a radio frequency amplifier, approximately 45 to 60 volts should be put on the plate. Tubes will operate on as low as 22½ volts, but not with any fair amount of success.

* * *

Is one stage of radio frequency amplification practical?

Due to the fact that no appreciable increase can be noticed in the strength of the rectified signals when using one stage of radio frequency, outside of a slight clearing of the signals, it is not advisable. Two stages to five should be used to get the benefit that comes of using radio frequency.

* * *

Can audio frequency transformers be used in radio frequency?

Audio frequency transformers generally incorporate an iron core. In the general method of making radio frequency transformers, this is not done, due to the inherent quality of iron to dissipate a large amount of the current in high frequency currents in hysteresis. Therefore, audio frequency transformers cannot be used.

* * *

What is a reflex circuit?

A reflex circuit is one that uses the same tubes for two different purposes. First, it amplifies them at radio frequency, then they are rectified and then by means of back coupling them through the transformers they are amplified at audio frequency. This is possible because advantage is taken of the principle of superimposition. Due to the fact that radio frequency is at a much higher frequency than audio, the two can be passed through the same tube and not interfere, much the same as the vision of two people can cross and not interfere with either one seeing the object desired.

One Year Lost

THE White Bill, safely through the House, is doomed to die in the Senate, says the *New York Evening Mail*.

Long neglected, sidetracked, pigeon-holed and evaded, it finally made its way through the lower body of the legislature.

It seemed for a time as if it might get on the books.

But a jealous, partisan Democrat from Texas, fearing Republican control of the air, and a Senate, fearful of giving too much power to a capable man like Secretary Hoover, have combined to act as executioners.

These pigeon-minded solons say they tremble at the thought of Hoover as the absolute dictator of radio.

Meanwhile the progress of radio in this country is to be set back at least a year, or until such time as public opinion becomes great enough to force the issue, which time will not be long.

The demise of the White bill itself isn't the serious part of the matter. It was anything but an ideal bit of legislation. Nevertheless, it would have clarified the broadcasting situation considerably and would have served a very good purpose until something better could have been devised.

All of which should bring every thinker interested in radio to the realization that NOW is the time to get ready a better bill, to force through the two branches, if need be, at the next session.

Here is a chance for the real minds in radio to contribute something. If you have some ideas on the subject, or only one, make yourself heard. Some one else may have another. With enough brains working on the subject, a practical bill can be drafted.

Send in your ideas and let the bunch talk 'em over in the columns which this magazine has set aside for that purpose.

If we can, *The Mail* will find some one to sponsor it and push it. You are the one who will have to listen and have to suffer, unless you can think of something better than has been brought out yet.

An Efficient Single Tube Super-Regenerator

By Frederick J. Rumford, E.E., R.E.

THE improved Armstrong regenerative hook-up better known as the super-regenerative hook-up, has been experimented with many times since it first made its appearance. One of the very latest is the single tube super set, which has been experimented with by the writer and has been found to be practical and efficient. This single tube hook-up is the result of the extensive experiments carried on by Mr. Philip Robinson, of the American Radio Relay League, and also has been experimented with by a great number of the advanced radio men.

This set can be constructed at a very slight cost to the experimenter. The writer has blueprinted, construction drawings, and hook-up full size which can be had for a reasonable cost to help offset the cost of tracing and blueprints. There are very few parts necessary for the actual constructing of this set, and the parts that are really needed can be obtained at a slight cost to the prospective builder.

This set will cover successfully a distance of 400 or 500 miles in radius with an average size loop antenna. The writer personally has covered a distance of three hundred miles with a set of this kind.

The diagram gives the correct hook-up, both internally and externally, of this remarkably efficient single tube super-regenerative receiver.

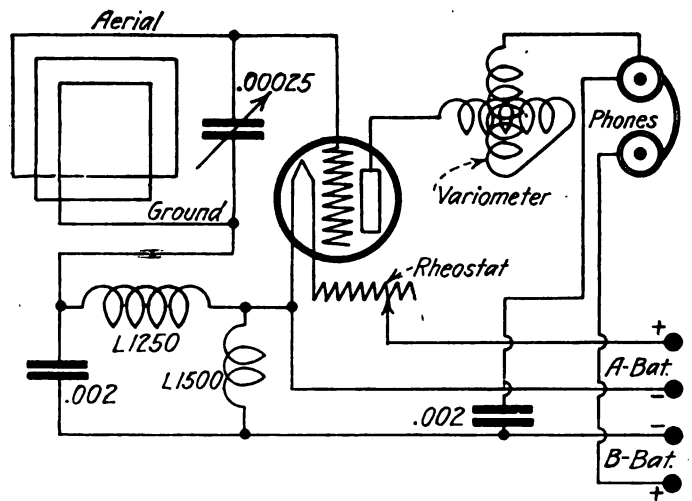
The following is a list of parts and the respective costs are about as follows:

- 1 Variometer\$5.00
- 1 1250 turn honeycomb coil, unmounted.... 2.50
- 1 1500 turn honeycomb coil, unmounted.... 3.00
- 1 .00025 variable condenser..... 2.50
- 1 Rheostat 1.00
- 1 Vacuum tube socket..... .50
- 2 .002 mfd. fixed condensers..... 2.00
- 8 Binding posts80
- 1 Radiotron vacuum tube U. V. 201..... 6.50

\$23.80

When the parts named have been purchased, the builder should go through the usual procedure of mounting the parts upon the panel and the base, the panel being of the desired size, as also the base. He is then ready to proceed with the actual wiring of this set as shown in the illustration on this page. Great care must be taken that the wiring is correct in every respect and it is advisable for the prospective builder to study the diagram thoroughly before even attempting the actual wiring.

On mounting the various parts upon the base care must be taken that the honeycomb coils are mounted at right angles to each other. They can be touching, for that matter, but right angled to each other they must be. The variometer is used to obtain regeneration, which will give a range of from between 400 and 500 miles in radius by using the usual loop antenna. This also has the advantage of giving directional effects, which in turn reduce interference and also eliminate a large amount of static. It is not



Schematic diagram of the super-regenerative circuit described in the accompanying text. The variometer in this circuit is used to obtain regeneration, and will give a range of from 100 to 500 meters, depending of course upon what type is employed.

advisable to use an outdoor aerial. If the builder of one of these sets wishes, he need not use the usual loop antenna, but can use either a small honeycomb coil or a spider web coil for a loop, grounding the set at the posts marked B. This latter arrangement has not the directional effect that the usual loop antenna has.

This set is somewhat critical in operation, but when it is functioning properly there will be a very high note in the head receivers until a phone station carrier wave is picked up. In turn, this high note will give away, bringing in the music or voice, whichever the case may be, with the very best of results.

The accompanying diagram is self-explanatory and anyone building this set should get satisfaction.

Britons Demand More Electricity and Wireless Apparatus

ECONOMIC conditions are forcing a broader use of electricity in England, says Commercial Attache W. S. Tower in a report to the Department of Commerce summarizing the British electrical industry in 1922. Only here and there is this trend revealed at present, but there are enough indications to show that, apart from the impetus that will be given by greater activity on the part of the Electricity Commissioners, the people of England have today an attitude toward electricity in factory and home that did not exist a few years ago. The domestic market of the United Kingdom, therefore, may be expected to show growing strength during the next few years. The electrical export trade during 1922 has

not been any more satisfactory than has the domestic, though two large colonial contracts which were placed with English manufacturers during the past year have helped to some extent.

The total value of the electrical goods and apparatus exports in 1922 was hardly more than half of that for the previous year, and this reduction is apparent in all items included in the table, more particularly in those items relating to electric wires and cables. Telegraph and telephone instruments and switchboards constitute the exceptions to this general reduction.

The demand for electrical supplies in the home market improved somewhat during the year; a feature was the interest in new

wireless apparatus and heating appliances. It must not be forgotten, says Mr. Tower, that the use of electricity and appliances in Great Britain has always been held back by the activities and influence of the big gas companies who were naturally strongly entrenched throughout the United Kingdom for many years prior to the establishment of electric companies. The gas companies cooperatively have spent many thousands of pounds sterling annually in advertising appliances to promote the use of gas, while electric current suppliers are usually of the opinion that the business of selling appliances should be left entirely to the manufacturers in order that proper and efficient progress may be made.

Radio Wrinkles

By Arthur S. Gordon

WHEN the amateur hits on a novel way of doing this, that, and the other thing with his radio apparatus, he feels more or less ambitious and tries to get out a patent. According to his way of thinking, he has "discovered" something; while, according to others, he has merely added one more "wrinkle" to the several thousand now running around uncopyrighted. As a general rule, wrinkles are too easily explained in a few words for a fellow to write a whole article about them, and so a neat half-dozen are presented in this article, five of which are illustrated. All of them have been tried out, and work as well as they look.

A Novel Hook for Headphones

It is safe to say that ninety per cent of the hornless breed of radio amateurs hang their phones on a hook when they are "signing off" for the night. It is also safe to say that a great many have forgotten to turn off the filament rheostat at least once in their radio career, much to the ruination of the A battery. Did you ever think of linking up the craze for hooks with the failing for filament rheostats?

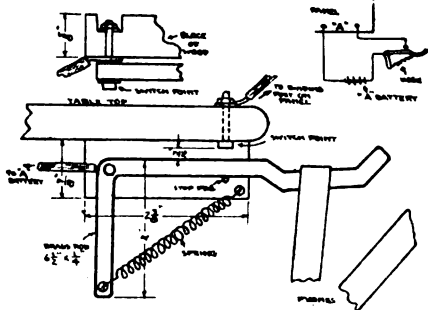


Fig. 1. A wrinkle that will save many "A" batteries, as well as a lot of worry. When you hang up your phones, the filament current is automatically shut off. That is, if you are methodical and hang your phones on a hook. If not, you will have to cultivate the habit and then everything will be O. K.

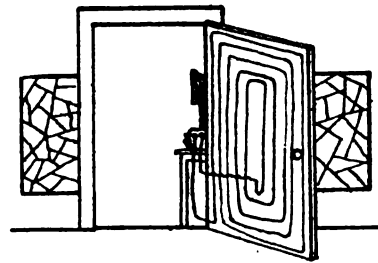
Wrinkle No. 1 does just that. It is the design of a headset hook which automatically turns off the filament current when the phones are on the hook. Figure 1 gives the constructional details of this wrinkle, and shows quite plainly that when the phones are lifted from the hook, the spring pulls the brass rod—out of which the hook is made—against the head of a switch point. A connection is made and the A battery current flows as it should. The moment the phones are replaced, however, this connection is broken, and even if the rheostat has been left on, no current will flow through the filament of the tube.

The hook proper is made of a piece of $\frac{1}{4}$ -inch brass rod, $6\frac{1}{2}$ inches long. It is bent into a right angle shape, as shown, and drilled at the angle to take a $6/32$ switch point which acts as the fulcrum. A spring is extended from the lower end of the part which is bent down to the corner of the base upon which the hook is mounted. This base is of wood, the dimensions of which are given. The contact point is embedded in the top of the wireless table, so that only the head of the switch point shows underneath the table. The connections from the A battery to the hook and from the hook to the binding posts on the panel, are shown in a small insert in the upper right. Figure 1.

An Idea for an Indoor Loop

There are many kinds of folding or portable loops for household use, designed to give the least amount of trouble with the maximum of pleasure. Who, but the amateur who simply had to have a loop that was practically invisible, could have thought of winding one in a vertical plane on a door, as shown in Figure 2? The wire used is No. 22 D. C. C. There are ten complete turns in all, each turn spaced one inch from its fellow. Small brads or brass tacks are placed at the corners, and the result is an attractive loop that is far from being a disfiguration.

Fig. 2. For those who do not like to have loop antennas hanging all over the room, the accompanying sketch will be a welcome suggestion. Variation of the loop is accomplished by swinging the door. It does not take up extra space, and at the same time allows a greater amount of wire to be used. A good idea is to tap the wire, and then tuning can be accomplished by using the different taps of the loop.



A really worth-while feature about this loop is that it can be swung for directional effects by merely opening and closing the door, putting a floor stop to hold the door in the most effective position.

Roll Your Own Phone Condenser

It's a terrible job to make a condenser pack come out right so why not roll the condensers? Figure 3 gives a very good idea of how this is done. A is a cardboard form coated with tinfoil and directly connected to the tinfoil sheet F. The tinfoil sheet D is separated from F by the waxed-paper dielectric E and is connected with the cardboard form B. Two other pieces of waxed paper, C and G,

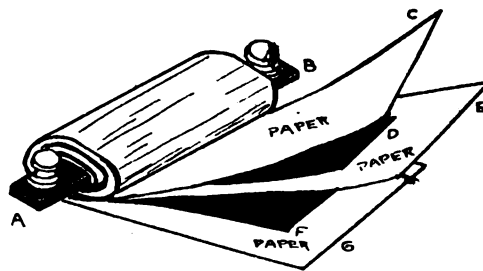


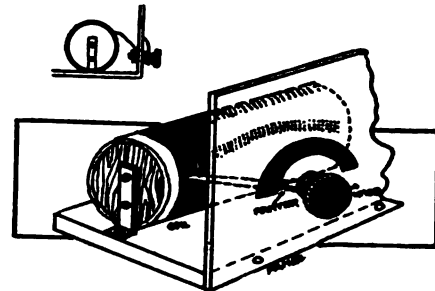
Fig. 3. Illustration shows the method of "rolling your own" condenser. Not quite as neat as the manufactured product, but serves the purpose admirably and doesn't cost much. Care should be taken when making that there is a generous margin of waxed paper left.

are used as shown, and then the whole assembly is wrapped around the two cardboard forms. The result is a neat and inexpensive phone or grid condenser. To get a capacity of .00025 mfd., use two tinfoil sheets, each 5 inches long by $1\frac{1}{8}$ inches wide. Cut the waxed paper so that there is a generous margin all around, particularly at the ends.

An Every Turn Contact Switch

If you dislike making taps when winding a coil, or if you would rather have a scale and pointer on your panel than a row of switch points, this wrinkle will give you an idea that may be of value. Figure 4 shows what is termed as an every-turn contact switch.

Fig. 4. If you dislike to make taps, here is an idea that will eliminate the troublesome drilling of holes and locating of switchpoints, and at the same time permit of single turn variation. The switch arm should preferably be of spring brass or phosphor bronze, and of sufficient length to reach to the ends of the coil.



The sketch explains itself. The switch knob is of the ordinary type, with its arm replaced by a pointer. Attached to its back-panel end is a long contact arm which describes an arc on the coil when the knob is turned. This arc is scraped bare so that an electrical contact is made with the contact arm. Spring brass will be ideal material for this arm, and the switch should be located so that when the contact arm is straight up and down, it is also in the center of the coil.

A Hole Plugging Solution for Old Panels

Take a pint of denatured wood-alcohol and break up in
(Continued on next page)

Radio Saves Time and Money for Ship Owners

By Arthur G. Shirt

NOT so many years ago it was not an uncommon experience for a shipowner to wake up in the morning and find that one of his ships had unexpectedly entered port the previous night. He sometimes became excited, because before the ship could dock there was much to do in the way of arrangements. While these were being made, time was lost as well as money.

Now, when a ship approaches port, the Captain sends in the exact time of arrival, so that the home office may prepare for the routine of handling the ship in the harbor, getting her to the pier, discharging her passengers and mail, and opening her hatches to discharge her cargo. Before the ship is within sight of the lightship at the entrance to the channel, the Captain is informed by radio whether or not he can dock that day. He knows when he can pay off his crew, and even knows the day when he will again set sail for foreign parts. While the ship is two hundred miles away, her owners know how much coal she will need for the next trip, what repairs are needed, or changes in the official personnel of the vessel.

Another feature of radio service while the ship is at sea is the transmission of the daily TR, or "position report." These reports enable the home office to follow the progress of the ship by plotting the noon positions on a special chart.

Besides these direct aids there are other ways in which radio saves time for shipowners. One of these is ridding the seas of derelicts—one of the greatest dangers that beset the navigator. The Hydrographic Office issues a monthly Pilot Chart of the great ocean bodies, and, because of the nature of the information of such charts, they are much sought for by navigators. These Pilot Charts show the position of floating and half-submerged derelicts when and where last seen.

This information does not help the navigator a great deal because a derelict will not "stay put." One seen and narrowly escaped, for instance, by Captain Brown, of the freighter Brazen Bell, should have remained to be blown up by the first Coast Guard Cutter that could respond to Captain Brown's warning. But it didn't. Instead, it led seamen a merry chase, and got under the bows of many vessels and was reported many times.

Now, when the radio operator brings the Captain the report that a derelict has been seen in the vicinity, the Old Man is greatly relieved. He carries the warning into the chart room and plots the position of the obstruction on the

chart. Then he runs down his course line, ascertains how far away he will pass, computes the direction and speed of the current and the probable drift of the derelict, and then changes course or doesn't, according to his judgment.

Just as derelicts frequently annoy a ship's navigator, so do chronometers. How fast are they? How slow are they? To ease the mind of the navigator in the matter of time, various government stations deem it part of their duties to send out time signals twice daily, and these signals, arriving at the ship by means of radio, are used to place the everlasting check on the ship's chronometers. Present day navigators have become so attentive to chronometers that they lose their poise when the radio signals are not forthcoming at least once in twenty-four hours.

As time "ticks" are rapidly becoming a matter of course, so are the weather reports and special storm warnings. A skipper feels that he has a justifiable grudge against the radio man if the ship runs into a storm without eight or ten hours warning by radio.

What a benefit these weather reports are to seamen! They contain information that may help the sailor dodge the storm or prepare for it. Seamen get the position of the storm center, the direction of the wind, its velocity, the direction in which the storm is moving and its rate of speed. The number of ships which have thus been saved from the consequences of a storm would mount up into thousands.

Can You Carry a Message to Garcia?

In most every city (outside of New York) are manufacturers of radio goods who are really anxious to get the patronage of our 70,000 readers.

These manufacturers would sign an advertising contract quick if they only knew what a wonderful advertising medium RADIO WORLD really is, but we have all been so busy here in New York we have not had the time to go out and personally solicit them. Will you undertake to carry one message a day for us? We will supply the message, tell you whom to carry it to, and, if you put over the message, pay you a handsome commission, and all without interfering with your other work. If you have the ambition to earn some substantial extra money, write F. S. Clark, Manager, RADIO WORLD, 1493 Broadway, N. Y.

(Continued from preceding page)

it an old phonograph-record, so that all the pieces of the record are covered by the alcohol. Let the mixture stand for a day and a half. At the end of that time, you will find that the formerly hard record has dissolved into a workable paste or black plaster. With this putty like substance fill up the holes in your discarded panel, and use it again on that new set you may be making. When the holes are filled up, and the hard rubber paste is dry and hard, give the face of the panel a coating of the same thinned-down solution. Then polish it with a fine piece of sand paper, or with pumice stone, and you will have the neatest dull-finished panel you ever want to see.

In using a one-step amplifier with dry cell tubes, it has been found more economical to use two dry cells—that is to say, one separate dry cell to each tube—rather than to

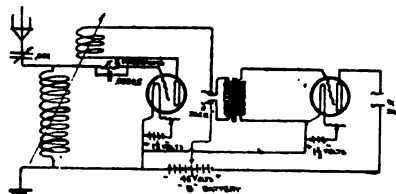


Fig. 5. A hookup for two WD-11 tubes, which is more economical in the use of filament current because of the fact that each tube has a separate dry cell supplying the filament.

connect the two filaments to the same dry cell. A hook-up showing how this is done is given in Figure 5. The essential qualities of a regenerative hook-up are in no way changed, with the exception that the extra filament battery is inserted for lighting the filament of the amplifying tube. This last idea, although it has to do with a hook-up, is as much a radio wrinkle as those ideas which concern the constructional features of a radio outfit.

Radio and the Woman

By Crystal D. Tector

A FRIEND of mine recently returned from Sunny France, and outside of bringing various beautiful gowns and other personal things, she brought me the dearest little French tube you ever saw. I might mention, by the way, that until she sailed for France she had never taken the least interest in radio, aside from coming in to listen to the style and fashion talks every little while. It was quite evident that the operator on the ship must have been a very handsome chap, from the way in which she talked about the "ship's radio."

* * *

THE fact that radio is an important science in our daily life was illustrated the other day in the following way: Friend Husband (who is a lawyer) had a case in which a young man had absconded with a sum of money and for two months had not been located. As a final resort the firm had his description broadcast through one of the larger stations. Result: He was found in a nearby town, living under an assumed name and working nights to escape detection. One of the men he was working with had heard the broadcast and advised the police of the town that the man wanted could be obtained at a certain address. Well, that is just another step in putting the fear of God and the dread of police in the hearts of evildoers, is my way of thinking.

* * *

POOR F. H. told me last night that he is going away for a few days on a business trip. When I started to feel sorry for him in the conventional wifely manner because he would miss his daily radio ration, he smiled indulgently at me and said: "Have you lost your respect for my resourcefulness? Why, I've already made arrangements for my railroad passage on a line which has installed radio sets for the convenience of its passengers and I've also wired for reservations at a hotel where radio is part of the service!" After all, it really is difficult to discourage a real fan, even if he is a husband and is more or less accustomed to being suppressed.

* * *

EVERY once in a while some of my friends get a "wild idea," and appeal to me to help them carry it out. The latest "wildness" was suggested to me by a little lady who had recently been married to a fine boy we all know. The "idea" was that she wanted to give him a present, preferably a radio set. She had seen pictures in RADIO WORLD of a set concealed in a tie-pin and wanted to know if F. H. wouldn't build her one to give him. She said that she had gone down to Tiffany's and bought the "dearest little pin you ever saw, and I want to leave it here for you to fix up for me. You know his birthday is next Wednesday and I'd love to give it to him then." Oh! Oh! Evidently radio sets in tie-pins must be the easiest thing in the world to make, outside of writing the Lord's prayer on the head of a pin.

Radiograms

A GERMAN electrician and radio expert recently made a study of atmospheric, commonly called static. Among other things he found out that with an outside antenna it took .000000005 ampere to cause a disturbance in a receiving set.

* * *

A SPECIAL program was arranged at the Cuban radiophone station PWX when Lemuel Bolles, National Adjutant of the American Legion, addressed the veterans of the World War. The program started at 9 P. M., Eastern standard time, and Mr. Bolles addressed the vast unseen audience at 10:30. After the address, the American Military Band of Havana gave an interesting program of American military music of pre-war days.

* * *

THE first authentic attempt to talk from coast to coast by means of radio telephony was only partly successful, due to outside interference. The test was made between the two stations WOR (L. Bamberger, Newark, N. J.) and KHJ ("Times-Mirror" of Los Angeles, Calif.). The experiment was made between 2 and 4 o'clock Sunday morning, Feb. 18. Dr. Lee de Forest was operating at the Newark end, and made an address, part of which was successfully reported at the Los Angeles station. The Los Angeles station then followed him up with its regular program, part of which were very plainly heard at the Newark station. The entire programs would have been received had it not been for the interference, chiefly from ships at sea, and from numerous CW stations in between, which caused enough interference to make signals entirely inaudible at times.

GIRLS, I have a new scheme for making "pin money." The idea is perfectly legitimate, and I can make enough to treat myself to a matinee and tea at least once a week. I simply get my friends to subscribe to the RADIO WORLD. The idea was suggested to me by a visit to "Ye Editor" the latter part of last week. I think that it is a very fine idea, and it doesn't take much time to sell anyone a subscription to a good radio magazine these days, especially when the magazine is a weekly, and is therefore weeks and weeks ahead of the other magazines in its news and pictures. Write in.

* * *

FOR every wrong way there is an easier right way" was demonstrated to me very forcibly last Wednesday. The occasion that causes me to wax philosophical was this: I had tried and tried for days and days to get "hubby dear" (you girls will understand what I mean), to buy me another pair of Radio Boots, but without success. Well, I finally became tired of telling him to stop in and bring a pair home, so that memorable morning I arose from my "downy" with a very apparent "grouch." During the course of breakfast I "took it out on the boss," and when he very meekly returned at night, he brought me a pair of boots and, also, a box of candy. Nothing like doing things "in the right way."

* * *

A GREAT many of my friends tell me that they have no trouble in operating their sets, but would like to try a few experiments once in a while. They set those cute little diagrams of various DX hook-ups in RADIO WORLD, but always complain that they can not possibly hope to understand the meanings of all the little hooks and dashes and wires. Take a page from the book of your younger days, ladies, and think how difficult it was for you to understand the first dress pattern you used for the first (and sometimes, only) frock you made. A diagram of a hook-up is no more intricate or harder to solve than a dress pattern, so don't be discouraged. And remember—you don't have to wear the set you build yourself!

* * *

SOME people are certainly persistent. The other evening a few of my friends gathered in my house to have the regular Thursday night "Radio and Gabfest." During the evening, a little old lady happened to mention the word wireless. "By the way," she remarked, "they don't use wireless much now since radio has come in, do they?" "Why, that is just two names for the same thing," I replied. Well, for the rest of an hour and a quarter the argument waxed hot and heavy, and in the end we had to resort to the almost sagacious advice of F. H., who settled the matter by telling the opposing parties that wireless and radio were the same thing, and that wireless did not mean code alone and that radio did not mean broadcasting and telephone. Oh! some people are so stupid—they simply will not listen or believe.

A NEW secret coding device was recently demonstrated before the officials of the navy during its recent manoeuvres. By means of this device, over twelve million codes are possible, each one controlled by a secret key-wheel which is the basis of the invention. The device resembles a typewriter, but instead of the regular type faces, there are numerous dials that are revolved. At present the entire device is being kept a secret, but in a statement given out it is said that it will make the decoding of messages impossible without the use of a duplicate set of key-wheels at the receiving station. This device will do away with the code books now used, and which are in constant danger of being stolen. It will do no good for anyone to steal the code wheels, as the code is used only once, it being impossible to get the same combination a second time without going through the entire twelve million combinations.

* * *

THE fact that radio is important to the churches was recently shown vividly in an address made by the Rev. Dr. E. J. Van Etten, of Calvary Protestant Episcopal Church, Pittsburgh. Dr. Van Etten said in part: "Radio broadcasting of church services will prove something of a disintegrating force of the church organizations themselves. Only the fittest preachers will survive, and struggling churches will more or less be backed to the wall." This, explained Dr. Van Etten, was because of the fact that the larger churches that broadcast sermons proved so much more of a magnet to a larger number of people that it was actually drawing among the congregations of the smaller churches, if not taking them away. "Many people," he continued, "are taking the following view of the entire matter: 'Why should I go to hear so-and-so when I can sit at home and listen to the entire services of any one of a half-dozen of the larger and more important churches scattered throughout the eastern part of the country?'"

Sends Stock Reports Over Radiophone

By Otto M. Falhaber

THE Huth-Funken Telephone Company, of Berlin, is sending stock reports to its clients by means of radio instead of through the ticker, as in this country. Subscribers wishing the stock service have a radio receiving outfit such as is pictured in the accompanying photograph over which they receive the reports of the various bull and bear activities on the Berlin Exchange.

This was made possible through an arrangement with the Berlin Stock Exchange, and has proved a success.

The only drawback is that as radio broadcasting is open to every one, any one owning a receiving set can get the reports. But this is not a serious drawback as any person can look at a ticker, the only difference being that where you probably had to go around the corner to reach a ticker you now have only to pick up your head phones and listen.

The idea has proved such a success in Berlin that there are several other countries seriously thinking of adapting it to their stock exchanges.

The idea is a time-saver in more ways than one inasmuch as with the present system wires have to be installed whenever a new ticker is to be installed, and also the apparatus used in the present system is so complicated that it takes a staff of expert mechanics to keep it in constant repair.

With the new system, of course, this is rendered unnecessary.



(C. Gilliams Service)

Interior of the Huth-Funken Telephone Co., which sends Berlin Stock Reports over radiophones. The girl at the left of the photograph is transmitting the reports, which are picked up by the various offices by means of a receiver identical to the one directly over the head of the man seated at the desk. The receiver, as will be noted, is of the type that needs no tuning, being switched on by simply raising the receivers off the hook.

Radio Service for Army Chaplains

CHIEF of Army Chaplains John T. Axton announces, with great pride, the broadcasting of Army religious services from four Army radio stations. This new public religious service, which was undertaken with the authority of the Secretary of War and the cooperation of the Signal Corps, was first broadcast from Army posts at Forts Crockett and Sam Houston, Texas, and followed at Camp Lewis, Wash., and Fort Leavenworth, Kansas, with marked success. At the two Texan posts radio sermons and services were both sent and received, indicating that broadcasting is possible in order to cover a large territory where Sunday services are not available.

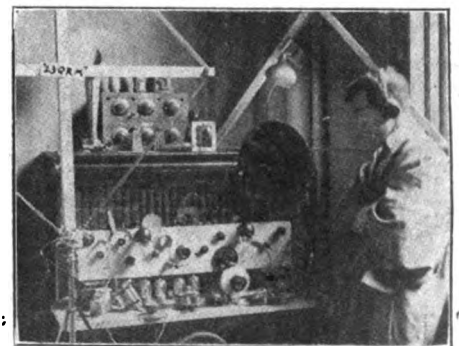
It is said that some radio-fans in districts

far from community centers heard services on the Sabbath for the first time in months. Instead of being confined to small assemblies audiences of unlimited size are assured Army chaplains for the first time. The transmission of sacred music by voices and bands is also handled as part of Sunday programs. At small posts where no chaplains are stationed receiving sets rigged by Signal Corps men, now pick up the divine services broadcasted from distant stations.

Capt. Robert H. Smith, who sent the first cablegram across the Atlantic on the second cable, laid by Cyrus W. Field in 1866, died recently in his eighty-third year.

Suzuki "Breaks Through"

HAVE been reading RADIO WORLD right along and I would say that all the DX Owls making record with the conventional outside aerial but how about mine? I am getting all the stations within 1,000 miles from here, but I heard KFI, Los Angeles, at 2 A. M. last Sunday Q. S. A., and listen, my outfit is of 3 stages of radio frequency amplification with UV 1714s, W.



Suzuki's Super-regenerative Set

E. 216a tubes and UV200, Baldwin C fones with 5 turns of 4 foot loop in steel Bldg. KFI is more than 2,000 miles air line. Do I get any credit for my set? Do you consider my set just the same as the one with outside aerial? My hook up is a regular Radio Corporation's, but used with best parts that I can find on market.

Yours truly,
73's Y. T. SUZUKI,
(Japanese Radio Bug)

420 Post Bldg.
Battle Creek, Mich.

Rothafel Returns from England

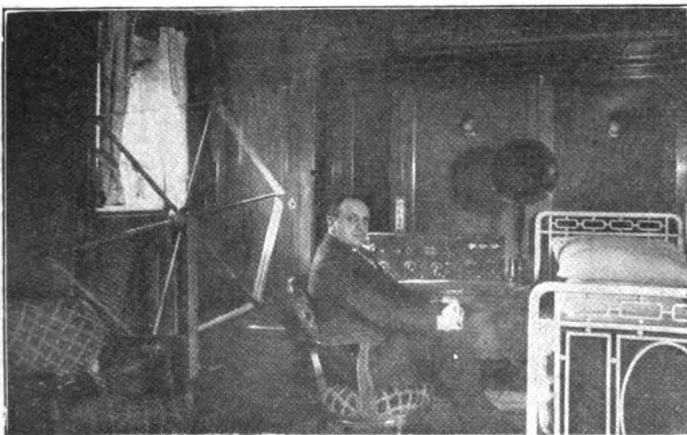
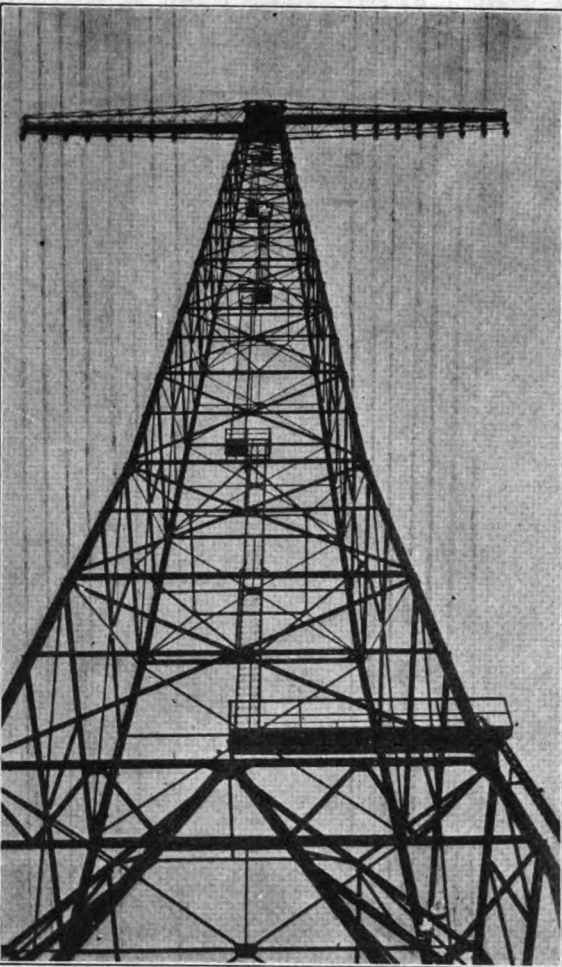


Photo by Bradley & Merrill

S. L. Rothafel, director of the Capitol Theatre, New York City, is shown here in his stateroom on the Berengaria during his recent trip to England. The radio set enabled him, during the voyage, to hear the Capitol orchestra through the Am. Tel. & Tel. Co.'s station, WEAF.

News Pictures from Radio World R

Captions by Robert L. I



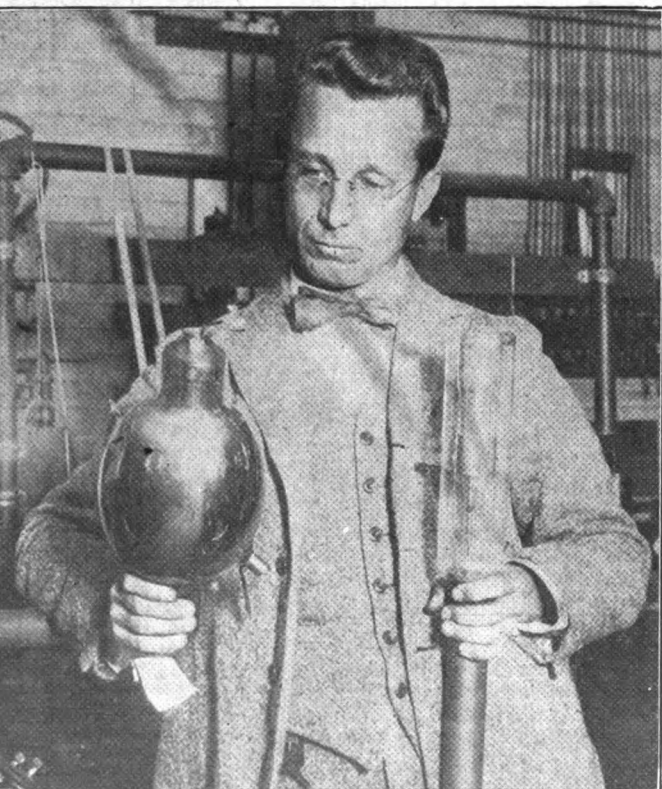
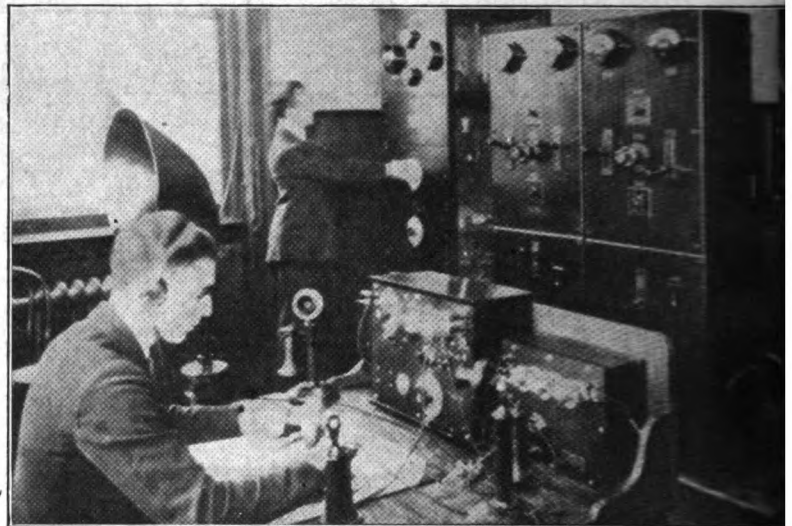
(C. Gilliams Service)

One of the huge steel towers of the Radio Central Wireless Station at Rocky Point, Long Island, N. Y. There are to be seventy-two of these monstrous towers, arranged in the form of the spokes of a wheel, the periphery of which is to be three miles in diameter. Each of the spokes is to have six of these towers, and there are to be twelve spokes. The towers are 410 feet high and weigh 180 tons each.



(C. Keystone Views)

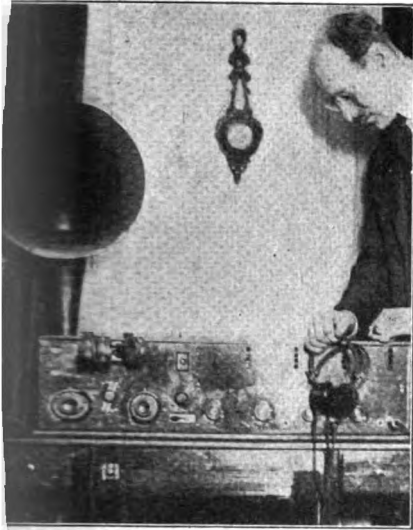
Frederick Charles Fleche, a London taxi-driver, is an ardent radio fan. This is denoted by the fact that he has even installed a set on the cab he uses to "pick-up" fares. His cab is in great demand, because it is the only one in "dear ol' Lunnon" having a radio set on it.



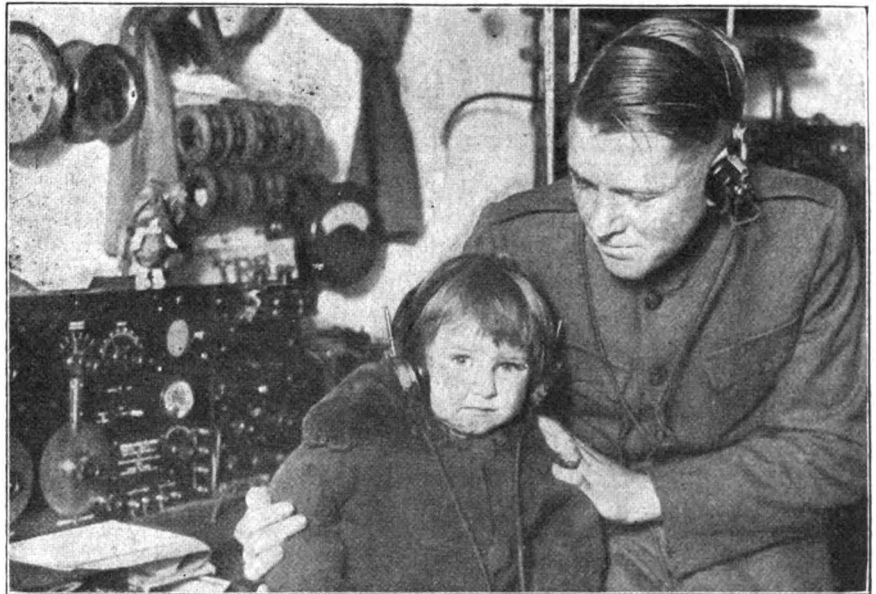
(C. Haezel and Herbert)

Two new water-cooled vacuum tubes used in place of the high frequency alternators for trans-oceanic radio work. Up to the present time it has been the custom to use large alternators for providing the high frequency currents for trans-oceanic work, but recent experiments with 20 kw water-cooled tubes such as shown in the picture will in the future make the alternators unnecessary.

All Over for Readers Cougherty

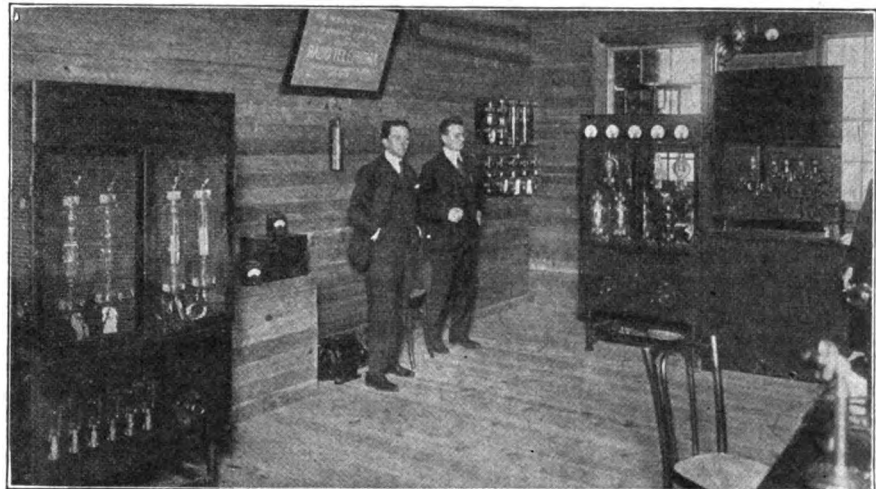


(C. Kadel and Herbert)
Operator C. P. Morgan, of the S. S. St. Mihil, entertaining little Anna Cauthorn, one of the children of the American soldiers of the Army of Occupation who recently returned to our shores. This operator was kept busy entertaining the children during the trip.



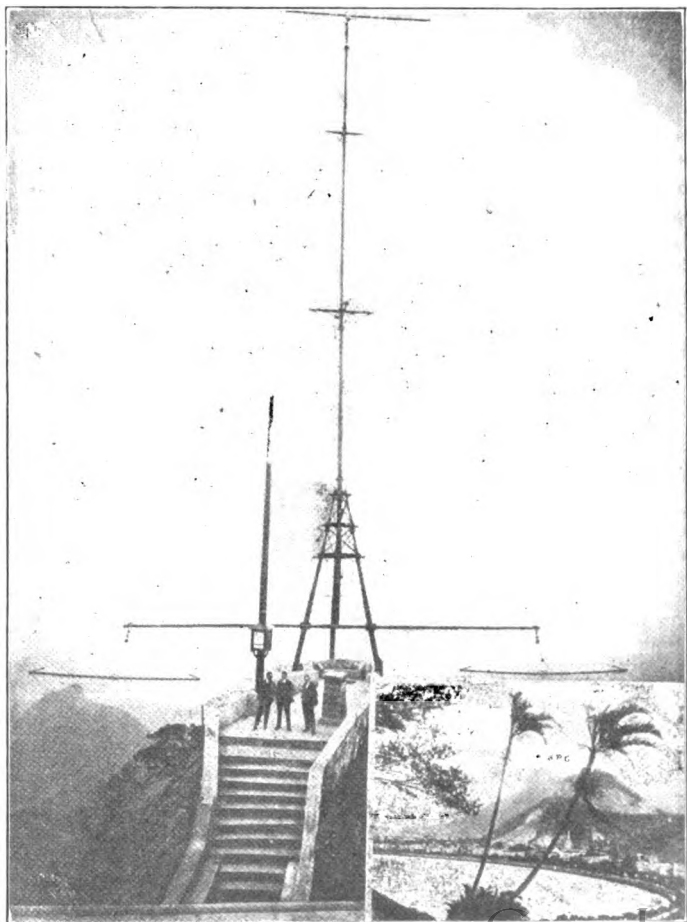
(C. Underwood and Underwood)
Using only a steel fire escape as an antenna, S. Mawhinney, of 801 Riverside Drive, N. Y. C., has been able to pick up concerts coming from Stockton, Cal. The set used is a five tube receiver using two stages of radio frequency, a detector and two stages of audio frequency.

(C. Kadel and Herbert)
The operating room of the highest broadcasting station in the world, located on the top of Mount Corcovado, Rio de Janeiro, South America. The call of this station is SPC and has been heard over long distances by many amateurs.



(C. Fotograms)
The apparatus used in one of the most unique meetings ever held. The Western Electric Co., of New York and Chicago, recently held a formal yearly meeting in both cities, which was presided over by the same officer though the two groups of officers were separated by more than 1,000 miles. Two-way reception and communication were successfully established for the first time.

(C. Kadel and Herbert)
The antenna system of SPC, the highest broadcasting station in the world. This station is 2,175 feet above sea level, and was established by the Westinghouse Electric International Co. Small insert in lower corner shows location of station atop the mountain.



(C. Keystone Views)
Cabin of the H. M. S. Impregnable that has been re-erected in Auto-voyer's Wireless Store in Victoria Street, London, as a demonstration room. It is complete in every detail, even the brass fittings and lamps of the original ship being used. It is one of the novelties of the largest radio store in London.

(C. International Newsreel Photos)
Rover listening in to a concert with his master. He evidently is not in favor of "ear-muffs," judging by the expression on his face. The set that the young man has built is constructed of parts of a Mecanno outfit that was laying around. Evidently steel has lost its original qualities and can be used as a cabinet now.

Answers to Readers

I have a regenerative set, but when listening to distance stations I am bothered with a whistle and squeal and cannot hear them. My set is shielded. How can I remedy the trouble?—Nick Tirone, 261 Seaton Avenue, Roselle Park, N. J.

Decrease the B battery current, or better yet, use a potentiometer. Don't burn your tubes too high. Burn them just high enough get the oscillations started. If burnt too high, they force oscillations.

1. *Enclosed please find diagram of my set. It worked fine until a couple of days ago, then it refused to work. My connections are all tight. What can be the trouble? When I disconnect the variable condenser in the aerial circuit and hook my aerial directly to the set, I get music faintly.*

2. *Why are some tubes (detectors) louder than others?—Karl Day, Dwight, Kansas.*

1. Your diagram is correct. We suggest that you put a new B battery in the circuit, and go over your connections very carefully. If they are soldered, look at them very carefully, as the flux might cause corrosion, which will seriously damage the sensitivity of the circuit. Your connections on your condenser are evidently making bad contact. Also, examine the lugs of your tubes, and sandpaper them lightly to remove any dirt or corrosion that may have accumulated. Keep all the contacts clean.

2. This is due to the fact that some tubes are exhausted to a greater extent than others.

What is the tube U. V. 201 A, and where is it possible to get it?—R. Prentiss, c/o Chas. Parker, High Street, Meriden, Conn.

This is a new tube recently brought out by the Radio Corporation, and does not consume as much current as the regular U. V. It consumes one-sixth of the regular current. It can be had at any of the larger radio supply stores, or the nearest branch office of the Radio Corp., or Westinghouse Electric Co.

I have constructed the WD-11 set described in your Jan. 20. issue, but cannot get it to work properly. What can I do?—Chas. G. Rose, Lorain, Ohio.

Switch the B battery leads and put on more plate voltage. See that the set is wired correctly. Use a variable grid leak. Test out your circuits by means of a battery and buzzer.

How can I make a rectifier for charging a 6-volt 40-ampere hour battery from a 110-volt 60-cycle alternating current line.—L. A. Remfry, Jackson, Miss.

Take two plates of aluminum about 6x3 inches and two like plates of lead. Fasten an aluminum and a lead plate on a block of wood about 1-inch square, and long enough to project one inch beyond each end. When both of these units are made up, take 2 mason jars or any receptacle that will hold the plates and fill them full of a solution of borax and water. Allow this solution to stand for about an hour, when the borax that did not dissolve will precipitate and lay on the bottom. Poul off the solution, and wash the rest of the borax out of the jar. Replace the solution and put the two aluminum and lead elements in the two jars. This will give you two rectifiers each containing a lead and an aluminum plate immersed in a solution of borax. The wooden piece that projects will serve to prevent the element

from falling into the jar. Fasten a wire onto each, and hook-up as follows: The aluminum plate of one of the jars goes to the positive pole of the battery, and the aluminum plate of the other goes to the line. Then connect the lead plate of the first rectifier to the series bank of lamps (4 60-watt lamps in series parallel will do) and the aluminum plate of the other jar to the other or open end of the line. This will allow you to rectify both sides of the current and when your battery is bubbling or tested by a hydrometer the correct charge can be found. It will generally take about 10 or 15 hours to charge a battery.

Will the set described by John Kent in the Jan. 27 issue tune out local stations? If not give me a hook-up of a two tube (WD-11) set that will accomplish this.—Robert Jacobs, 112 W. Irvinton Place, Denver, Colo.

This set is extremely sharp in tuning, and will tune out local stations. Of course, it is impossible to tune out stations if you are very really close to them. If they are at some distance, it is possible with this hook-up.

My antenna is between the house and barn, and is strung up on two poles. Will it be necessary to ground the poles, or is grounding the antenna when not in use sufficient? The aerial is 150 feet long.—Leo Clark, Seward, Nebraska.

It will not be necessary to ground the poles, provided they do not project too high above the roof. If they are over fifteen or twenty feet above the highest part of the roof, it is better if they were grounded; that is, provided that they are metal. If they are wooden, you cannot ground them, as you cannot ground any wooden object, it being an insulator even if a poor one.

Publish a hook-up for a U. V. 200, one vario coupler, two variometers, condensers, rheostats, etc.

With my present regenerative hook-up I am enabled to get only nearby stations. Will this improve my reception?—J. Walton Holmes, 521 Kew Gardens Road, Richmond Hill, N. Y.

We refer you to our issue of RADIO WORLD dated Oct. 14. On page 4 you will find a hook-up similar to the one you request, with full constructional details of the variometers and variocoupler construction, by G. W. May.

1. *Kindly furnish me with a hook-up using a WD-11, 2 honeycomb coils, and condensers.*

2. *Also a hook-up with one honeycomb coil tube and condensers.*

3. *Can a WD-11 tube be used with the Flewelling circuit, or is a six-volt tube necessary?*

4. *Are honeycomb coils better than variocouplers?—D. V. Keedwell, Independence, Missouri.*

1. We refer you to the hook-up by Ortherus Gordon, published in our issue of Jan. 20. This article includes all the particulars for panel, and also for making the coils.

2. See the article by G. W. May in RADIO WORLD of Feb. 17, on page 11.

3. The WD-11 can be used with this hook-up, but only 60 volts should be put on the plate, as if more than that is used there is a liability of the tube breaking down.

4. Due to the fact that a greater range of wave length is possible with the honey-

comb coils, they are sometimes preferred to the coupler, which is only useful throughout a comparatively small range.

1. *Does the De Forest D7 Reflex set use a variocoupler, or is it tuned by a condenser?*

2. *If a tuner is used, is a variable condenser used in the open circuit?*

3. *Can you give me the capacities of the condensers?*

4. *How can I construct a 50,000-ohm resistance unit?—S. J. Gordon, 458 Tompkins Street, New York City.*

1. This set is constructed in such a manner that either antenna and ground, or loop can be used. This is accomplished by using a double circuit plug. When the loop is plugged in, it automatically cuts the coupler out. Across the secondary of the variocoupler there is a condenser. When the loop is inserted the set is tuned by means of the condenser.

2. There is also a condenser in the open circuit. This is cut out when the loop is inserted.

3. The capacities are .001 in the primary, and .0005 in the secondary.

4. It is cheaper to buy these than to make them, as winding high resistance wire on a suitable core entails a lot of work. They can be obtained in any radio or electrical shop.

What is the diameter of the pasteboard tubes used for the variocoupler in the article by Ortherus Gordon in the Jan. 20th issue of RADIO WORLD?—F. N. Cash, Norwich, Conn.

The diameter of these coils should be 2 inches.

1. *How can I construct the coils mentioned in your article by Ortherus Gordon in RADIO WORLD, Jan. 20?*

2. *Should the coils be in opposition, or must both the windings run in the same position?*

3. *Does it matter which coil goes to the plate?—Richard Blair, 17 Clifton Park, Pittsburgh, Pa.*

1. These coils and their construction are fully explained in the text under the heading "The Variocoupler."

2. The coils should run in the same position; that is, the windings should follow each other.

3. The top coil should go to the plate, and the outside end of the winding is the one that connects with the phones. The inside of the winding goes to the plate itself.

Please publish a reflex amplifier circuit using two tubes.—Honore Girouard, B.Sc.A., Drummondville, P. Q.

We refer you to the article appearing in this issue, by W. S. Thompson, E.E.

Can you give me a hook-up using two tubes and a crystal with two stages audio and two of radio?—R. B. Eaton, 20 Maple Baine Avenue, Toronto, Ont., Can.

We refer you to the hook-up published in this issue, under the heading "Multiple Tube Reflex Circuits," by W. S. Thompson, E.E. The first article of this series was published in our issue of Feb. 24, and contains some very good explanations of reflex circuits, as well as several very interesting diagrams.

Radio World, 52 issues, \$8.00.

Subscribe direct or through your news dealer. \$6.00 a year, \$3.00 six months, \$1.50 three months. Radio World, 1493 Broadway, N. Y. C.

Latest Radio Patents

New Method of Signal Reception

No. 1,443,280; Patented Jan. 23, 1923. Patentee: Burke Bradbury, Schenectady, N. Y.

THE present invention of Mr. Bradbury relates to a radio receiving system, particularly to systems for receiving continuous wave signals.

In some cases where it is desired to receive continuous wave signals by some method, such for example as the heterodyne method, for rendering such signals audible,

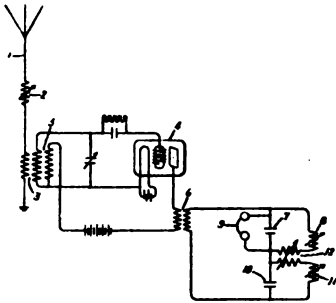


Diagram of Mr. Burke Bradbury's invention, making it possible to receive continuous wave signals without the use of the regular heterodyne method generally employed. As will be seen, a double coupled circuit is used with a valve detector.

it will be found difficult to tune a receiving system sharply enough to eliminate the effects in the receiver of stations of neighboring wave length which are either of higher power or located much nearer a receiving station than the one from which signals are to be received.

The object of the invention is to overcome such difficulties as the one mentioned and to provide a means for eliminating the effect in the receiver of interfering signals.

The novel features which are believed to be characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation will best be understood by reference to the following description taken in connection with the accompanying drawing in which is illustrated diagrammatically one way in which the invention may be carried into effect.

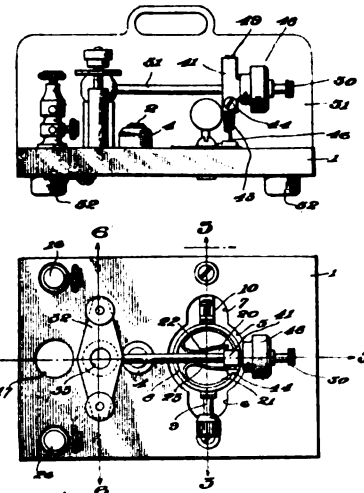
There is indicated in the drawing an antenna 1 with the usual tuning inductance 2 and a coupling transformer 3 by means of which the received signals are impressed upon the grid circuit of a detector 4 of the electron discharge type. The plate and grid circuits of the detector are coupled together at 5 in order that the detector may generate local oscillations of a frequency slightly different from that of the signals which are to be received. Coupled to the plate circuit of the detector 4 by means of the transformer 6 is a separate circuit in which are provided two frequency traps. One of these which comprises the capacity 7 and parallel inductance 8 is tuned for the frequency of the signals to be received, the usual telephone receiver 9, or any other desired form of indicator, being connected in parallel to this trap. The second trap made up of the condenser 10 and parallel inductance 11 is tuned to the frequency of the interfering signals which it is desired to suppress. This second trap offers a high impedance in the circuit to the flow of currents of the interfering frequency and thereby prevents such currents from affecting the telephone receivers 9. In case the second frequency trap does not completely prevent the interfering signals from affecting the telephone receivers a coupling 12 may be provided between the two frequency traps for the purpose of impressing upon the first frequency trap a current of the proper phase and intensity to neutralize any current of the undesired frequency which may flow in the first trap.

different frequency for transmission and reception, by providing separate antennae for transmitting and receiving, the said antennae being located a considerable distance from each other, and by neutralizing the inductive action of the transmitting system proper on the receiving system by means of balancing circuits.

New Crystal Detector

No. 1,441,968; Patented Jan. 8, 1923. Patentee: Emmet P. Lindner, Indianapolis, Ind.

THIS invention of Mr. Lindner's relates to crystal detectors as used in wireless receiving apparatus, and an object of the invention is to provide a carborundum detector which is constructed to permit movement in any necessary direction, making it possible to engage any sensitive spot on the mineral crystal with centralogical pressure of the contact point of the detector, thus making the detector very sensitive, as



A new crystal detector invented by Emmet P. Lindner, which allows flexibility in finding the most sensitive spot, as well as making the adjustment permanent when once found. It is for use with a carborundum detector or one requiring a very hard and steady pressure.

any spot on the surface of the mineral crystal can be met at any required pressure; also to provide a detector as specified, which is constructed to securely maintain the movable contact in any adjusted position against vibration occasioned during the use of the apparatus, and which will also permit the contact to be maintained in proper engagement with a sensitive piece of mineral crystal without the contact slipping.

Another object of the invention is to provide a wave detector which comprises a carrying rod, on which it is mounted, for longitudinal movement; a carrying block for the contact spring, the contact point of which is sharpened to permit sensitive and accurate engagement between the contact point of the spring and a carborundum or mineral crystal, and also to provide a supporting structure for the carrying rod, which comprises a sphere or ball on the end of the rod, engageable in a suitable socket, the frictional engagement of the ball with the socket being regulated by a spring plate which grips the surface of the ball opposite the socket, and the tension of which is adjusted by adjustable thumb nuts.

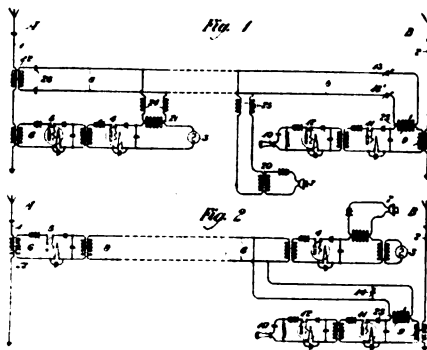
A further object of the invention is to provide a holder for the mineral crystal, which is rockably supported relative to the detector, and comprises a suitable cup in which a spring clip is mounted for yieldably engaging the mineral crystal and maintaining it in proper position.

Duplex Wave Transmitter

No. 1,443,965; Patented Feb. 6, 1923. Patentee: Lloyd Espenschied, Hollis, L. I., N. Y.

THE invention of Mr. Espenschied's relates to wireless signaling systems, and more particularly to a wireless duplex signaling system. The object of the invention is to provide a system for the simultaneous transmission and reception of signals, and in particular to provide means for duplex communication between two stations. For successful duplex operation it is necessary that the receiving arrangement be effectively protected from interference by the transmitting arrangements associated therewith; that is protected from what is known as "side tone." It is well known that in wireless telegraph and telephone systems the magnitude of the transmission current is enormously greater than that excited in the antenna by the received waves, the relative magnitude of the former with respect to the latter being of the order of one million to one. This enormous ratio renders inapplicable to wireless systems the means of transmission interference elimination which are successfully employed in ordinary wire telegraph and telephone systems. The wireless system is, however, differentiated in two important respects from the ordinary wire system; first, signals are transmitted on high frequency carrier waves of definite

frequencies, this fact permitting of the employment of different frequencies for transmission and reception, and secondly resonant tuned circuits may be employed, thus ren-



Mr. Lloyd Espenschied's method of transmitting. This new system will permit duplex transmission. The figures show two different methods of accomplishing this, as explained in the accompanying text.

dering the receiving system selective with respect to the waves it is desired to receive. In the invention I provide successful duplex operation by employing carrier waves of

New Records of The DX Nite Owls

Well Repaid by the Enjoyment

From Charles A. Smith, Roselle, N. J.

After reading your column, "Latest from the DX Nite Owls," I am not ashamed to submit this list of distant stations. These have all been tuned in on detector only. My set is a single circuit regenerative two-step audio amplification, designed by the Consolidated Radio Call Book Co., and built by the writer from plans furnished by them.

I feel that I am well repaid by the enjoyment gotten for the loss of time and sleep. I don't know what kind of an owl "DX" is, but I must be some sort of a "bird" to stay up half the night. The stations alluded to are as follows:

Distant Stations, 360 Meters—WGY, Schenectady, N. Y., General Electric Co., 150 M.; WGI, Medford Hills, Mass., American Radio and Research Corp., 250 M.; WFI, Philadelphia, Pa., Strawbridge & Clothier, 90 M.; WHK, Cleveland, O., Westinghouse, 410 M.; WSY, Birmingham, Ala., Alabama Power Co., 900 M.; WLW, Cincinnati, O., Crosley Mfg. Co., 560 M.; WLK, Indianapolis, Ind., Hamilton Mfg. Co., 725 M.; WWT, Buffalo, N. Y., McCarthy Bros. & Ford, 300 M.; WRW, Tarrytown, N. Y., Tarrytown Radio Laboratory, 35 M.; WBT, Charlotte, N. C., Southern Radio Corp., 500 M.; WMAF, South Dartmouth, Mass., Round Hills Radio Corp., 225 M.; WDAP, Chicago, Ill., Midwest Radio Central, 525 M.; KDKA, Pittsburgh, Pa., Westinghouse Mfg. Co., 325 M.; WHAM, Rochester, N. Y., Rochester University, 300 M.; WLAG, Minneapolis, Minn., Cutting & W'ton Radio Co., 1,050 M.; WDAJ, College Park, Ga., Atlanta & West Point R. R., 800 M.; KOP, Detroit, Mich., Detroit Police Department, 325 M.; WFAJ, Asheville, N. C., High Grade Wireless Co., 675 M.; WEAN, Providence, R. I., Shepard Stores, 175 M.; WHN, Ridgewood, L. I., Ridgewood Times, 20 M.; WHAS, Louisville, Ky., Courier-Journal, 675 M.; WOAX, Trenton, N. J., Frank J. Wolff, 40 M.; CFCFA, Toronto, Can., Star Pub. & Printing Co., 350 M.

Local Stations, 360 Meters—WJZ, Newark, N. J., Westinghouse, 7 M.; WBS, Newark, N. J., D. W. Mays, Inc., 7 M.; WDT, Tompkinsville, N. Y., Ship Owners' Radio Service, 10 M.; WNO, Jersey City, N. J., Wireless Telephone Co., 12 M.; WVP, New York, N. Y., Signal Corp., 15 M.; WAAM, Newark, N. J., I. R. Nelson & Co., 7 M.; WBAN, Paterson, N. J., Wireless Phone Corp., 20 M.; WWZ, New York, N. Y., John Wanamaker, 15 M.; WEAM, N. Plainfield, N. J., Borough of N. Plainfield, 10 M.; WDAM, New York, N. Y., Western Electric Co., 15 M.

Distant Stations, 400 Meters—WBZ, Springfield, Mass., Westinghouse, 200 M.; WSB, Atlanta, Ga., Atlanta Journal, 800 M.; WIP, Philadelphia, Pa., Gimbel Bros., 90 M.; KSD, St. Louis, Mo., Post-Dispatch, 950 M.; WHB, Kansas City, Mo., Sweeny School, 1,200 M.; WOC, Davenport, Iowa, Palmer School, 950 M.; WWJ, Detroit, Mich., Detroit News, 325 M.; WNAC, Boston, Mass., Shepard Stores, 225 M.; WHAZ, Troy, N. Y., Rensselaer Institute, 175 M.; WGM, Atlanta, Ga., Atlanta Constitution, 800 M.; WBAP, Fort Worth, Texas, The Star Democrat, 1,500 M.; KYW, Chicago, Ill., Westinghouse, 525 M.

Local Stations—WOR, Newark, N. J., L. Bamberger & Co., 8 miles; WCAF, New York, N. Y., Western Electric Co., 15 M.; WBAY, New York, N. Y., American Tel. & Tel. Co., 15 M.

Your magazine is much enjoyed by me and my friends, and it carries "the real dope."

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

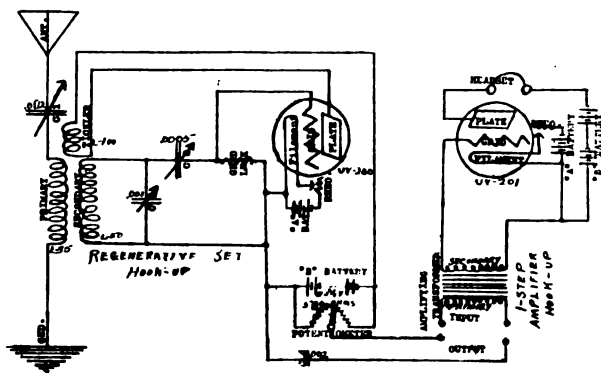
The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

A Five-Months Fan

From Quentin Weaver, Saratoga, Texas

Enclosed you will find a hook-up which I believe gives remarkable results. As I have been a fan only five months, I think that the following is a fair record. To date I have received 76 stations in 26 different States and Havana, Cuba. The farthest station being KDZT at Seattle, Washington, at the distance of 2,100 miles. Here is a partial list: WLW, WEAO, WHK, WWJ, KLZ, KWH, KHJ, WHA, WLB, WAAM, WPJ, KFAE, WFAF, WBZ, KZN, and PWX.

My aerial is a single wire 150 feet long and 50 feet high. The primary condenser C1 should be treated in both series and parallel for best results. The coils are honeycomb coils and the turns are marked on the diagram. On the diagram I show 22½ volts on the B battery of the first tube, but I find that 45 volts work the best. The potentiometer is 500 ohms, but any potentiometer of 500 ohms or over can be used.



I noticed in a recent RADIO WORLD a story about Radio Golf. I have a fairly good score myself. Here it is: WEV, Houston, Texas, 70 miles; WMAM, Beaumont, Texas, 40 miles; WFAF, Houston, Texas, 70 miles; WDAO, Dallas, Texas, 260 miles; WOS, Jefferson City, Mo., 605 miles; WOC, Davenport, Iowa, 865 miles; WBAP, Fort Worth, Texas, 278 miles; WOAI, San Antonio, Texas, 263 miles; WPA, Fort Worth, Texas, 278 miles; WGM, Atlanta, Ga., 679 miles; WDAF, Kansas City, Mo., 635 miles; WHB, Kansas City Mo., 635 miles; WRW, Tarrytown, N. Y., 1,515 miles; WHAS, Louisville, Ky., 755 miles; KSD, St. Louis, Mo., 637 miles; WDAJ, College Park, Ga., 639 miles; WFAA, Dallas, Texas, 260 miles; WLB, Minneapolis, Minn., 1,065 miles; PWX, Havana, Cuba, 901 miles; WKAL, Orange, Texas, 67 miles; WSB, Atlanta, a., 679 miles; WDAP, Chicago, Ill., 933 miles.

Total: 12,129 miles in three hours and thirty minutes. Mileage per hour, 3,465 miles. I believe this nears the record of Mr. Anthony, of Needham, Mass.

Joins Our "Nite Owls"

From Willis Nye, 310 East Sonoma Avenue, Stockton, California

WOULD like to join your "DX Nite Owls" Society. I will give my qualifications. I use an inductance with 8 taps, in inductive relation to a variometer, a 23 plate condenser, one vernier condenser, grid leak (variable), grid condenser, one telephone jack, vernier rheostat, tube, variable "B" battery, and "A" battery and Federal phones. I have got the following DX stations beside many local stations within one hundred miles radius of my home. My aerial is 20 ft. high, 80 ft. long; 1 wire

KHJ, Los Angeles; KZN, Salt Lake City; KGG, Portland; KFC, Seattle, Washington; CKCK, Regina, Saskatchewan, Canada; KLZ, Denver, Colorado; KFI, Los Angeles, Cal.; KFBC, San Diego, Cal.; CFCN, Calgary, Canada; KFAF, Denver, Colorado; WBAP, Ft. Worth, Texas; KWH, Los Angeles, Cal.; KDYL, Salt Lake City; KFBD, Hanford, Cal.; KNI, Eureka, Cal.; KFAV, Medford, Oregon; KGW, Portland, Oregon; 6XAD, Catalina Island; KFAE, Pullman Washington; CFCB, Vancouver, British Columbia, Canada.

Locals within 120 miles: KUO, S. F., Cal.; KWG, Stockton, Cal.; KFBK, Sacramento, Cal.; KJQ, Stockton, Cal.; KXD, Modesto, Cal.; KPGH, Palo Alto, Cal.; KFDB, S. F., Cal.; KVO, Sacramento, Cal.; KZY, S. F. Cal.; KDN, S. F. Cal.; KJJ, Sunnyvale, Cal.; AGI, Presidio, Cal.; KRE, Berkeley, Cal.; KZM, Oakland, Cal.; KLX, Oakland, Cal.; 6XJ, S. F. Cal.; KLS, Oakland, Cal.; KQW, San Jose, Cal.; 6AJD, Stockton, Cal.; KYY, San Francisco, Ca.

I use only one tube.

Hookup with which Mr. Weaver (see letter on this page) has done some remarkable work. Take note of the fact that he uses separate batteries for his amplifier. This is a good idea, if the builder has sufficient space to accommodate the extra batteries. It allows better reception through the amplifying circuits. This is because there is less chance of the amplifier oscillating, due to enforced oscillations through the battery circuits from the detector circuit.

Without Amplification

From Kenneth I. Scouten, Los Angeles, California.

HAVE a record which I consider unusual for a crystal set without amplification. Have listened in to concerts from KPO and KUO, San Francisco, and KZN and KDPT of Salt Lake City, coming in loud and clear.

Local stations can be heard all over the room with phones hanging on the wall. My aerial is 4-wires 60 feet, 30 feet high. The set is entirely home-made, with the exception of the phones.

Another 1-Tube

From Fred Hoffman, 1963 61st St., Brooklyn, N. Y.

Would like to mention the stations I have heard on a 1 bulb (W-D11) set using a variocoupler, variable condenser. PWX, Cuba; WGAD, Porto Rico; WHAZ, Troy; KDKA, Pittsburgh; WIP, Phila.; WOO, Phila.; KYW, Chicago; WSB, Atlanta; WGM, Atlanta; WWJ, Detroit; WBZ

(Continued on page 24)

WJZ's Children's Story Heard in British Isles

TO Florence Smith Vincent, a charming and talented New York woman is accorded the distinction of being the first of her sex to be heard in Great Britain over the radio from WJZ, the Westinghouse Radio Corporation at Newark, N. J. At least she is the first woman to be heard talking and it was during one of her recent stories from "Peter's Adventures in Birdland," that J. W. F. Cardell in Cornwall, England, not only heard every word of the tale but received a Christmas greeting from the young woman. So impressed was Mr. Cardell by the marvelous experience that he forthwith wrote to the Radio Corporation Westinghouse Station, congratulating WJZ and Mrs. Vincent on their achievement. WJZ is the only broadcasting station to be heard regularly in Europe.

Other women's voices have been heard in songs as far as England but only in fragmentary shape, and later at night. Mrs. Vincent tells her stories to the children at seven o'clock in the evening when the air is full, which makes the achievement all the more extraordinary.

Mrs. Vincent, who has been relating her delightful stories of "Peter's Adventures" over the radio for the past year has received more than 4,000 letters from pleased listeners and these have come from all parts of this country and as far north in Canada as Banff. From Maine and all the other New England States, from towns as far south as Miami, Florida, from Texas, Iowa, Missouri and in fact from almost every state this side of the Rockies have come letters from young and old. And every letter has been answered either personally by Mrs. Vincent or through her publishers, Frederick A. Stokes Company.

Mrs. Vincent has another distinction which might be mentioned in connection with her great success as a radio broadcaster and that is that she is the author of more than two thousand children's stories. Many of these have been compiled in "Peter's Adventures in Meadowland," and "Peter's Adventures in Birdland." A third book, "Peter's Adventures in Animal-land," is shortly to be published. These form an interesting children's library.

More Work for NAA

THE broadcasting of weather reports and market news from the Agricultural Department was transferred from the Washington Post Office station recently to Naval station NAA at Radio, Va.

In all, NAA got eleven new schedules comprising nearly three hours a week more of broadcasting. This station now handles an average of 18 schedules of fifteen minutes each a day, totaling approximately 25 hours a week or almost 4½ hours daily except on Saturday and Sunday.

The new schedules are all on radio telephone circuit carried on the 710 meter waves. They include reports on live stock, fruit and vegetable, hay and feed, dairy products previously carried by the Post Office but now broadcast via land wire from

the Agriculture Department, Washington. Weather reports and forecasts as well as warnings are now sent twice daily by voice directly from the Weather Bureau, so that several thousand more recipients can understand the broadcasts, than get the code reports. It is understood that all work previously handled by the Post Office stations will soon be transferred to Army or Naval Radio stations.

A new schedule from the Civil Service will be handled by NAA every Wednesday evening at 7:25, so that a radio civil want ad broadcast will soon be in operation.

Marine and Naval Band music will be continued each Wednesday and Friday evenings, Chief Radio Man B. L. Moore, U.S.N., doing the announcing.

A Real Opportunity

OF late, there has been a general and marked improvement in shipping, and of course with the increase in the number of ships doing business, there naturally is an increasing demand for competent radio operators. All over the country there is need of radio operators, and on a canvass it was learned that 15 out of every 20 amateurs did not know enough of the rudimentary principles of the science to pass the examinations.

The graduates of the Radio Institute of America (formerly the Marconi Institute), are placed in berths by the Radio Corporation of America, of which the Radio Institute is a part. The Radio Institute has not at present enough operators to go around and as a result there are many ships that are inadequately supplied with operators. The present pay of operators range from \$75 per month and board, upward, depending upon the class of the vessel they work on. This pay, of course, is absolutely all clear, there being no deductions for expenses, meals, etc., and the operator is classed as one of the officers of the ship.

This Institute was founded in 1909 to train operators for the American merchant marine, but it now offers instruction to anyone interested in the science of radio telegraphy and telephony. Its graduates are under no restrictions as to where they may seek employment, although upon the ter-

mination of the course they are placed immediately by the Radio Corporation.

The requirements necessary for obtaining a position as a wireless operator are: 1st Class Commercial License Certificate, either 1st, 2nd or 3rd grade; 18 years of age or older, preferably American citizens, or those possessing citizenship papers. There is no physical examination given, but the applicant should have no major disabilities, requiring the use of crutch or canes.

Here is one of the best opportunities of seeing the world, and is also one of the most complete ways of obtaining an electrical education.

Unique Washington's Birthday Broadcast

FROM Washington a unique broadcast went out over NAA to the country on Washington's Birthday at 9 o'clock in the morning. Plans provided for the broadcasting of a salute to the Flag rendered by Army field musicians from Fort Meyer on fives and drums.

Arrangements undertaken by the Bureau of Public Buildings and Grounds provided, through the co-operation of the Chesapeake and Potomac Telephone Co., a land line and a pick-up instrument installed at the base of the Washington Monument where the celebration was held. This carried the music to the Arlington Naval Station.



This Combination
Completes any RADIO
RECEIVING SET



TO own a good receiving set without Magnavox equipment, is like having your house properly wired and then using only small, feeble candle-power lamps in the sockets!

Whether placed in the average living room or large dance hall, Magnavox Radio floods the desired area with clear, resonant music or speech—its volume perfectly controlled from the Magnavox Power Amplifier constructed specially for it.

Combination R-3 Reproducer and 2 stage Power Amplifier (as illustrated).

R-2 Magnavox Reproducer with 18-inch horn: the utmost in amplifying power, for store demonstration, large audiences, dance halls, etc.

R-3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc.

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer. 2 stage 3 stage

Magnavox Products can be had of good dealers everywhere.

The Magnavox Co.,
Oakland, California
New York: 370 Seventh Avenue

Write for booklet illustrating and describing the

MAGNAVOX
Radio
The Power Amplifier
and Reproducer Supreme

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

New Radio Firms

(The new firms and corporations mentioned in these columns can be reached directly or by communicating with the attorneys, whose addresses are given when ever possible.)

Altex Electrical Supply Company. (Attorney, N. B. Finkelstein, 51 Chambers Street, N. Y. C.)
Baker & Son, Mozart heatre Building, Elmira, N. Y.

Rubes Radio Manufacturing Co., \$125,000; V. G. Swope, Raymond Swope, New York; W. W. Lecount, Brooklyn. (Attorney, Colonial Charter Co.)

Parkway Electric Company, 1330 Commonwealth Avenue, Boston, Mass.

E. R. LeManquais Company, Inc., 134 Worth Avenue, Plainfield, N. J.

Radio Electric Company, 102 West 9th Street, Frank T. Scudder, prop., Fort Worth, Texas.

Automotive and Radio Manufacturing Corporation, New York, \$1,000,000 to \$2,000,000.

Cresson Electric Supply Co., Keystone Avenue, C. A. Klemstein, prop., Cresson, Pa.

The Radio Shop, 841 Main Street, Westbrook, Me.

Bluestone Electrical Company, Philadelphia. (Attorney, Corporation Guarantee & Trust Co.)

Carroll-Edwin Co., 3217 Fourteenth Street, N. W., Washington, D. C.

Scott & Knies, Adler and Third streets, Hazleton, Pa.

Chamberlain Electric Co., N. Y., to make radio instruments, \$25,000; E. Gross, E. Bensamson, R. Kessler. (Attorneys, Reit & Kaminsky, 305 Broadway.)

Lee S. Geddes, 389 Madison Avenue, Albany, N. Y.

Alcon Electrical Supply Co., N. Y. C. (Attorney, S. B. Cardozo, 30 East 42d Street.)

University Electric Co., 1353 University Avenue, Madison, Wis.

M. B. Sleeper, publishing of radio books, incorporated for \$5,000. Directors, J. E. Whiting, E. Webster, G. O. Castell. (Attorneys, Avery & Whiting, 5 Nassau Street, N. Y. C.)

This Radio Mfg. Firm Works 24 Hours a Day

THE fact that the radio industry is continually growing was indicated the other day in a bulletin issued by the Alden Manufacturing Co. of Springfield, Mass. In a letter to RADIO WORLD they say in part:

"Our process has worked so that sockets being shipped to customers today were only raw materials yesterday. This is our third month of operating on three shifts, eight hours each. By this is seen that the factory is running 24 hours a day, and due to the fact that our orders are increasing at such an enormous rate, we are forced to increase our floor space over 25 per cent. We believe that we are right in the claims that we are now the largest manufacturers of tube sockets in the entire world. It is partly due to the fact of our enormous advertising campaign, and wholly due to the quality of our product, which is the best that can be made, and in which no pains are spared to make it absolutely the best."

Some idea of the extent of this concern's development may be gained from the volume of sales. These have increased over 700 per cent in less than two years, and it is a constant rush to keep up with the ever-increasing orders coming in.

Sales offices have been established in all parts of the country, and the company is also well established in Cuba, South America, and Canada. There have even been considerable call for their products from Continental Europe.

Radio Stocks

(Quotations as of February 21, 1923, furnished by Frank T. Stanton & Company, 35 Broad Street, New York City, Specialists in Wireless Securities.)

American Marconi Stamped.....	5c	20c
American Marconi Unstamped.....	\$5	\$7
American Tel. & Tel.....	123	123½
Canadian Marconi.....	3¼	3½
De Forest Radio.....	7	10
Dubelier Condenser.....	5½	5¾
English Marconi com.....	11	15
English Marconi pfd.....	11½	15½
Federal Tel. Calif.....	5	6
General Electric.....	185½	186
Hennessy Radio Pub.....	9	11
Mackay Company com.....	116½	117
Manhattan Elec. Supply.....	55	57
Marconi Int. Marine.....	8	10
Radio Corporation com.....	3½	3¾
Radio Corporation pfd.....	3¾	3¾
Spanish Marconi.....	1	3
Western Union.....	118	119
Westinghouse E & M.....	65	65½

Move Because of Increase of Business

BECAUSE of the tremendous growth in their business, Chas. Freshman Co., Inc., manufacturers of the well-known radio appliances, Antennas, Micons and Variable Resistance Leaks, found their quarters at 97 Beekman street, New York, totally inadequate to meet the prevailing demand for their products.

They have, therefore, taken much larger quarters in a modern, up-to-date building at 106 Seventh avenue, on the corner of 17th street, and are now doing business on an even larger scale.

Production has been increased many fold and everything possible is being done to assure a maximum of service to all customers.

Radio Wanted in Brooklyn Parks

A radio set in every Brooklyn, N. Y., park has been urged in a letter to Borough President Riegelmann by Arthur J. Olmstead, head of the Municipal Civic Service League of Brooklyn. Mr. Riegelmann is reported to favor the suggestion.

Dr. Lee De Forest Wins Cresson Gold Medal

PRESENTATION of the Elliott Cresson Medal to Dr. Lee De Forest for his invention of the audion or three-electrode vacuum tube took place at Philadelphia last week at the Franklin Institute in connection with a joint meeting of the Institute and the Philadelphia Section of the American Society of Civil Engineers.

The special committee appointed by the Institute to investigate and report on the audion consisted of Charles E. Bonine, chairman, and Dr. George A. Hoadley, with the following consulting members: Gen. J. J. Carty, Dr. A. E. Kennelly, Major Gen. George O. Squier, John Stone Stone. The presentation address was delivered by Dr. Walton Clark. The report upon which the award was made says in part:

"This invention for amplifying minute electrical currents and pressures, called by the inventor the audion, is one of the most important ever made in the field of the electrical transmission of intelligence and through its development has worked a profound revolution in the art of radio communication.

"Its use as an amplifier has made possible the extension of radio communication to distances hitherto impossible and has made available at the receiving end of the line a means of making the voice of a distant speaker audible by an unlimited assembly."

Among others to whom the medal has been awarded by the Institute are Alexander Graham Bell, Sir William Crookes, Prof. and Mme. Currie, O. Mergenthaler, Sir William Ramsay, and W. C. Roentgen.

Coming Events

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

A Suggestion to Broadcasters

Editor RADIO WORLD—Many of us (meaning radio bugs), like Jazz, and others like music, and it is our pleasure to sit at our receivers and fish about until we get just what we prefer, and when we get it we like to know who is giving the treat.

But too often the broadcasting station neglects to give its call letters and we cannot give the proper credit.

Radio is good advertising for anyone whether it be an individual, a business concern or a city, and the broadcaster should not be so modest as to hide his light under a bushel.

A statement through your medium might correct this and we, who try for long distances, would be relieved of an awful strain sometimes.

Have 'em shout who they are from the housetops, so to speak, long, loud and often.—Frank D. Fox, Minneapolis, Minn.

It is a good suggestion brought out by Mr. Fox in the above letter. The RADIO WORLD would be glad to hear from others on the subject, especially from broadcasters. Our columns are open to you.—The Editor.

GALENA CRYSTAL

Mounted in special prepared metal 30c. Unmounted 35c. All guaranteed. Manufacturers, dealers and jobbers write for quantity prices. We also manufacture Radio parts to order. PRECISION TOOL & MFG. CO., 102 Lewis St., N.Y.C.



List	Our Price
\$8.00 Federal Phones.....	\$5.95
1.50 Klossner Vernier Rheostats .79	
1.75 Bright Star "B" Batteries, 22 1/2 volt.....	1.10
7.70 43 Plate Vernier Condenser	4.75
6.80 23 Plate Vernier Condenser	4.25
5.00 WD-11 Transformer.....	3.75
1.00 WD-11 Socket.....	.49
22.50 Bristol Loud Speaker.....	19.50
4.75 Variable Condenser 43 Plate	2.00

Write for free catalogue. Perfection Pays Parcel Post

Perfection Radio Corp. of America
119 WEST 23RD STREET, NEW YORK

180 DEGREE VARIOCOUPLER
\$2.15
(Regular Price \$3.50)
ECLIPSE RADIO CORP.
414 W. 42nd St. New York City

NATIONAL RADIO SERVICE CO.

140 W. 32nd ST.
NEW YORK CITY
NEW YORK

Flecher Variocoupler	\$2.75
Flecher Variometer (Small).....	2.15
Flecher Variometer (Large).....	2.80
Arrow Variocoupler	2.15
Arrow Variometer (Small).....	2.15
Arrow Variometer (Large).....	2.80
A. B. C. 43 Plate Condenser.....	1.85
A. B. C. 23 Plate Condenser.....	1.65
Freshman Var Gr Lk & Condenser...	.79
Freshman Var Grid Leak.....	.60
U. V. 281 Amplifying Unit.....	8.00
W. D. 11 Amplifying Unit.....	7.50
Framingham Vernier Rheostat.....	1.15
De Forest Rheostat.....	.95
Socostat (Socket & Rheostat Combined)	1.65
Bannard Phones	3.65
Dr. Siebt Phones.....	5.75
Federal Phones	5.25
Four Way Plug.....	1.10
Firth Bull Dog Plug.....	.75

ALL PARTS
FOR LATEST CIRCUITS
LIKE FLEWELLING
AND REFLEX

We Pay the Postage

Second District Amateurs' Convention at the Hotel Pennsylvania

THOSE who attended the Second District Executive Radio Council held at the Hotel Pennsylvania last year will remember very distinctly that "a good time was had by all." Those who attended last year's exposition will most surely attend this year's affair scheduled for March 1, 2 and 3, at the Hotel Pennsylvania. The present plans as outlined will make the last year's meeting look like an old straw hat.

The following clubs will be represented at the Pennsylvania Hotel, and are the larger clubs of the Second District: Hudson River Yacht Club, Radio Association of Greater New York, Hudson, Chelsea, Down Town, City College, Radio Club of Harlem, Bronx, Bronxville, White Plains High School, North Jersey Radio Association, Bloomfield, Hill City, Radio Club of Irvington, N. J.; Rutherford, Ridgewood, Westfield, Hackensack, Nutley, Roselle Park, Bushwick Evening Trade School, Vocational School for Boys, Nassau Radio League, Radio Club of Long Island, Staten Island, Baldwin, Radio Club of Brooklyn; Stuyvesant, Highway Radio Club, and Yonkers, Passaic High School, Radio Club of Hudson County, Hudson City, Ridgefield Park, Radio Club of Jamaica, Universal, Radio Division.

The convention opens at 2 p. m., March 1, on the Roof Garden of the Hotel Pennsylvania, and the following booths have been set aside for the Radio Clubs: Booth 26, Radio Club of Brooklyn; booth 27, Hackensack and Ridgefield Park, N. J., Radio Clubs; booth 29, Radio Association of Greater New York; booth 30, Ridgewood Radio Club; booth 31, Hudson Radio Club; booth 35, Department of Commerce; booth 36, Bronx Radio Club, New York; booth 38, Staten Island Radio Club; booth 39, Radio Club of Jamaica, L. I.; booth 40, Radio Division Hudson River Yacht Club; booth 42, Roselle Park Radio Club.

At the Department of Commerce booth, wave meters will be checked and calibrated free of charge by United States radio inspector. This is a feature in itself, and one that should not be overlooked. If you own a wave meter, bring it along, and have it corrected and then you won't stand any chance of running your wave up among the BRs, which "isn't nice."

The banquet will be held in the grand dining of the Hotel on March 3, and from present indications it will be "some feast." Music during the banquet will be furnished by Ted Schuster's Society Orchestra.

Is It Always the Fault of the Amateur?

Much has been said about the interference that is created when tuning up a regenerative set. Rumors of official reprimanding for those found to be the owners of re-radiating sets have cause considerable uneasiness among some novices. This is unnecessary worry. Unless one owns and operates an outfit consisting of two or more amplifying tubes the possibility of creating serious interference is nil. So says the *New York Globe*, and continues:

It is the amateur who is using 5-watt power tubes and high plate voltages that is the real cause of this form of interference. Yet it is doubtful if the wave he puts on the air is bothersome to any one except the owner of an ultra-sensitive receiver who unfortunately happens to live nearby.

White's "Varioment" Cement
Make your own coils. Construct variometers, variocouplers, etc. No distributed capacity. Holds windings securely and permanently.
Send 25c. for sample bottle
WHITE RADIO COMPANY
123 East 23rd Street New York City

D-X-

(DISTANCE)
Free Catalogue

This Catalogue should be called "Recipes for Long Distance." The D-X-RADIO COMPANY was founded to help amateurs pull in the most distant stations. This Catalogue is a compilation of radio instruments designed for D-X (DISTANCE) Work.

The Thrill of Your Life

When you first hear a voice from a ship at sea,—or on one of these snowy days you pull in a song from a concert down in Florida—say that's the thrill that comes once in a life time!

D-X-Radio Company Specializes

on instruments built for Distance. If you want to jump States or reach over mountains you must use the proper equipment. Our instruments do the trick.

Mail Order

Pin a Post Office Money Order on to your order and our Mail Order Department speedily and carefully does the rest. Checks or stamps not accepted. Merchandise shipped postpaid east of the Mississippi.

Free Catalogue on Request

D-X-Radio Co.

123 Liberty Street New York City

RADIO BROADCASTING MAP

FOR the benefit of those interested in Radio and those who are becoming interested, Rand McNally & Company have prepared a publication containing a wealth of information of greatest value. It shows in the most comprehensive way, the location of the broadcasting stations, gives their classification, the call letters, wave lengths, wavelengths, etc., of each.

Everyone who wishes to get the maximum pleasure and enjoyment from Radio should have a Rand McNally Radio Map of United States. It is complete, accurate and up-to-date.

The Rand McNally Radio Map of United States is 32x20 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover.

Price 35c Each

THE COLUMBIA PRINT

1403 BROADWAY NEW YORK CITY

AMATEURS, SEND FOR CATALOGUE
"B" Batteries That Last For Five Years



RADIO EQUIPMENT MFG. CO.
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PROLONGS LIFE OF TUBES
AMPERITE
AUTOMATIC FILAMENT CURRENT ADJUSTER
ELIMINATES RHEOSTATS
EXPELS ALL TUBE TROUBLES
FROM YOUR DEALER OR
RADIAL COMPANY
99 WARREN STREET, NEW YORK \$1.10

DX Nite Owls

(Continued from page 20)

A Pretty Good Record

From C. Parkinson, Toronto, Canada

IN your January 27 issue I noticed several very remarkable records, and hard ones to beat. These reports were under the heading, "With the DX Nite Owls." Well, here is my record for the month of January. The stations are: WGY, Schenectady; WGR, Buffalo; WEA, New York City; WMAQ, Chicago; WOO, Philadelphia; WFI, Philadelphia; WNOK, New York; KDKD, Pittsburgh; WJZ, Newark; WCAE, Pittsburgh; WLW, Cincinnati; WLK, Indianapolis; WOR, Newark; WWJ, Detroit. For all of these stations I can use a small Brown's loud speaker. The following are a list of the long distance stations that I have heard: WHAS, Louisville; WSB, Atlanta, Ga.; WDAF, Kansas City; WOC, Davenport; CSCG, Winnipeg; CKCK, Regina, Canada; WDAJ, College Park, Ga.; WCAT, Rapid City, S. D.; WDAO, Dallas, Texas; WCAY, Milwaukee, Wis.; CHAC,

Halifax, Canada; WBAP, Fort Worth, Texas. This completes my list, all but these two KDZH, Fresno; KWH, Los Angeles. What do you think of these two for long distance work? All of the other stations I can tune in or out whenever I wish, all but the last two. And I have only heard these twice. All of latter stations are over 600 miles from Toronto. The circuit that I am using is regenerative. When I tune into our own local station CFCA you can hear it 40 feet from the horn. My aerial is 130 feet long, one wire, and 70 feet above the ground; the lead-in is 50 feet. I think for a one-bulb set this is a pretty good record. (I use a WD-11 tube.)

Using Only One WD-11

From William Brantly, 1115 Humboldt St., Bakersfield, Calif.

I am sending you a list of stations I have heard in the past three nights. They are: 6BM, 6BAC, 6ZM, 6ORE, 6XAS, 6BA, 6BVW, 6BO, KWH, KDYL, KZN, KDYO, KSL, KFBK, KHJ, KFEB, KFI, KFDS, KWG, KQW, KFAF, KMJ, KPO, KFZ, KLZ, KVO, KFCK, KGG, KFAF, KGW.

Another Home-Made Set

From James W. Turner, Norfolk, Virginia.

HERE are my records for a single-circuit, home-made receiving set with which I have had remarkable success. It is very selective both for phone or C. W. On November 25 I heard 27 stations during five hours. These were: WJZ, WOR, WSB WGY, WIP, WGM, WHAF, KDKA, WBZ, WDAF, WRR, WEA, WMAK, KSD, WLAG, PWX, WHAS, WOC, KYW, WBAJ, WGR, WOI, WEAB, WNAC, WDAP, WNAN, WOO, WOS.

I have codes from almost all of these stations. I have heard over 100 since I constructed the set, and I am using only a single, 7-strand aerial, 25 feet high and 150 feet long. The vario-coupler was made by myself, and it works on wave-lengths from 170 to 500 meters. All battery connections, as well as aerial and ground, are on the rear of this set, which leaves a very pleasing effect from front. I used no shielding, as I found there was practically no body capacity effect when using the I. R. adjusters. The set is bus bar, wired with square tinned copper wire, which makes it very neat if care is taken in wiring. I am enclosing circuit of tuner and construction of coupler. I should be glad to give any other information.

Twenty-five an Evening in N. S.

From Horace S. Olding, New Glasgow, Nova Scotia

Using single circuit regenerative and one tube I have heard the stations listed below: WJZ, WBZ, WOO, WIP, KDKA, WAAM, WGL, WHAM, CFCA, WBAP, WCM, WSB, WHP, CFCF, CKAC, CHYC, WGR, WBAN, WFI, WWJ, WBAK, WNAC, WEA, WHAZ, WMAK, PWX, WKAQ, WDAF, WMAF, WMAC, KLK, WHAS, WBAF, KDOW, WGY, WRW, KHJ, WCAE, WNAT, WQAA, WGI, KOP, WDAP, WJAX, WPL, WDAK, WOC, WLAK, WFAB, WWB, WBU, WFAC, WBAU, WNAN, WCAP, NOF, NSF, WJAZ, PBAN, KYW, WJX, WAAT. I have heard as many as twenty-five in one evening and enjoyed them all.

The Heart of the City

From Charles Kohlman, New York City

AFTER reading the lists of many DX fans in your magazine I decided to send you my list. I am situated in the heart of the city.

WAAQ, Greenwich, Conn.; WOC, Davenport; 2XJ, Deal Beach; WCAE, Pittsburgh; WIP, Philadelphia; WBZ, Springfield; WSZ, Toledo; NOF, Anacostia, D. C.; WLW, Cincinnati; WWJ, Detroit; WDAP, Chicago; WGI, Medford Hillside; WNAC, Boston; WHAS, Louisville; WHB, WDAF, Kansas City; WSB, Atlanta; WHAZ, Troy; WFAA, Dallas; WEAN, Providence; WEY, Wichita, Kansas; WBT, Charlotte, N. C.; WSY, Birmingham, Ala.; WNAP, Springfield, O.; WCAL, Northfield, Minn.; WGY, Schenectady; WMAK, Lockport.

All the Way from K. C.

From Frank M. Faxon, 210 W. 53d St., Kansas City

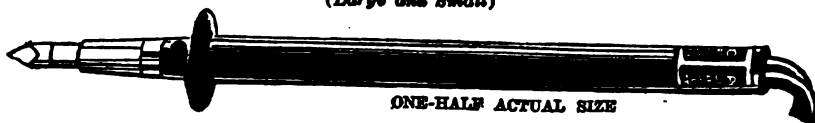
The Sweeney Automobile School in Kansas City, Mo., lays claim to broadcasting records. They started broadcasting at 7:00 p. m. Feb. 1 and broadcast until 7:28½ a. m. Feb. 2. They broadcast continuously for 12 hours and 28½ minutes, and the engineers did not replace tubes or do any work on the set. Chamber of Commerce members spoke and Ted Lewis and his jazz band playing in the "Greenwich Village Follies" entertained. The Radio Bug reigned supreme from 2:00 a. m. to 5:00 a. m. and choir music was furnished by the Central Episcopal Church of Kansas City from 5:00 a. m. till 7:15. The program ended with a short talk by E. J. Sweeney about the Sweeney School.

DELICATE SOLDERING

Both the manufacturers' and amateurs' problem on all fine work is readily solved by the instrument constructed for this particular purpose.

THE POST SOLDERING IRON

Platinum Heating Unit—Interchangeable Tips—Universal Current
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ONE-HALF ACTUAL SIZE

\$6.00

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Awarded Certificate of Excellence, N. Y. Evening Mail Radio Institute

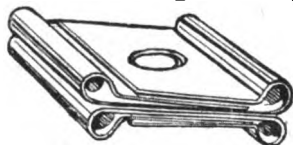
POST ELECTRIC COMPANY, (Div. 509) 30 E. 42nd St., New York

Phone Clips, Crystal Detectors, Condensers

Duplex Clips Two for 7c Post Paid

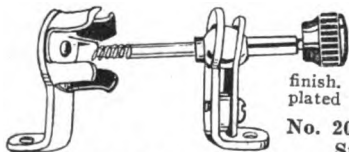
Special Price, 2 for 5c

With this device Phones may be used in either series or parallel. Unequaled for square bus wire work.



No. 17 Crystal Detector, 27c each, Post Paid

The most dependable and efficient Phone Condenser to be had at any price. Made of high dielectric specially processed varnish paper. .001 M.F.D. capacity, and each condenser is tested at 110 volts. Remember that Fixed Condenser capacity is necessary for tube sets.



ASSEMBLED

Assemble your own Crystal Detector. Complete parts for panel mounting; unassembled, in envelope. Highest quality design and finish. Heavy brass nickel-plated with Bakelite Knob.

No. 20 Fixed Condenser, Special 39c each Post Paid



Hedden Place Machine Co.

Manufacturers of HPMCO WIRELESS PARTS
40 HEDDEN PLACE EAST ORANGE, N. J.

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RADIO WORLD

RADIO WORLD

1493 Broadway, New York City.

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One Year (52 Issues) 6.00
Add \$1.00 a Year for Foreign Postage, 50c for Canadian Postage.

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for repairs. All makes. Satisfaction
guaranteed. Reasonable charges.
Box, 191 West 42nd St., New York City

CABINETS
Hinged Top, Beautifully Rubbed
Mahogany Finish.
7x18\$3.25 7x21\$3.50
7x24\$4.00
Ask your dealer for the E.C. Type.
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CORPORATION OF AMERICA accept no new or inexperienced
applicants in their services as Wireless Operators
other than our Graduates. Investigate the advantages of-
fence through taking either our HOME STUDY or RESI-
DENCE course in Radio.
RADIO INSTITUTE OF AMERICA
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RADIO MAILING LISTS
12,400 Radio Dealers, covering U. S. by States, \$7.50
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25,000 Radio Amateurs and Managers of Radio
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Ask for price lists for Canada, England, other lists.
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Side Cutting Plier
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With Soldering Iron Kit, \$4.75
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The Nickest Short Wave Tuner on the Market
Only \$6.00 & PP on 1 lb. Send for pamphlet.
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Doctor _____, Norristown, Pa., writes: Listening
in recently with my GOODMAN, heard a voice. "We
are now 90 miles out from San Francisco." Then
DENVER came in and sank the ship.

TRADE "VAC-SHIELD" MARK
bring in DX
The invention of this
non-magnetic shield
cuts out electro-static
effects between
vacuum tubes, over-
comes interstage
coupling, which
causes distortion and
unnecessary noise
which make it diffi-
cult to tune in dis-
tant stations - also
guards tubes against
breakage. Your tubes
should have them.
Attached in a minute
If your dealer cannot
supply you we will
ship immediately by
mail postpaid on re-
ceipt of \$1.00.
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41 North 16th Street East Orange, N. J.

RADIO WORLD
TELEPHONE, BRYANT 4700
PUBLISHED EVERY WEDNESDAY (Dosed
SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE,
1493 BROADWAY, NEW YORK, N. Y.
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TECHNICAL EDITOR
Robert L. Dougherty

SUBSCRIPTION RATES
Fifteen cents a copy. \$3.00 a year. \$2.00 for
six months, \$1.50 for three months.
Add \$1.00 a year extra for foreign postage.
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Receipt by new subscribers of the first copy of
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their order, is automatic acknowledgment of their
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Entered as second-class matter, March 28, 1922,
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IMPORTANT NOTICE
While every possible care is taken to state
correctly matters of fact and opinion in technical
and general writings covering the radio field, and
every line printed is gone over with a scrupulous
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out of technical problems or other matters that
may be printed in good faith and on information
furnished by those supposed to be trustworthy.
This statement is made in good faith and to save
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publisher cannot possibly have control.

**Alphabet Tells Use of Battery
in Radio Set**

AT one time the various batteries neces-
sary to the operation of a radio set
could easily be distinguished by their type, as
storage or dry battery. But with the wide
use of the dry cell tube with which a dry
cell does the work of the storage battery,
the use of the letters "A," "B," and "C" is
to be recommended.

For no other reason than that some dry
cell sets contain instructions directing the
owner to attach the 1½-volt dry cell to the
filament posts, hundreds of vacuum tubes
have had a short but merry life. To the
novice a dry cell is a dry cell whether it be
one of 22 or 2 volts, and it takes no longer
to attach the higher potential battery to the
filament binding posts than the bell ringing
cell.

The letters A and B were given to bat-
teries in the filament and plate circuit, re-
spectively, for no special reason. Likewise,
when it was found that some tubes needed
a supplementary battery in the grid circuit
to make the tube work at the proper place
on the characteristic curve it was only nat-
ural that the method of lettering be con-
tinued to call the new battery "C."—New
York "Globe."

**Model Electrical Farm in
Sweden**

A model electrical farm to encourage the
use of electricity in agriculture is being
established near Stockholm, Sweden, and
demonstrations of electrically operated plows,
harrows, harvesters, threshing machines,
churns, separators, etc., will be given.

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Marks registered in the
U. S. and abroad. Call or
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FREE MANUFACTURERS
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L. D. R. SUPER-CRYSTAL
"The Vacuum Tube's Only Rival"
Will Make Your Crystal Set Sound Like Seven's
Band—50c Each.
Reflex and R. F. Crystals—\$1.00.
JAYNIXON LABORATORY
57 DEY STREET, NEW YORK CITY

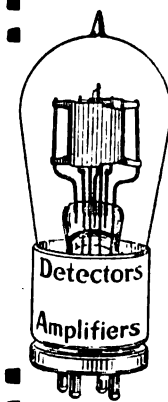
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VARIOMETERS
With
3¼" Dia ROTORS—Mah. Stators, Special 2.50
Brass Contact Bushings, 250 to 600 Meters. 2.50
Prompt Attention to Mail Orders
B. E. JARVIS, Inc.
113-115 Mechanic Street Newark, N. J.

RADIO PANELS
Cut exactly to size and shipped within 15 hours.
¼ inch thick, 1½¢ per square inch, 3/16 inch,
1¼¢ per square inch. Made of the highest grade
black fibre. This material possesses high dielectric
strength, is inexpensive, unbreakable, easy to work
and takes a nice finish. Special offer, 6x2x¼, 59¢; 6x
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CRYSTAL FANS
Are you satisfied with your crystal,
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MOLYBDIC GALENA
A new detector just discovered is
sensitive even when ground to dust.
Send 50c for one of these wonder
crystals. We will refund your
money if you are not entirely sat-
isfied.
Phoenix Radio Laboratory
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NOISELESS DEPENDABLE
NOTE THE INSULATED BINDING
POSTS AND 7/16 WIRE CONNECTOR
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Broken and Burned-Out
**VACUUM
TUBES**
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for repair
Your dealer should know, but
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Catches distinctly everything broadcasted within 30 miles. We also manufacture the "Little Wonder" assembled set at \$5.00.

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It lists all our radio parts and supplies.

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From the Edge of the Aurora Borealis to Center of World

OUT of the snow buried north was sent the following letter, which helps our appreciation of this old world we live in:

"Osaquan (via Ignace, Ont.)

"General Electric Co.,
Radio Station WGY,
Schenectady, N. Y.:

"Many thanks and greetings—shake!

"On Saturday morning at 10 o'clock, central time, we received a radio receiving set and at 5 o'clock we were listening to your concert at Schenectady, N. Y.

"You will not find us on any map you may have, but we are situated, geographically, on longitude 92 west, and, I think, about 1,100 miles to the northwest of Schenectady. In the morning, we were only a lumber camp on the edge of the Aurora Borealis, and before supper time,

thanks to you and others, we became the centre of the world.

"Your program came through perfectly and was heard in a room 16x20 as clearly as if you and your concert company were with us.

"In the evening after your concert, we were in Minneapolis, Chicago, Denver, St. Louis, Louisville, Davenport, Kansas City, Winnipeg, Regina and Calgary. In fact every place on the face of the North American Continent was contributing to our pleasure, and they were doing it as if it were the greatest pleasure in the world to do so, freely and without stint.

"Sincerely yours,

"E. Appleton."

Radio Audience Builds Scenery for Dramas

EVERY listener constructs his own scenery when the WGY Players broadcast their weekly play from the Schenectady radio station of the General Electric Co. and the probabilities are that nearly everyone is seeing the play in a different setting. The listener hears a telegraph key and the lines refer to a railroad station in a small village, as in the case of the first act of "The Traveling Salesman." At once is created in the mind of every fan a picture of a railroad station, and to him all the succeeding action denoted by the voices of the players takes place in the mind-picture of the listener.

In the radio drama only sound "atmosphere" is possible. Telephone bells, closing doors, thunder, an automobile horn, the whistle of a train or the whistle of the wind, the rattle of dishes or the rattle of a typewriter all help to convey pictures to the listeners, and these pictures are made fairly definite by the lines.

Players of radio drama are handicapped by the necessity of conveying all emotion by the voice, by intonation and shading. The real artist of the stage need not utter a word to express emotion; the clinching of the hand or the twisting of a handkerchief are stronger than words.

The radio audience of to-day gets its drama exactly as the blind man formerly "saw" the stage play, entirely through the ears, but supplemented by imagination and experience. Radio drama is the direct opposite of motion pictures; the former depends upon sound, the latter upon sight. It is reasonable to expect that the growing popularity of the radio drama will result in a revival of interest in the spoken drama. After every play presented by WGY Players the studio receives from 800 to 1,000 letters from radio fans, expressing appreciation and enjoyment. It is interesting to note that a great many of these letters come from those who have seen the stage production of the broadcast plays.

Radio Story Told in Movies

UNSEEN things like radio waves, electrons, electric current and voltage are pictorially presented in a two-reel picture called "The Wizardry of Wireless" just completed by the General Electric Co. The unseen is made visible by means of animated drawings and the result of the 2,000 feet of celluloid is a gripping, interesting and convincing explanation of the fundamentals of radio, the newest and most popular of arts.

In this film the amateur is offered an exceptional medium for instruction. Responsible radio clubs desiring to exhibit this film may have it free, except for transportation charges, by applying to Charles F. Bateholts, Director Visual Instruction Section, General Electric Co., Schenectady, N. Y. The film will be released from district offices of the company, thus considerably reducing transportation cost.

STANDARD RADIO APPARATUS BARGAIN PRICES

Every item listed in this advt. is guaranteed by us to be new and in original cases. Our guarantee of satisfaction or money refunded still prevails.

**BARGAINS
EVERY DAY**



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Diagraph Loud Speakers.....	\$15.00	Na-aid W. D. II Socket.....	\$0.65
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Radio Stores Variable Con-		Hook-up using this coil, which	
densers, Balanced Shaft,		has brought in Havana, furn-	
Bakelite Ends with knob and		ished upon request.	
dial.			
43 Plate.....	4.10		
23 Plate.....	3.75		

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SUNBEAM ELECTRIC CO.

71 THIRD AVE. (Bet. 11th and 12th Sts.) NEW YORK
Farm Lighting Plants at Bargain Prices.

SERVICE QUALITY STANDARD RADIO LOW PRICE RELIABILITY

All Goods New, in Original Packages

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72 PAGE
RADIO CATALOGUE
WE GUARANTEE
A SAVING OF 15%

Reliable merchandise first, then price. We will refund, at any time, for Radio material purchased from us which is not up to standard and as represented. No Checks. No C. O. D. Add Parcel Post. Reference: Radio World.

BROOKLYN RADIO SERVICE CO.

577 MYRTLE AVENUE. Phone Prospect 2952-8168. BROOKLYN, N. Y.

Body Acting as Antenna Detunes Set

WHILE listening to a broadcasting station the radio novice, studying the exterior mechanism of the receiving set, usually discovers that he can change music into discordant squeals and squawks by putting his finger against the grid leak or transformer, or merely by passing one hand near some part of the sensitive tuning apparatus, says the New York "Globe." If he seeks an explanation of the phenomenon he is told that "body capacity" causes it. This means, in simple English, that a charge of electricity from the body has entered into the delicately adjusted circuit of the radio apparatus, thereby putting the receiver out of tune.

Such an experience serves to give tangible evidence that the human body is in effect an aerial sharing with the wires of the radio apparatus a capacity to store electricity. In the technical phrase of the radio fan the body, like the wire aerial, has inductance and capacity. It transmits electricity as well as it stores it. It also offers a certain resistance to the passing of an electric current. And since these qualities are essential characteristics of the apparatus with which the radio operator traps the radio waves and brings the message bearing current to his receiver, it follows that the body is virtually an aerial.

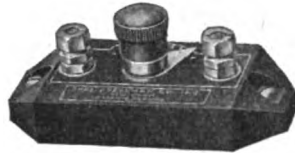
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Announces a change of location to
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We apologize for any delay in shipments due to our moving and assure our customers that all mail orders are being given our prompt attention.

FREE DIAGRAM AT YOUR DEALER of the Flewelling Super Circuit

FRESHMAN PRODUCTS Especially Adaptable for this Circuit



VARIABLE RESISTANCE LEAK
With .00025 mfd. Micon Condenser Combined... **\$1.00**
Without Condenser... **75c**



ANTENELLA
No antenna or aerial needed. Eliminates all the inconveniences in radio; operates from any light socket. Price **\$2.00** only



"MICON"
.006 Mica Condenser... **\$1.00**
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OTHER "MICON" SIZES

Size	Price	Size	Price
.00025	\$.35	.0025	\$.50
.0005	.35	.005	.75
.002	.40	.01	1.50

At your dealer's—otherwise send purchase price and you will be supplied without further charge. A diagram of the Flewelling "Super" Circuit sent free if your dealer can't supply you.

CHAS. FRESHMAN CO., INC.

106 SEVENTH AVENUE (Note New Address) NEW YORK CITY

COMPLETE YOUR FILES OF RADIO WORLD FOR 1922

Back numbers of Radio World are becoming scarcer all the time. We can now furnish you with back numbers from No. 1 to date at fifteen cents a copy. Any seven numbers for one dollar. RADIO WORLD, 143 Broadway, New York City

THE

RADIO

CONSTRUCTOR

BUILD YOUR OWN SET

This new edition of THE RADIO CONSTRUCTOR (just off the press) illustrates and fully describes the most popular and efficient hook-ups.

Full and complete instructions for the construction of

FLEWELLING REFLEX

REINARTZ HONEYCOMB

And Many Other Tested Circuits

This is the book you have been waiting for. Get it today from your dealer, or it will be mailed you postpaid on receipt of only 25c.

Newman's Radio Plans also tell how to make a crystal receiving set a super selective regenerative tuner, a loop aerial receiver, short wave regenerative set, medium wave tuner, radio frequency amplifier, etc., sheets 17x22"—25c. each.

DEALERS! WRITE FOR QUANTITY PRICES!

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DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. If copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

4 INCH HARD FIBER RADIO TUBING, any length to 4 ft., 20c. per ft. Variocouplers, \$2.25. Radio Assembly, 1109 Valley St., Joplin, Mo.

THE IDEAL RECEIVER tunes with SINGLE CONTROL. No variometers, variocouplers, taps or switches. Cheapest to build. Particulars. ROKAY ELECTRIC COMPANY, Ingomar, Ohio.

RADIO-APPLAUSE Post Cards. Encourage broadcasting by such acknowledgment. 2 dozen, 25c, postpaid. D. J. SPANGLER, Elkhart, Ind.

AGENTS—Are you interested in radio? If so drop us a card. We have a proposition no live agent should turn down. Meets the needs of 90 per cent. of the public. THE WILKENDA CO., 500 Fifth Avenue, New York City. Dept. R.W.

GREBE RECEIVER AMPLIFIERS, cheap. IRVIN MAURER, Bethlehem Prop., Bethlehem, Pa.

IF YOU ARE A REGULAR RADIO fan and like to hear the stations in the four corners of the United States come in with a bang, then you will want the Flewelling Circuit. If you do, send 15c for RADIO WORLD, issue of Feb. 27, which contains complete description and directions for the manipulation of the circuit. RADIO WORLD, 1493 Broadway, New York.

DO YOU WANT TO SAVE MONEY in making your set? Send for the Jan. 27 issue of RADIO WORLD, containing a full-page drawing of how to make filament control rheostats, as well as an easily understandable text, which makes the construction easy. 15c a copy, or start your subscription with this issue. RADIO WORLD, 1493 Broadway, New York.

EXCHANGE LETTERS with friends everywhere. Pleasant pastime. Information for stamp. Smith, Box 3125, M. Portland, Ore.

GUARANTEED Radio "A" Batteries, 40 ampere hours, \$12.00. 4" hard fibre tubing, 30c. per foot. Variocouplers, \$2.25. RADIO ASSEMBLY, 1109 Valley St., Joplin, Mo.

EXCHANGE JOLLY, INTERESTING LETTERS through our club. Stamp appreciated. Betty Lee, Inc., 4254 Broadway, New York City.

ELECTRIC MAGNETS, 98c.; Vernier variable Condenser, \$1.48. Garth Heckman, Ft. Recovery, Ohio.

FOR SALE—Regenerative Receiver in cabinet, \$22.00. Remler detector panel, with tube and B battery, \$12; Remler amplifier with tube and B battery, \$12; Murdock 3000 ohm phones, \$2.50. All in perfect condition. Robert Van Vleck, 116 Chestnut St., Liberty, N. Y.

TWO one stage amplifiers, Acme, \$8; Remler, \$7. King Amplifying horn, \$7. Condensers. J. B. Rich, Hobart, New York.

A COURSE IN MECHANICAL DRAWING—By Louis Rouillon. The author has written a most practical book on the subject of Mechanical Drafting. It fully explains the art of Drawing, Lettering and Dimensioning. It is, by far, the most practical book ever published on this subject, for use in day and evening schools, and more especially adapted for the teacher and for self instruction. Fifteenth edition, revised and enlarged. Fully illustrated. Oblong. COLUMBIA PRINT, 1493 Broadway, N. Y. C. Price, \$1.50.

HOW TO BECOME A SUCCESSFUL ELECTRICIAN—By Prof. T. O'Connor Sloane. An interesting book from cover to cover. Telling in simplest language the surest and easiest way to become a successful electrician. The studies to be followed, methods of work, field of operation and the requirements of the successful electrician are pointed out and fully explained. 202 pages. Illustrated. Nineteenth revised edition. Cloth. Price, \$1.50. The Columbia Print, 1493 Broadway, New York City.

HOW TO REPAIR Vacuum Tubes. Complete literature, \$1.00. Box 103, Station C, Toledo, Ohio.

BROADCASTING MAP

of the United States appeared in RADIO WORLD No. 8. Sent on receipt of 15c, coin or stamps; or start your subscription from that number (\$6.00 for 12 issues).

RADIO WORLD, 1493 Broadway, New York

STUCK?—Let me solve your Radio receiving problems. Service charge, 25c per question. Frederick Barber, 216 Jasper St., Syracuse, N. Y.

HAVE YOU SEEN IT? My unusual fully illustrated radio catalog is complete. Only a dime. N. E. Ristey, Spring Grove, Minnesota.

FREE APPARATUS FOR SECURING SUBSCRIPTIONS FOR "RADIO." Write today for complete list of premiums and our special subscription offer. "RADIO," Pacific Bldg., San Francisco, Cal.

BATTERIES—Edison Storage "B" Battery Elements, 5c per pair; 18 will make one 225 volt Battery. GILMAN'S BATTERY SHOP, Chelsea Sq., Chelsea, Mass.

MAKE MONEY AT HOME MAKING TOYS and novelties. Send 5c. for samples and particulars. New Specialty Co., 417 E. 71st St., New York.

PATENTS PROCURED AND TRADE MARKS REGISTERED—Advice and terms upon request. Robb, Robb & Hill, 1403 Hanna Bldg., Cleveland, Ohio; 942 McLachlan Bldg., Washington, D. C.

ADVERTISING SOLICITORS to represent RADIO WORLD. The best quick action radio advertising medium. State territory you can cover. Tell us about your past experience. Write Fred S. Clark, Manager, RADIO WORLD, 1493 Broadway, New York.

NEWS AND GOSSIP OF THE STAGE—Send 10c. for specimen copy of NEW YORK STAR, the great illustrated theatrical weekly. \$4.00 year, \$2.00 six months, \$1.00 three months. New York Star Co., 1493 Broadway, N. Y.

VACUUM TUBE RESULTS WITH A CRYSTAL SET! Cover distance with a "PT" ULTRA-SENSITIVE CONTACT in your crystal detector. Beats gold and other ordinary catwhiskers. DOES NOT JAR OUT. Myrle Wood, Rhineland, Wisconsin, writes: "That 'PT' Ultra-Sensitive Crystal Detector Contact I purchased is sure a wonder. Using the 'PT' contact and galena, I have heard over 43 different broadcasting stations, up to 1,000 miles distant." The "PT" has received code 3,300 miles. Price, only twenty-five cents. "PT" CRYSTAL CONTACT COMPANY, Box 1641, Boston.

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MODEL MAKING—By Raymond Francis Yates. A new book for the mechanic and model maker. This is the first book of its kind to be published in this country, and all those interested in model engineering should have a copy. The first eight chapters are devoted to such subjects as Silver Soldering, Heat Treatment of Steel, Lathe Work, Patterns Making, Grinding, etc. The remaining twenty-four chapters describe the construction of various models such as rapid fire naval guns, speed boats, model steam engines, turbines, etc. 400 pages. 301 illustrations. Price, \$3.00. The Columbia Print, 1493 Broadway, New York City.

OLD MONEY WANTED—\$2.00 to \$300.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, free. You may have valuable coins. Get posted. We pay CASH. Charles Coin Company, Ave. 83, Le Roy, N. Y.

AMATEURS—LOOK! Send in 15 cents to RADIO WORLD for issue of January 20 containing panel layout, hookup and full explanatory data on the construction of a D-X receiver, which simply lays the long distance on your table. Or start your sub. with that issue. RADIO WORLD, 1493 Broadway, New York City.

WIRING A HOUSE. By Herbert Pratt. Shows a house already built; tells just how to start about wiring it; where to begin; what wire to use; how to run it according to insurance rules; in fact, just the information you need. Directions apply equally to a shop. Sixth edition. COLUMBIA PRINT, 1493 Broadway, N. Y. C. Price, 35 cents.

ATTENTION, Amateurs! Have you seen the RADIO WORLD'S page of hook-ups in the Oct. 21 issue? 15c a copy or start your subscription with that Number. Many people are writing in for the hook-ups listed here. RADIO WORLD, 1493 Broadway, New York City

CASH FOR OLD GOLD, Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magnet Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 137 Hipodrome Bldg., Cleveland, Ohio.

RADIO TUNING RODS

(Patent Applied For)
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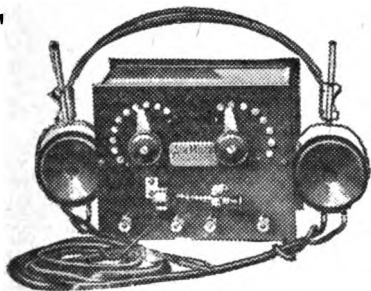
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THE constant reception of WJZ's signals in England makes it unnecessary for the Radio Corporation-Westinghouse Broadcasting Station to run a trans-Atlantic test. This fact became known recently when Geoffrey E. Duveen, Director of the Burndept Ltd., of London visited Station WJZ, and who stated that the signal strength of WJZ is so strong phonograph records can be made of it in the British Isles. Mr. Duveen is a most enthusiastic radio telephonist. He demonstrated the new science in the British Isles by a unique method. He took his fishing rod and a receiving set in his Cadillac Sedan and toured the British Isles. When he came to a large tree he would cast his line over it and then reel in his line until the eight ounce lead would give him a tight line. He then attached his copper wire to the stretched fishing line, drove his Cadillac several hundred yards and tuned in his radio apparatus to catch the music in the sky broadcast from America.

J. H. Redley, a Burndept engineer, was the first Englishman to receive a continuous broadcast from an American broadcasting station, namely an Estey Organ Recital from New York City broadcast by WJZ using remote control wires.

Mr. Duveen, who has been a candidate for Parliament, stated that the British Broadcasting Stations copied after WJZ's programs beginning at 5:30 with Bedtime Stories, followed by news bulletins, weather forecasts, musical and speaking programs.

Upon his return to England, Mr. Duveen will try to arrange a trans-Atlantic test for 2 LO, the Broadcasting Station in London, the test will probably be run in the early part of March at 1:00 A. M., or 7:00 P. M., Eastern Standard Time, WJZ, standing by three nights during this period in order to give the American amateurs an opportunity to hear the first broadcast from the British Isles.

The trans-Atlantic unofficial test requested by the British amateurs was heard in several parts of the British Isles according to Mr. Duveen. The newspaper clippings from English papers that came to the attention of WJZ checked up in detail with the programs broadcast. This unofficial test was also heard in Haiku, on the Island of Maui of the Hawaiian group, or about 100 miles southeast of Honolulu by Jack Costa, who reported hearing the British National Anthem. The report from Haiku brings to light a most unusual program broadcast from WJZ. Wm. D. Ager, the New York representative of Selfridge, through whom the unofficial test was arranged, distributed pencil copies of "God Save the King" to WJZ's announcers and operators. The impromptu chorus was made up of the British Consul General, Groster Armstrong, and his wife and daughter; Milton J. Cross, tenor, announcer AJN; Vaughn de Leath, the "Original Radio Girl," and Thomas Cowan, announcer ACN, a light opera tenor, took high C whenever it was due, while George Bliziotis, Chief Operator, added a slight Greek accent to his bass voice. The chuckle of the special policeman was neutralized by the dialect singing of Alvan Simmons, who is slightly darker in complexion than the Hawaiians. The accompaniment was played by the Black and White Melody Orchestra.

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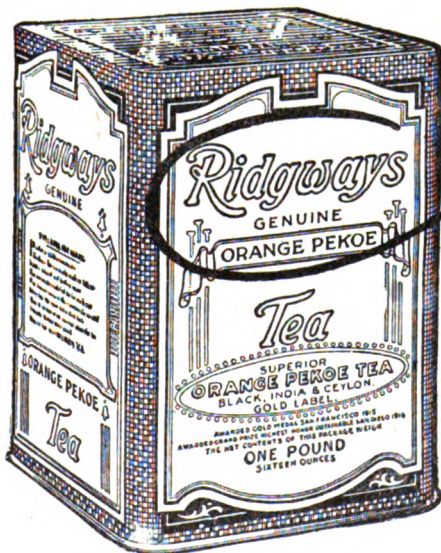
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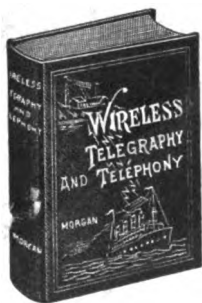
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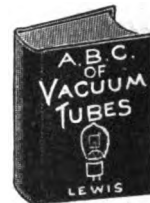
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Inventor Sues Radio Corporation for Alleged Infringement

The Radio Corporation of America, a \$25,000,000 company, which has many stations at various points in this country, has been made defendant in a suit brought in the United States District Court in Brooklyn by Walton Harrison, a lawyer and inventor, of 1974 Madison avenue, New York City. Mr. Harrison alleges that the company has infringed upon patents obtained by him in 1914 on a multiple sending antenna device. His suit is for an accounting of moneys made from the use of the device. Large sums are involved. In his affidavits Mr. Harrison states that multiple antennae are of vital importance to large sending stations. He alleges that his letters patent incorporate the basic principles on which the multiple antenna used by the company are designed.

"The Laughing Lady" Broadcast

The first act of "The Laughing Lady," by Arthur Hopkins, was broadcast last week direct from the Longacre Theatre, New York City, with Ethel Barrymore starring. A description of the stage setting of this high English comedy was given by Bertha Brainard, who is known to radio audiences by her "Broadcasting Broadway" talks.

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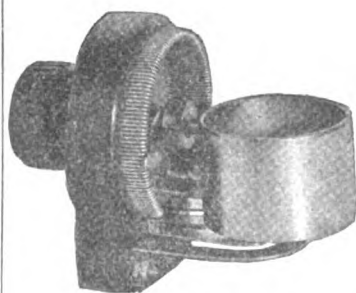
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Publisher's Announcement
on Page 7—This Issue

VOLUME TWO OF
RADIO WORLD

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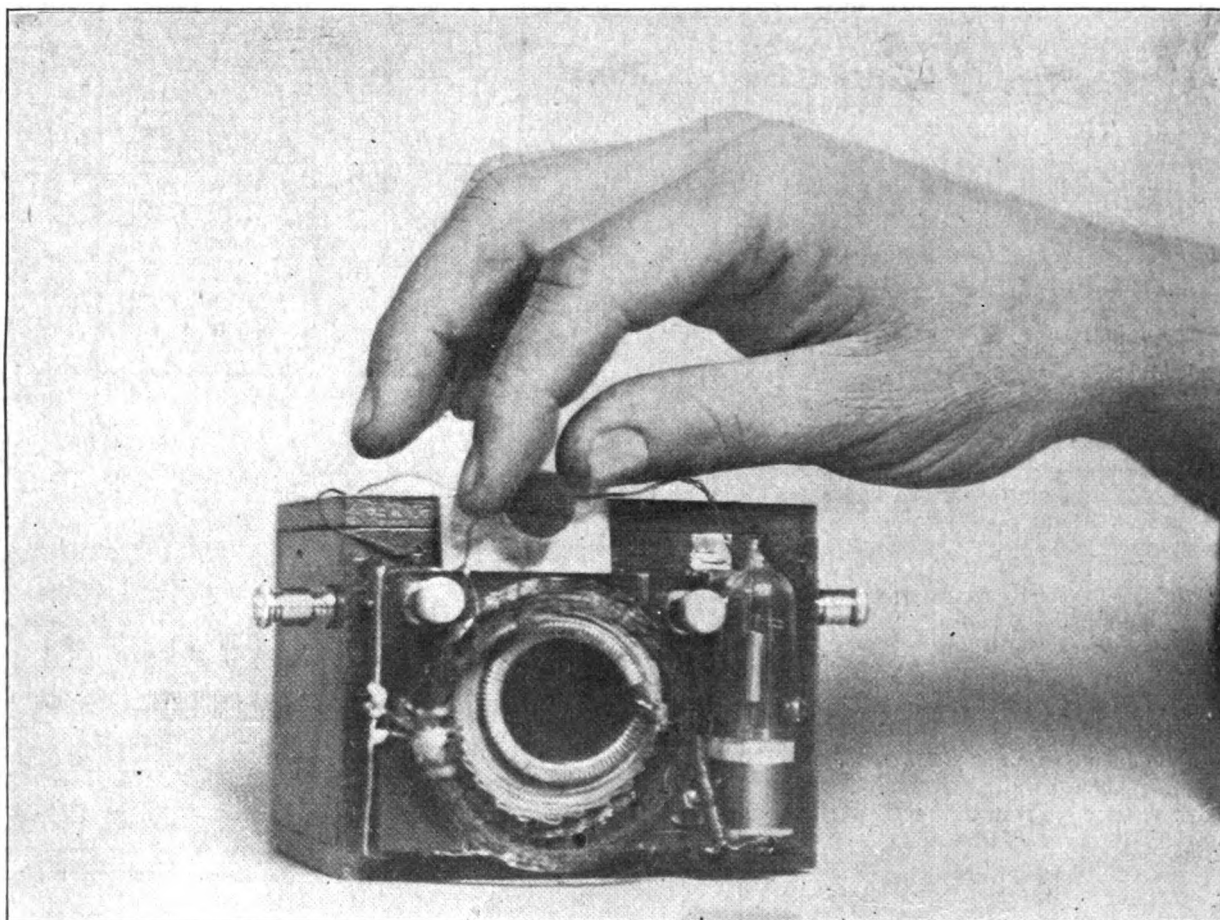
Takes Up Little Space, But Is Efficient Receiving Set

By *Louis S. Fielder*

NUMEROUS and varied are the models of miniature sets which have been made by various amateurs, but one that is especially complete, even to containing its own A and B batteries, was recently exhibited at the Permanent Radio Fair, New York City, by Frederic W. Proctor, a New York amateur.

is only necessary to attach the antenna and ground in order to receive signals. The small block type B battery is used and flashlight cells are employed to heat the filament.

While most of the miniature sets recently exhibited were slightly smaller than the present model, they all lacked the necessary batteries, and the fact that this particular set is



(C. Photo News)

Ingenious tube receiving set built by Frederic W. Proctor, a New York amateur. It is a most complete regenerative receiver, embodying everything necessary to make it complete in itself.

The set is a regenerative receiver, using fixed inductances with a small variable condenser to vary the tuning. As can be seen by reference to the illustration herewith, a peanut tube detector is used, the filament resistance being varied by means of a clip that is moved around the rheostat which is located directly inside the main inductance coil. The two coils are wound in staggered form and are in direct inductive relation to each other.

The batteries are all located inside the small cabinet which makes this receiver complete in itself. It, therefore,

absolutely complete even to that extent makes it stand in a class by itself.

As to receiving qualities, much can be said. Of course, as it is a tube detector set, and regenerative, is extremely sensitive and performs remarkably well, considering the fact that it is so extremely small and compact.

The builder of this set evidently had a very positive idea in mind before he constructed it, as the finished device shows careful planning of all details, such as the relation of the coils and also the best method of mounting.

A Dry Cell Tube Socket—Cheap

By Arthur G. Shirt

FOR one reason or another tube sockets are unpopular instruments for home construction. Yet they can be made by the amateur, and well made, too. This is important, especially when so many amateurs are replacing their six-volt V T's with 1½-volt WD-11's, and are finding that they must either buy an adapter or a new tube socket. The WD-11 will not fit the regulation size socket, although the De Forest dry cell tube will, having been designed for that purpose. In other respects, these tubes are practically the same.

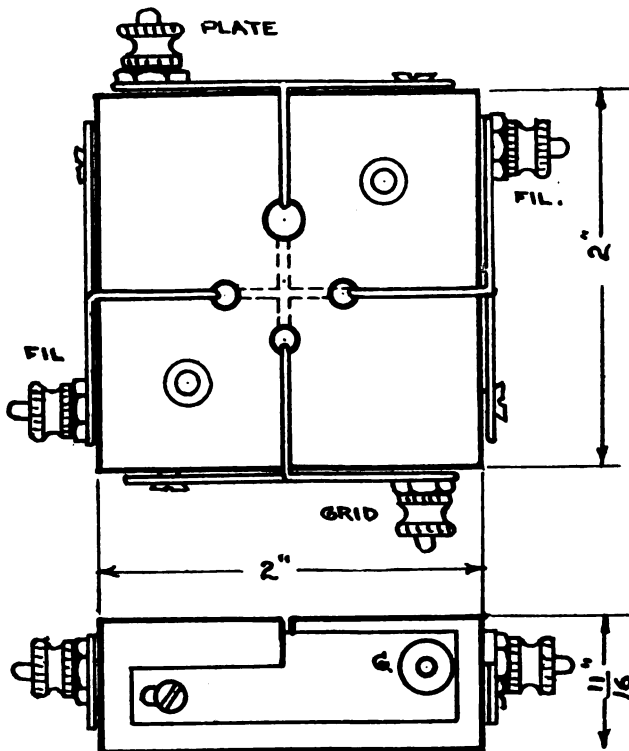


Fig. 1. Assembly of a WD-11 socket as explained in the accompanying text. The exact dimensions are given and should be strictly followed. A neat and practical socket will result.

To aid those who want to construct a socket for their WD-11's these plans are submitted. When finished, the socket will be neat and efficient. The contact fingers will make sure contact, and the bulb will be held as steady and upright as in any socket on the market.

Fig. 1 shows the assembled instrument to be a square block of some insulating material, preferably hard rubber or bakelite, drilled with four holes suitably placed to receive the lugs of the tube. From each side of the block or base, a saw cut goes into one of the holes, so that each hole can be reached from the outside by a groove. This groove or saw cut should be about ¼ of an inch deep. Four contact springs are cut out of spring brass and the upper half of each is bent in so that it will run in this groove and protrude into the hole about 1/16 inch. Binding posts are provided as shown, carefully marked for the grid, plate and filament terminals (as shown in Fig. 1) and then the socket is connected up for use.

Perhaps the most troublesome item in the making of this tube socket will be in finding a square block of hard rubber suitable for the base. This problem may be solved by taking four or five pieces of panel thickness and gluing or bolting them together so that they form one piece. In bolting, be careful to place the bolts so that they will not interfere with either the contact fingers or the binding posts.

The proper size for the base is 2 inches by 2 inches by not less than ⅝ inch thick. It may be thicker if convenient, but owing to the length of the lugs on the WD-11 tube, the base may be no thinner than the size indicated.

Any one who has examined a dry cell tube has probably noticed that the lugs coming from the bottom are not evenly placed and that one lug is larger than the other three. Because of this unevenness, the holes must be laid out and drilled with the utmost precision. To amateurs who have dividers and rule the job may be easy enough, but even then look carefully to the detailed dimensions of Fig. 2. For the convenience of those who have no designing tools, a template for the holes is given full size in Fig. 3. Merely lay this template down on the base, prick or punch the center-holes, and then drill as required.

Another word of caution: Drill straight up and down! If you don't the tube will not seat itself on the base as it should, but will refuse to go all the way down.

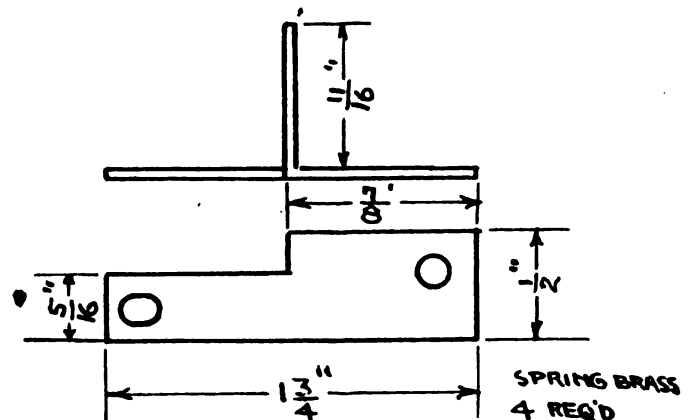
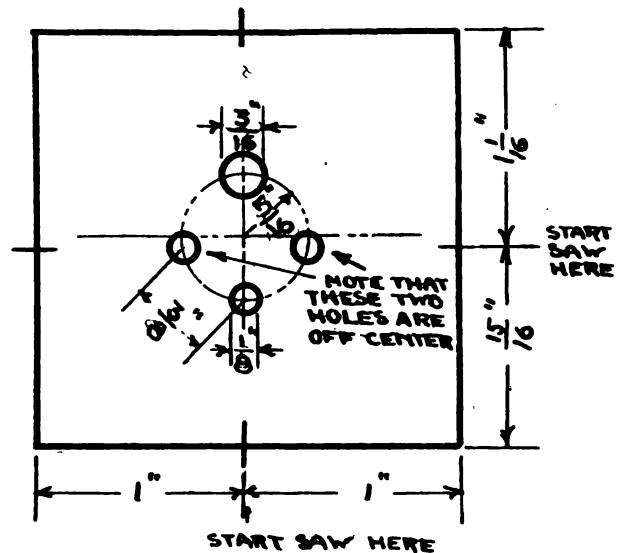


Fig. 2. Detail sketch for drilling the hard rubber plate and construction of the spring. The ends of the spring should be rounded with a file, to permit easy insertion of the tube. Sizes of holes are very important and should be made exactly as shown.

The saw cuts are easy. Saw straight across the top of the base, passing through the centers of two holes at once. Use a hack saw in preference to a wood saw. The groove should be cut about ¼ inch deep.

Cut the contact springs out of fairly heavy spring brass

(Continued on next page)

An Improved Single Circuit for Nite Owls

By F. N. Hollingsworth

A YOUNG amateur of Newfields N. H., Russell Sheehy by name, has copied 162 stations in 38 different states with his set, which is well located, with little or no local interference, besides Cuba, Canada, and Porto Rico, using one tube.

While fundamentally the hook-up is of the common or garden variety of single circuit using a variocoupler, it has several refinements which have given him the remarkable results mentioned. It has added a three-plate vernier condenser shunted across the rotor winding, which gives a change in classification. He uses a potentiometer for grid control, as well as one for plate control. The stator is wound on a four-inch bakelite tube and has 35 turns of No. 24 D. C. C. magnet wire, without tape. For the tickler he has the same number of turns, with the same size wire, wound on a 3½-inch diameter support. This tickler rotates on one end of the rotor tube.

Following the diagram given herewith, the antenna condenser, C1, is the usual .0005 vernier variable. C2 is .0005 for a UV-200 tube and C3 is .005. C4 is a three-plate vernier. High grade condensers must be used in any set, and the one shown in the diagram is no exception.

Potentiometer R2 is of the 200-ohm type and R3 is one of 400 ohms. R4 is the usual 6-ohm vernier rheostat, the former being used for controlling the kind and amount of potential on the grid and the latter for providing accurate adjustments of voltage as required of UV-200 and detector

tubes. Grid leak R1 will vary between one-half and two megohms, depending upon the tube in use.

Tuning is quite simple in this circuit, the carrier wave being picked up by adjustment of the condenser, C1, which should be a vernier type for correct results. Then the condenser C4 (a three-plate vernier) should be varied until signals have cleared out. The operator can do this by variations in coupling between stator and rotor until he finds the best combination. Movement of the rheostat handle R2 will serve to vary volume and quality of signals received. R3 will make the detector tube more sensitive

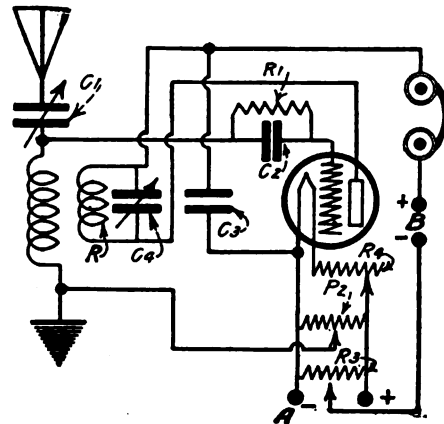


Diagram of circuit described by Mr. Hollingsworth. The two potentiometers give stability to the circuit and make tuning-out of nearby stations easier.

(Continued from preceding page)

and provide four 1¾ inches by ½ inch in size. Cut as shown in Fig. 2 and bend the fingers at right angles. Drill for the binding posts and also put a slot in the other end for the tension screw. These contact springs go on flat against the sides of the base with the fingers going in the grooves to the tube holes. The binding posts hold them rigid at one end, while tension screws are placed in the slots at the other end.

Now when the tube is pushed in the socket, the lugs will press outward on the contact fingers, which will resist the pressure according to how springy the brass is and how

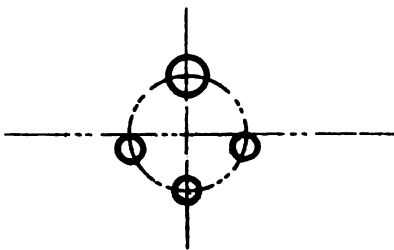


Fig. 3. Template for drilling holes in base of tube socket. If you cut this out and paste it on the hard rubber there need be no fear of going wrong, as it is exactly right and will save measuring.

tightly the tension screws are set up. Practice with a socket of this design has shown that the tension screws need never be tight.

Now comes the most important part of the job, namely, to mark the binding posts so that the proper connections can be made. The extra-large lug on the WD-11 is the plate terminal, so the binding post which connects with the 3/16-inch hole should be marked PLATE. The lug opposite is the grid, so mark that binding post GRID. The other two, of course, are the filament terminals, which should be marked, too, in order to avoid mistakes.

at its correct value, which is easily found by adjusting the knob R4. The filament rheostat should have a vernier adjustment for best results.

While those who may set up this particular circuit may not be able to duplicate exactly the results of the originator, owing to difference in location, condition of atmosphere, interference, etc., they will be able to get satisfactory results if they use care in connecting up and in adjusting afterward. Careful adjustment is one of the biggest factors in securing satisfactory reception in any set. The owner of this set has totaled over 112,000 miles, using the radio "golf" method of computation.

An Explanation to Our Readers

Perhaps you are among those RADIO WORLD readers who have not been able to get copies of this publication through your newsdealer a day or two after the day of publication, owing to the fact that there has been such an unusual and increased demand for RADIO WORLD of late.

We have increased the edition of this week's issue very materially and you should have no difficulty in getting copies through your regular newsdealer. If your dealer sells out before you go to him, will you favor us by sending his name and address on a postal card? We will endeavor to see that he is supplied.

We also suggest that you become a regular subscriber so that you will not miss any copies. Our subscription rates are \$6.00 one year (fifty-two numbers), \$3.00 six months, \$1.50 three months. You can subscribe direct or through your newsdealer, who, by the way, should send your order to us immediately, less his commission.

"American Interests May Rule World Radio"—Admiral Ziegermeier, Chief of Naval Communications

By Carl H. Butman

THE Radio Corporation of America and the U. S. Naval Radio Chain may eventually control the radio of the world. This is the opinion of Rear-Admiral H. J. Ziegermeier, Chief of Naval Communications. The impression that the Naval Communication Service might be trying to compete with or control commercial radio traffic is entirely erroneous. The Navy strives to maintain efficient and uninterrupted communication between all units of the U. S. Fleet, and to that end maintains many land stations. From its stations on both sea and land commercial messages are handled when other facilities are not available.

Instead of competing with commercial stations, the navy charges a little more for handling traffic, except in the Pacific, and has closed a number of stations recently where other facilities existed. Close co-operation between the naval and American commercial radio interests have existed for several years.

In this connection, Admiral Ziegermeier recently stated that it was due to representations of naval officers that the Radio Corporation of America was organized in October, 1919, to take over commercial stations and traffic handled by the navy during the World War. Admiral Ziegermeier reviewed briefly the activities of the commercial companies in this country, and among them named the Radio Corporation of America, the Tropical Radio Company, Federal Telegraph Company, and Independent Wireless Company.

"Of these the Radio Corporation of America have the largest facilities," he said. "They have direct connection to England, Sweden, Norway, Germany and France. They are building a station in Poland which will soon be in operation, and the Buenos Ayres station will be in commission this summer. This company has valuable franchises in South America. In the Pacific it has the Honolulu station for its Japanese connection. A company has been formed by the Radio Corporation and the Federal Telegraph Company for operation in China. China has granted the necessary rights to erect and operate four stations and this work is now under way.

"This company, with its connections and the naval radio chain, bids fair to control the radio of the world, as England now controls the cables," Admiral Ziegermeier claims.

"The Federal Telegraph Company," he said, "operated a point-to-point service on the Pacific Coast at Los Angeles, San Francisco, Portland and Seattle, and also handled some ship-to-shore work. Through its affiliation with the Radio Corporation of America, it will eventually have connections in China." The Admiral explained that, although the Federal Company has the necessary grant from the Chinese Government, there have been some delays in getting started, due to the desire of two other nations to block American interests. His latest information, he said, was that these obstacles had been overcome, and that the construction of the stations would begin immediately.

Admiral Ziegermeier said the Tropical Radio Company was connected with the United Fruit Company and had stations in Central America, where it was extending its facilities. He stated that the Tropical Company has stations in Boston, New Orleans, and Miami, and is anxious to locate a station in Panama. The Independent Wireless

Company handles mostly ship-to-shore traffic, he added.

The Navy and Pacific Traffic

In October, 1922, the Admiral said he attended the Pan-Pacific Commercial Conference at Honolulu, where there were present 110 delegates representing 16 countries. One of the most important subjects considered by the conference, Admiral Ziegermeier said, was "Communications," especially with reference to expanding the already existing government radio stations to the extension of press service. If other countries on the Pacific would be willing to receive our press at a corresponding low rate, all difficulties would be removed, he explained.

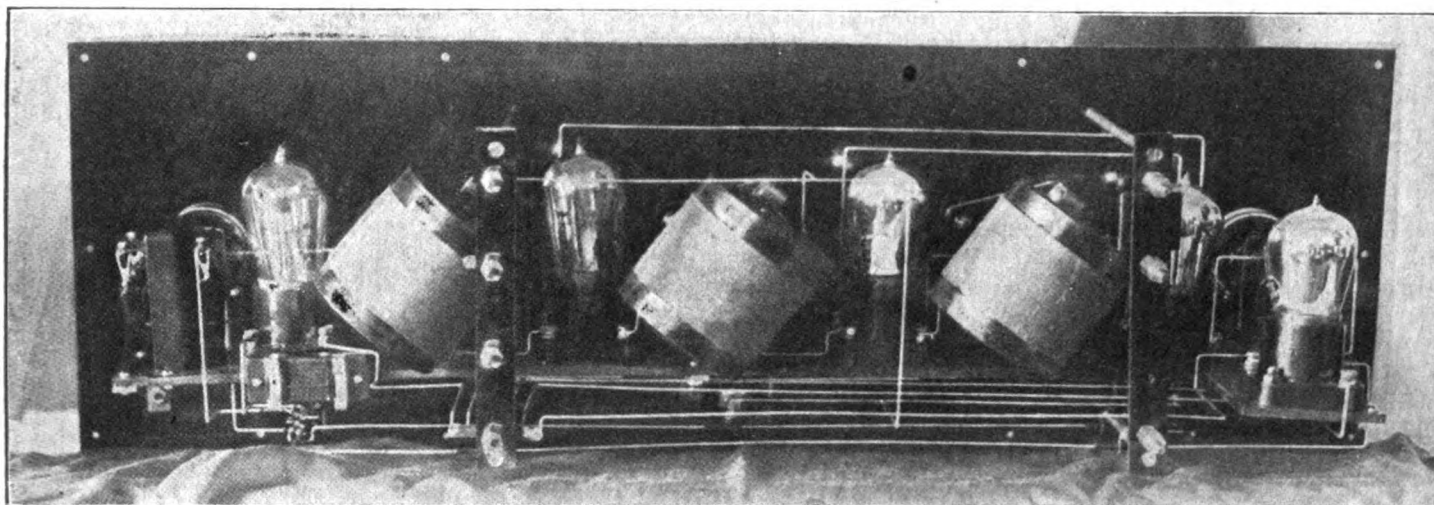
He said that a resolution adopted by the conference on the subject of communications urged that the governments of the countries use their radio facilities in cooperation with each other or with other agencies, to provide means of intercommunication for the public, wherever such services could not be obtained through private agencies, the chief objects being to secure the transmission of commercial messages at the usual commercial rates and the transmission of news messages promptly and at the low rates.

In outlining the navy's service to the public, he said that the navy may use its radio stations for press and commercial traffic under certain restrictions. Generally speaking, he said, the navy handled commercial messages at any of its stations at rates not less than those charged by commercial companies for like messages and for like service. This service ceases, however, when the navy is notified by the Secretary of Commerce that a commercial company is able to fulfil the requirements. It was thus shown that the Naval Communication Service is never a competitor with commercial companies.

In the Pacific, however, the navy is permitted, by law, to handle press to practically any locality at any rate, provided only that one end of the transaction is connected with American interests to the extent at least of being any newspaper published in the United States or a newspaper published by its citizens. This authority on both press and commercial traffic, it was pointed out, expires June 30, 1925.

To-day, practically all news service in the Pacific is handled by the Naval Communication Service, the commercial rates being prohibitive for any satisfactory service. The Associated Press sends on an average daily about 1,000 words from San Francisco to Honolulu, and about 800 words to Manila. This service is said to be most satisfactory to the press, and Admiral Ziegermeier said he had heard many complimentary expressions about it. The commercial companies have as much as they can do without handling press messages, he added. The navy press rate to Honolulu is three cents a word and six cents a word to Manila. To explain the situation, it was shown that the commercial radio rate from San Francisco to Japan is 72 cents a word; for press, 27 cents a word (subject to delay) and \$2.16 a word for "urgent." The cable rates between similar points are 96 cents, 32 cents and \$2.88, respectively. As privately owned radio stations are not permitted to operate in the Philippines, the U. S. Navy must be depended upon for all radio communication with these islands, he said.

Receiver Operates Under New Principle Invention of Professor



(C. Kadel & Herbert)

The new Hazeltine circuit receiver. Five tubes are used and the circuit is incapable of regeneration or oscillating, which is the cause of much interference in the present-day receivers, especially where many are located in a small district, such as New York.

ONE of the most recent improvements in the field of receiving instruments was recently made by Professor L. A. Hazeltine, of Stevens Institute, Hoboken, N. J. The receiver embodies an entirely new principle in reception and cannot radiate energy. This radiation of energy is one of the great drawbacks of the heterodyne and regenerative sets of today. Due to this fact, and also that it is an extremely powerful receiver capable of receiving marvelous distances, a popular future is predicted for it by its inventor.

In a test of the receiver a few feet of bare wire was thrown across the floor, serving as an antenna, and reception of long distance was possible.

As can be seen by the illustration it embodies five tubes, in connection with three couplers or inductances, and in this form is different from the regular sets.

As many people know, England forbids the use of regenerative circuits, because of their habit of re-radiating signals and thereby causing disturbance to sets in

the vicinity. It was proved that a regenerative set embodying three tubes with sufficient plate current to operate it efficiently, could cause, through re-radiating signals, disturbance in receivers over a quarter of a mile away. This is especially noticeable in the more crowded districts such as New York, when there are many people listening in. The different sets can actually be used as small distance transmitters, and the writer has actually carried on conversation over a distance of over 650 feet air-line with a party having another regenerative set.

This will be absolutely prevented by the use of the new Hazeltine circuit, which, as said before, is incapable of re-radiation, and is at the same time a sensitive and flexible long distance receiver. As it does not need an outside antenna to operate efficiently, especially where local work up to 100 miles is desired, it will solve a lot of the problems that are so prevalent today in connection with the question, "Where can I put my antenna?"

Publisher's Announcement

RADIO WORLD, THE OLDEST RADIO WEEKLY, WILL CELEBRATE ITS THIRD VOLUME BY ISSUING A SPECIAL ANNIVERSARY NUMBER DATED MARCH 31, PUBLISHED MARCH 28.

LAST PAGE OF RED FORM GOES TO PRESS MARCH 19.

LAST PAGES OF BLACK FORMS CLOSE MARCH 22.

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How to Bank-Wind a Coil

By Arthur S. Gordon

AS far as telling at a glance how bank-winding is done, the average commercial bank-wound coil is a deep mystery. Wires tuck under each other and then disappear entirely. Any attempt short of wrecking a coil fails to uncover the method of construction, and so the radio amateur who thought he could figure it out by looking at the coil, leaves the radio store vowing that as far as he is concerned, the secret of how to wind coils in two, three or four layers will remain untold.

The idea of intensified inductance is familiar to all. The ordinary single layer coil, which is easiest to wind and therefore the most popular, is ideal for short wave lengths, but for long wave lengths the size of the coil becomes prohibitive. Coils eight or nine inches in diameter and standing four and five feet high are no longer in favor with radio amateurs, although a few of these monstrosities formerly graced the shack of the long-wave radio enthusiast. Gradually, new forms of winding were employed which

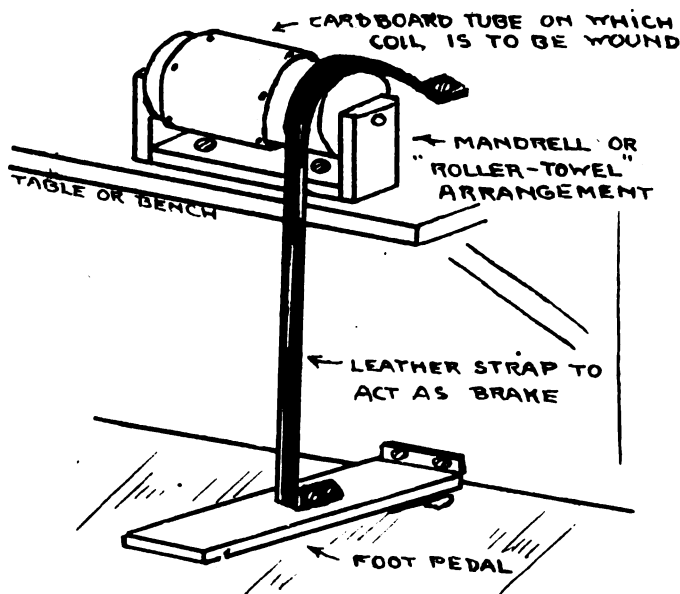


Fig. 1. A mandrel or winding-jig recommended for winding the bank-wound coils described in the text. It is almost impossible to wind coils by hand without a device of this sort.

not only cut down the size of the coil but actually increased the inductive effect to a maximum. One of these forms is the double, triple, or quadruple-layer coil which, because of the manner in which it is wound, is commonly known as the bank-wound coil.

Many amateurs wonder why it is not feasible to wind a number of layers of wire, one on top of the other, thus making a compact long-wave tuner. In such a winding, the effect known as distributed capacity is at a maximum. Distributed capacity may be defined as that loose and undesirable element in a radio receiver over which the operator has no control. When it is present to any degree at all, the coil or circuit will have a natural period or wave length of its own, and will perform more satisfactorily on one wave length than on any other. Tuning is rendered difficult if not impossible, and sometimes the other instruments in the circuit are prevented from functioning. In order to overcome this effect there have been evolved many types of winding, and among them is the bank-wound coil.

It is not an easy winding. Without some arrangement such as shown in Fig. 1, and a supply of collodion or coil cement, it is practically impossible. Yet when the amateur goes about it with care, first mastering the method as de-

scribed in this article, bank-winding becomes easy. Once the amateur completes a finished coil, he will become official bank-winder for the whole neighborhood.

The home-made form needed consists of a wooden roller just the size of the inside diameter of the cardboard tube on which the coil is going to be wound. A three and one-half inch tube is about the size recommended. This wooden roller is mounted on a wooden bracket much after the fashion of a roller towel arrangement, the important part of the construction being that the roller can be taken from the bracket at will. When the bracket is screwed down to a bench or table, a leather strap is fastened to the table just behind it, and passed over the roller to a foot pedal hinged to the floor or wall. This pedal is the brake, and when winding, a slight foot pressure will hold the coil rigid so that the turns may be wound very tightly. This mandrel—another name for the device—need not be anything elaborate; the roughest construction will do the work.

The cardboard tube on which the winding is to be placed is tacked to the roller. Place the tacks along the end of the tube so that they can be withdrawn after the winding is completed. Supply yourself with either collodion or cement so that you can make the turns self-supporting as you go along. Then begin the winding.

Bank-wound coils may be double, triple or quadruple layer. A double-banked coil is easier to wind than a triple, while a triple is easier than a quadruple. The same principle, however, holds good for all, so in the instructions which follow for the winding of a three-layer coil the amateur will find a method for winding two and four-layer tuners.

The first step in winding a three-layer, bank-wound coil is to complete what are known as the "anchor" turns. They are six full turns wound in pyramid fashion on a base of three. In studying Fig. 2, in which four progressive steps are specified, give your attention to each step in turn, mastering the detail in one before passing to the next. Close your eyes and imagine yourself winding a tube on a form suggested in the preceding paragraphs. Get the idea of the winding firmly in your mind, and then, as the process is explained in detail in the next paragraph, follow each step through once again.

In detail, the procedure is as follows: Bring the wire (No. 20 or 22 S. C. C. copper wire) up from the inside of the coil, or from a binding post mounted on the coil and make three complete revolutions, laying down three turns as shown in "A" of Fig. 2. Put the brake on the winding device, and holding the free end of the wire with one hand, apply a solution of collodion or coil cement with the right hand. For this operation of cementing the three turns together, shellac will *not* do. In the first place, shellac is going out of favor with radio experts on account of its tendency to increase distributed capacity, and in the second place it is not of sufficient body to hold these first three turns together as firmly as they should be held.

At the end of the third turn, make a sharp angle to the left and wind the next turn on top and in the groove between turns Nos. 1 and 2. See "B," Fig. 2. Turn No. 5 is wound in between Nos. 2 and 3 as shown in "C," while the last turn of the "anchor" goes in the remaining groove, which is on top of and between Nos. 4 and 5. The last sketch in Fig. 2 shows the anchor turns complete.

At this point apply collodion once more. Now, when the anchor pyramid is complete and the collodion has hardened, make a sharp inward angle as though you were going to pierce the tube with the wire. Instead, straighten out with

(Continued on next page)

A Code of Ethics for Radio Fans

By O. G. De Witt

TWO simple yet important rules constitute what has been termed a "code of ethics for radio fans." In operating our radio receiver so as to get the maximum of enjoyment out of it, we should also think of the other fellow, and the two rules formulated by L. W. Chubb, a well-known radio engineer, show that this unselfishness is not only practical but that it really reacts to our own good.

Surrounding all of the high-powered broadcasting stations is a broad belt of radio receivers, most of them of the inexpensive crystal type. The first rule of behavior concerns the operation of crystal sets. Always de-tune them when they are not in use. It seems that when a radio receiving set is tuned to the wave length of a second station, the coils of that set absorb some of the radio energy, regardless of whether that energy is rectified by the detector and sent to the phones to be enjoyed by the listener. In other words, an idle crystal set, if in tune, will take away from the sum total of a sending station's energy and thus rob somebody else who is farther away from the transmitter.

To avoid offending in this respect, always throw your dials to the zero position when you sign off your crystal set for the night. It is not necessary to throw your detector out of adjustment. With this rule, the owners of vacuum tube outfits do not need to concern themselves, because when they shut off their tubes, their aerial and coils are harmless.

There is, however, a rule about vacuum tube operation that should be taken to heart by every tube owner. Do not hunt for stations with your tubes oscillating. To do so is to annoy the listener-in at a nearby set, who can hear a shrill whistle emanating from your set as you go up and down the scale in search of carrier wave whistles. One "peanut stand whistle," as this interference is called, is not bothersome, but when a thousand neighboring stations begin hunting with their cut-outs open, the resulting interference is the most persistent and annoying characteristic of present-day radio.

When your tube set is operating at excessive regeneration, it is in reality a miniature transmitting set. It sends out at once everything that it brings in. There is, of course, an appreciable lag between the original signal going on its way and the re-transmitted signal from your receiver. When another receiver is reached, it not only records the reception of the original music but it also piles on top of that music, the reproduction of it sent out by your station. This is what causes the gurgling and distorted music and speech often received over the radiophone.

You are frequently annoyed by these apparent defects in radio. Why not resolve now to help the situation by tuning-in with your set just on the verge of oscillation, and not in a howling state of excessive regeneration? If we want the quality of broadcasting programs to improve, we must also improve the quality of broadcasting reception, and there is no better way for a radio fan to do this than to observe one or both of the rules given above.

(Continued from preceding page)

another sharp angle and continue the winding, laying turn No. 7 alongside No. 3. As turn No. 8 comes around it goes on top of No. 7 and runs next to No. 5. Turn No. 9 is on top of No. 8 and next to turn No. 6. Turn No. 10 comes down to the first layer again, and the succeeding turns are wound *against the inclined bank* of the three preceding turns, and so on until the required number have been

taps—about every twenty-four turns—take them from the first layer always, so that the two other layers can cross over the twist and help to hold it in place. Be liberal with the coil cement and above all things—take your time!

Four and five-layer coils are wound in the same way as three-layer, with the exception that four and five layers, respectively, are placed at the base of the anchor winding.

Bank-winding is not used in short wave tuners, but in

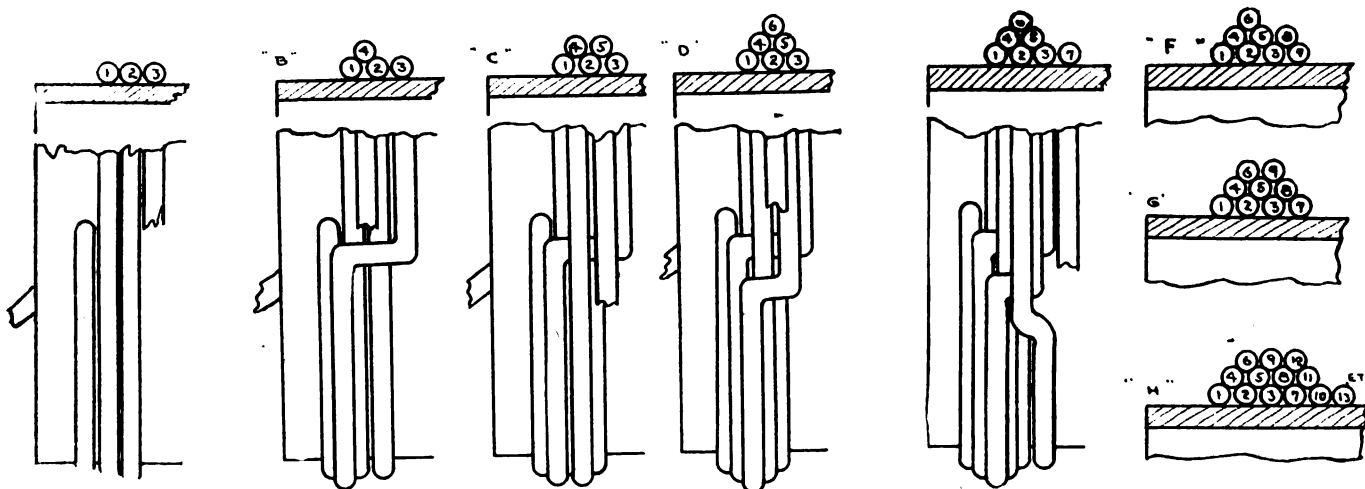


Fig. 2. Progressive steps in winding a bank-wound coil. Care should be taken that the tension is even so that the top turns will not slip.

placed on the coil. Every third turn after the sixth appears on the top layer, and the only difference noted between the appearance of a bank-wound and a single layer coil is the spiral path indicating where the top turns, one after the other, have been turned down to make the next turn on the first layer.

Don't make all the turn-downs in the same place, but drop back about $\frac{1}{4}$ of an inch each time. In taking out

loading coils or in long wave instruments, nothing is quite so effective. On a cardboard tube no larger than that used for an ordinary tuner operating on 360 and 400 meters, enough turns can be bank-wound to bring in everything that sends on less than 3,400 meters—and that's pretty nearly everything. Bank-wound coils are intensified inductance, and not only that, but they keep down to a minimum that deadening effect known as distributed capacity.

A Long Distance Three Tube Set

By H. Spencer Lewis

THE most important tuning element in this strange set is the combination coil containing the primary, secondary and regenerative windings. Contrary to popular belief the induction set up by a primary winding is not best absorbed by a secondary winding inside the primary, but on a plane with it and outside of it. This gives a maximum induction in one sense and a maximum of selection, permitting extremely accurate tuning. Hence this tuning coil should be made of a cardboard or fibre tube six or seven inches long and four inches in diameter. At one end there should be twenty turns of number eighteen D. C. C. wire. S. C. C. wire will not do. More turns can be used for this primary winding if higher wave lengths are desired, but 20 turns will take care of wave lengths up to about 700 meters. By putting the primary condenser in parallel with these twenty turns the wave length can be increased. If more turns are used, taps should be put on every second tap above and beginning with the eighteenth. Note that the last turn, toward the center of the tube, must have the connection from the ground.

to modulate the whistling, while acting at the same time as a tuning device, for with this condenser alone one can tune in or out a number of stations on any given wave length without disturbing the other condensers once they are set. And stations selected in this wise would not be located if this condenser did not do this little trick.

The elements in the set are as follows:

1. Fixed condenser, .00025.
2. Variable condenser, 43 plates.
3. Variable condenser, 43 plates with one vernier of 3 plates.
4. Fixed condenser of .00025 mfd.
5. Fixed condenser of .00025 mfd.
6. Variable condenser 43 plates.
7. Fixed condenser of about .0005 or .001 mfd.

Transformers of any standard make, at right angles, are used. If possible use regular 4 to 1 transformer for first stage and 7 to 1 for second stage or a R. C. A. audio transformer. The rheostats for detector and first amplifying tube should be Bradleystats, because they permit extreme

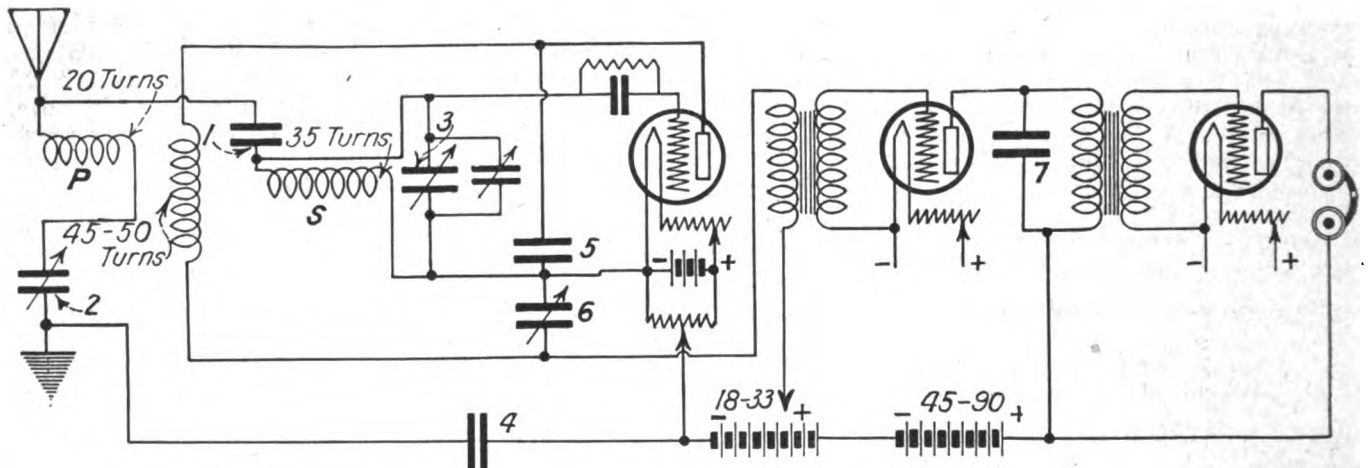


Fig. 1. Schematic diagram of the set described by H. Spencer Lewis in the accompanying article. The filament leads for the second and third tubes are left open to show that each of the tubes is supplied from separate batteries. This is done to prevent any back-coupling through the battery leads.

After this primary winding is completed, leave a space of half an inch and wind 35 turns of the same wire. This forms the secondary winding. It should be wound in the same direction as the primary winding, and both windings are determined by the winding of the rotor within the tube, for the rotor must be wound in the same direction as the primary and secondary. The rotor should have about 35 or more turns of 22 S. C. or D. S. wire.

The shaft for this rotor should come in the half-inch space between the primary and secondary windings, and the ball should fit snugly in the tube. Therefore, before starting to wind the tube get your ball and either shave down the ball to fit your tube or make the tube slightly smaller to fit the ball. In making the secondary connections be sure that the first turn of the 35 secondary turns, the one nearest the rotor, goes to the grid leak. The connections to the rotor from plate and transformer will have to be determined by listening for the regeneration and oscillations. If wrongly connected there will be few or no oscillations. The rotor acts as a tickler despite the fact that it is located between primary and secondary and you will soon note that it seems to be regenerating radio frequency oscillations in a manner peculiar to itself.

The other odd feature of this hook-up is the condenser shown at No. 6. This I call a *modulating condenser*, for it acts as a vernier on the tickler regeneration and also helps

lowering of current, gradual increase, fine adjustments, and are absolutely noiseless, which is exceedingly important in picking out weak distant stations before bringing them up to maximum loudness.

The potentiometer shown at No. 8 should also be one which is not in steps, but graduated like the Bradley, for stations can be tuned in or out on this alone, sometimes a slight increase bringing a change of many stations.

The detector tube should be preferably an A. P. or Moorehead, but for those who are out of luck in this regard, some Radiotrons or Cunningham tubes are critical and oscillate at a low point and these are very fine. Any good tube, even the four-volt Myers tube will also work well. The first amplifying tube will be almost as critical as the detector tube.

In finding the proper plate voltage on the detector tube, do so with the potentiometer set in its middle or neutral point so as to leave a range for increase or decrease. The more distant the station being tuned-in, the less plate potential and filament current will be needed and in some cases loudness is reached by turning down the amplifying tubes, even turning the last one down to its lowest point and at other times by turning the first one way down and the second one on full.

In operating observe these points: First, find where your

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detector oscillates by adjusting the primary condenser, rotor and secondary condenser along with the detector, rheostat and potentiometer. Once the oscillations are noted, keep your adjustments confined to that small field and try to soften the oscillations, remembering that you may be generating QRM for many others in your neighborhood. Once you locate some broadcasting station, either 360 or 400 wave length, you will find that all other stations are within a quarter-inch on all your condensers. But for long distance stations you will have to slightly increase the position of your rotor. In between the low soft whistles you will find the distant stations by adjusting the verniers on your secondary and primary condensers. Then use the modulating condenser and rheostats to clear away all

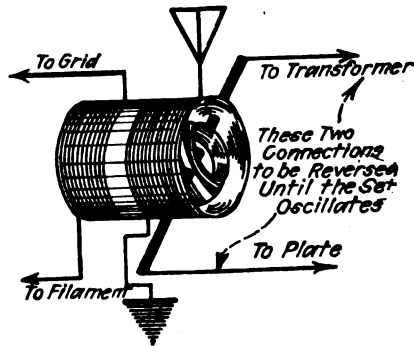
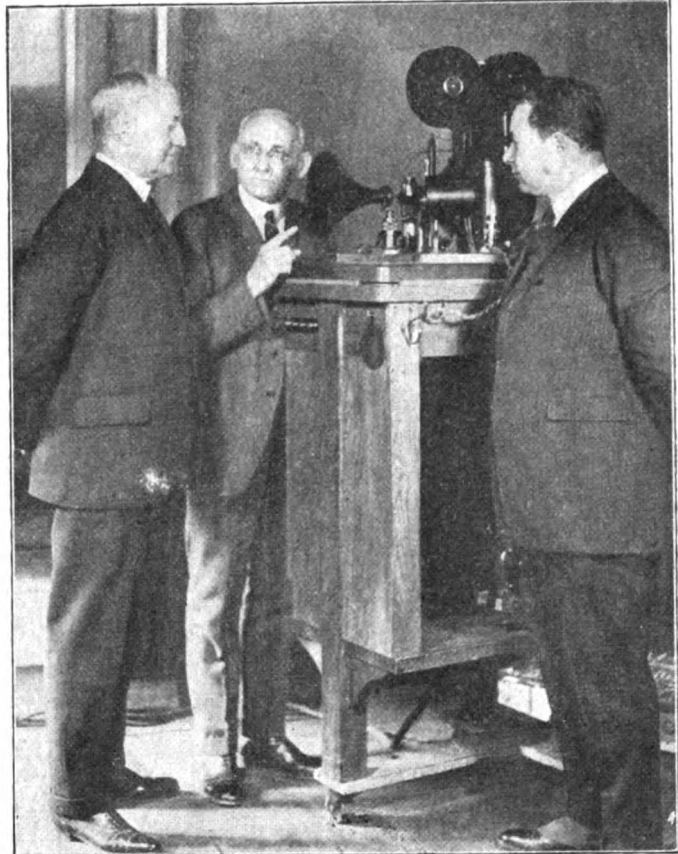


Fig. 2. Diagram of the coupler to be used with circuit shown in Fig 1. The two coils are wound on the same tube. The coupling is movable. Regeneration is obtained through varying the tickler.

whistling and add loudness. It will take probably several hours to become acquainted with the tuning of this set, but once you have found the critical points on each dial or knob, you will be able to go back any time and pick out any station. I have picked out seven distant stations on 360 meters by moving the vernier of the secondary condenser within a space of half an inch only.

Putting Themselves on Record



(C. Radio Corporation of America)

Three of the most prominent figures in the radio world today, putting themselves on record by means of the pallophotophone. Left to right they are: General Harbord, president of the Radio Corporation; C. A. Hoize, inventor of the pallophotophone; David Saranoff, vice-president and general manager of the Radio Corporation.

Difficulties of Radio Licensing

SECRETARY HOOVER will have to contend with many difficulties during the next year operating under the old radio laws of 1912. Conditions have changed in ten years. There were, in June, 1913, only 1,890 transmitting stations all told, whereas there are today almost twenty-one times that number—actually 21,065. There were no broadcasters in 1913, but in January there were 544, and today—576. Of amateurs, there were 1,312 in 1913 compared with 16,898—over ten times the number now. Special amateurs, experimental, technical and training stations number 618 against 20 ten years ago. Ship stations have increased nearly seven times, and commercial stations have grown from 79 to 218. Instead of one trans-Atlantic there are twelve such stations.

All of the above indicates how badly the Commerce Department needs new and specific laws for the assigning of more wave lengths and the policing of the air. If there was interference in 1913 there is over twenty times the interference today. Naturally, the Department has revised its regulations somewhat to meet the needs of this great increase in stations, but there is not much that can be done

under the old law as it stands. Secretary Hoover's hands are practically tied until new legislation is enacted.

One of the first things to be done by the Department will be the extension of the license periods for broadcasters from three months to a year. Since the introduction of the White Bill last June the Department has been extending broadcasters' licenses every three months, on application, in anticipation of new regulations which would have followed closely upon the enactment of new laws. But the failure of the Senate to pass the radio bill precludes new legislation for at least a year, and twelve-month licenses will now be issued to save the Department time and work.

There are about four times the operators' licenses issued annually today compared with those issued in 1913. Ten years ago only 3,682 operators were licensed, but in 1922 the operators licensed totaled 12,113. Commercial licenses issued increased about 80 per cent, and amateurs' licenses were nearly eight times as many. In 1922 there were issued 8,920 amateur licenses, and in 1913 only 1,841. As all of these operators' licenses are issued for two-year periods there are practically double this number of amateur stations in operation.

Berlin, Germany, Picks Up WOR, Newark, N. J.

MUSIC transmitted from the United States was heard in Germany for the first time on February 24, according to a press dispatch from Lichterfelde, a suburb of Berlin. The experimental wireless station at Seehof, at 6 a. m., picked up the

voice of Miss Edith Bennett singing in the department store of J. Bamberger & Co., Newark, N. J., station WOR.

The vocal and instrumental tones were perfectly audible. The transmission is regarded as remarkable since the broadcast-

ing station operated on a 400-meter wave length, the same as is commonly used for nearby American listeners. Eight high vacuum amplifiers were used in receiving, but only ordinary antenna, eight meters high.

Methods of Measuring Properties of Electron Tubes

Apparatus Used by The Bureau of Standards

IN papers dealing with the operation of electrical circuits which use electron tubes, as well as in the design of radio equipment using electron tubes, certain properties of the tube appear to be of much importance. This article describes apparatus used at the Bureau of Standards, Department of Commerce, Washington, for measuring some of these properties. Those included are:

- I. Combination alternating-current bridge for measurement of
 - (1) Internal input resistance.
 - (2) Internal output resistance.
 - (3) Amplification coefficient.
- II. Arrangement for measurement of
 - (1) Direct-current characteristics.
 - (2) Power output of generator tubes.
- III. Measurement of detection factor,
There are other important factors which are not covered

This bridge is an alternating-current bridge which by simple switching arrangements may be used to measure internal input resistance, internal output resistance, and amplification coefficient under any condition of grid voltage, plate voltage and filament current. The principle involved in each of these measurements can be seen by reference to Fig. 1. In each case the contact on the slide wire is varied until there is no sound in the telephone receivers. When this condition is satisfied the value of the factor desired is given by the relation indicated.

The complete circuit arrangements is given in Fig. 2 in which
 1 and 2 are SPDT switches.
 3 is a SPST switch.
 4, 5, 6, 7, 8 and 15 are terminals to which auxiliary apparatus is connected as indicated.
 9—Filament ammeter.

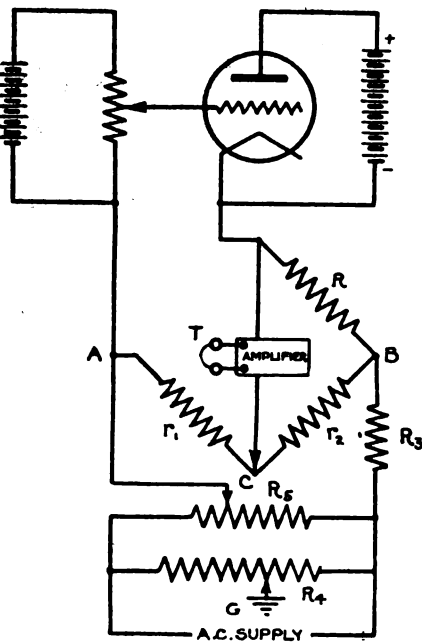


FIG.1.(a) INTERNAL INPUT RESISTANCE (r_i) WHEN THERE IS SILENCE IN THE PHONES T

$$r_i = \frac{R_1}{R_2} R$$

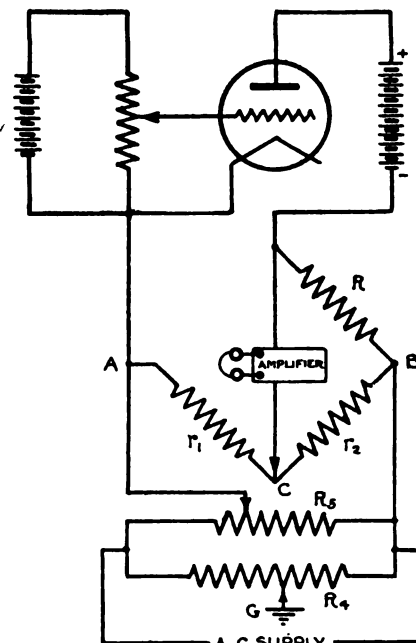


FIG.1.(b) INTERNAL OUTPUT RESISTANCE (r_p) WHEN THERE IS SILENCE IN THE PHONES T

$$r_p = \frac{R_1}{R_2} R$$

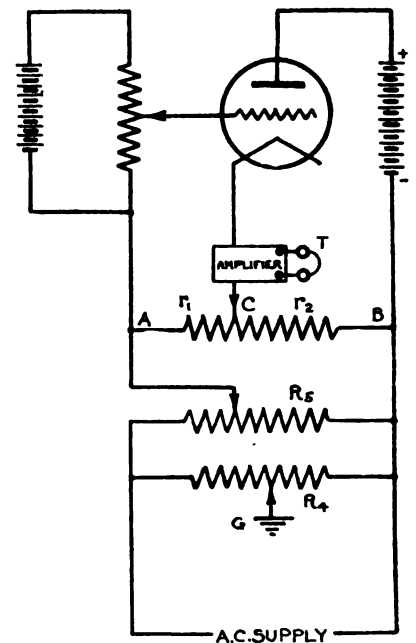


FIG.1.(c) AMPLIFICATION COEFFICIENT (μ) WHEN THERE IS SILENCE IN THE PHONES T

$$\mu = \frac{R_2}{R_1}$$

by this series of articles. Some of the more important of these are, inter-electrode capacities, mutual conductance, and detection factors defined differently from the one included in an article to appear later.

The methods of measurement used have been described by several writers* on the subject and this paper is intended to give convenient circuit arrangements that may be used for the rapid determination of the various properties with the values of the circuit constants that have been found most convenient.

I. Combination Alternating-Current Bridge for the Measurement of Internal Input Resistance, Internal Output Resistance, and Amplification Coefficient.

*J. M. Miller, Proc. I.R.E., June, 1918. H. J. van der Bijl, "The Thermionic Vacuum Tube," Chap. VII. J. H. Morecroft, "Principles of Radio Communication, Chap. VI.

- 10—Grid voltmeter.
- 11—Standard receiving tube socket.
- 12—Terminals for connecting non-standard tubes.
- 13—Slide wire.
- 14—Two-stage audio-frequency amplifier.
- G—Ground terminal.
- R—Standard resistance box, variable from 0-100,000 ohms.
- R₁—Filament rheostat.
- R₂—Grid voltage divider.
- R₃—Rheostat 0-10,000 ohms.
- R₄—Rheostat 0-1,000 ohms.
- R₅—Voltage divider 0-1,000 ohms.
- S—Reversing switch by means of which the grid may be made either positive or negative with respect to

(Continued on next page)

The Radio Primer

For Thousands of Beginners Who
Are Coming Into Radio Circles

Weekly A B C of Radio Facts and Principles Fully and Clearly Explained

By Lynn Brooks

WHAT are the advantages of using a crystal detector in connection with a reflex set?

When using a reflex circuit a crystal detector is advantageous because it is the quietest detector known, not having troublesome tube noises and also being the most distortionless. A crystal, while not quite as sensitive as a tube, overbalances the slight disadvantages of this loss in a reflex circuit by being a quiet and distortionless detector.

* * *

A capacity of .006 is desired. The highest capacity condensers that can be gotten are .002. How can the difference in capacity be made up?

In the case of a certain fixed capacity being wanted, where there are a number of condensers of smaller value at hand, the higher capacity may be obtained by placing the condensers in parallel. Thus it is seen that if the desired capacity is .006 and there are three .002 condensers used in parallel, the desired capacity will be obtained.

* * *

What is the effect of connecting condensers in series?

When condensers are connected in series it cuts the efficient capacity down in direct ratio to the number of condensers as compared with the capacity of each. Thus for example three condensers connected in series, the capacity of each being .002, the method of finding out the capacity is as follows: Take the capacity of 1 condenser as .002. Divide by the number of condensers in circuit thus: $.002 \div 3 = .000666$, or the capacity of three condensers in series.

When making fixed condensers, state the precautions that are to be observed.

In the manufacture of condensers, if they are to be packed (rolled) the best method of making is to use tin foil and waxed paper. The paper used should be at least one inch larger all around than the foil. The waxed paper should be heavy enough to stand the strain. The lugs for connections should be taken off opposite sides.

* * *

When a receiving set is installed, and refuses to work, what should be done to test it?

In the case of a receiving set refusing to work when installed, the following should be done: See that the tube is lit properly. If there is no click when the B battery is connected, reverse the leads. If variable condensers are used across the secondary, rotate them to determine if they are short-circuited. If this is the case a series of loud clicks and knocks will be heard in the phones. See that the antenna is not grounded and that it is connected to the proper post of the set. See that all the lugs of the tube are making connection with the proper post of the socket. The lugs of the socket sometimes become bent and do not connect with the post, so see that they all make good connection.

* * *

Can a tube filament be repaired after the manner of a regular light bulb, by tapping the side of the glass?

This cannot be done, because of the fact that the filament in a tube is short and stretched tight. When burnt out, it fuses short because the filament is extremely thin. This leaves the filament too short to enable any jar to allow a short circuit to again connect the wires.

* * *

In the new $1\frac{1}{2}$ -volt tubes, vibrations are very apparent. What can be done to reduce the noises?

The socket should be mounted on a pad of thick felt or soft gum rubber and not screwed down. Glue should be used to fasten both the felt on the sub-panel and also to fasten the socket proper on the felt. This will reduce the vibration of the elements of the tube and decrease the noises.

SECOND DISTRICT RADIO CONVENTION A BIG SUCCESS

THE third annual convention and radio exhibition of the Second District Executive Radio Council, opened at 2 P. M., Thursday, March 1, with a bang. In contrast to the convention held last year, both from standpoints of beauty and usefulness, it overshadowed the second annual meeting as completely as a Rolls-Royce outclasses last summer's Ford.

The exhibits, which are really the hit of the show, were arranged in a most interesting and unusual manner. A point of note is the fact that the exhibits have practically the same amount of space allotted to each. Therefore, they stand out because of the value of exhibits themselves, rather than the amount of space allotted to them. This is a noteworthy idea, as no unfair comparisons can be drawn from the consideration of space alone.

The booths as allotted for the exhibition were occupied as follows:

Booth

3. Westinghouse Union Battery Co.
4. Electric Storage Battery Co.
5. Radio Corporation of America.
6. Mortimer Radio Co. and Advance Metal Stamping Co.
7. General Radio Co.
8. Acme Apparatus Co.
9. W. J. Murdock Co.
11. Jefferson Electric Mfg. Co.
12. American Radio Relay League.
13. F. A. D. Andrea.

14. Experimenters' Information Service.
15. Federal Tel. and Tel. Co.
16. Diamond State Fibre Co.
17. A. H. Grebe & Co., Inc.
18. Executive Radio Council, Second District.
19. De Forest Radio Tel. and Tel. Co.
20. Marco Storage Battery Co.
21. The Bristol Co.
22. Jewell Electrical Instrument Co.
23. Adams-Morgan Co.
24. Novo Mfg. Co.
25. Allen D. Cardwell Mfg. Corp.

In the Butterfly Room, which is right across the hall from the main exhibition, are the Club Exhibits. The following clubs were represented, in the booths allotted:

Booth

26. Radio Club of Brooklyn.
27. Hackensack and Ridgely Park, N. J., Radio Clubs.
28. Chelsea Radio Association.
29. Radio Association of Greater New York.
30. Ridgewood Radio Club.
31. Hudson Radio Club.
32. Department of Commerce.
35. Bronxville Radio Club.
36. Bronx Radio Club of New York.
37. Hill City Radio Club.
38. Staten Island Radio Club.
39. Radio Club of Jamaica, L. I.
40. Radio Division, Hudson River Yacht Club.

41. Bushwick Evening Trade School Radio Club.
42. Roselle Park Radio Club.
43. Camp Walkill Radio Club.

The club exhibits at the third convention overshadowed those of all previous years, even beyond comparison. One of the finest installations of the radio clubs was that made by the Radio Division of the Hudson River Yacht Club.

In the next issue of RADIO WORLD will be published illustrations of the various exhibits and news of the convention.

One of the features of the show was the fact that A. H. Grebe & Co., Inc., installed a complete 500-watt transmitter under a special license to operate three days, the call being 2CYT.

Radio and the Churches

ROGER W. BABSON, the well-known statistical expert, is quoted as saying: "A hundred thousand churches in this country and their millions of members little realize how their institutions are to be changed by radio broadcasting. People, like water, travel along the lines of least resistance. If they can hear at home by the fire-side, on the radio, the same service that they would otherwise have to go out and hear, they are apt to remain at home and use the radio."

Radio and the Woman

By Crystal D. Tector

UNKNOWN to F. H. the other day I visited town and, going to one of the largest radio stores, bought all the necessary parts for the "Flewelling Circuit." Two days later, when hubby arrived home on the 6:10, he was much surprised to find that I had taken his set and put it away, and in its place was my work of art. Well, you never saw a more surprised man in all your life. He just couldn't understand how any woman (he generally calls them "mere womings") could make a set. It worked so well that we decided to let the old set stay upstairs and play around with the "New Flewelling" awhile. You want to try it, girls! It's more fun than making a cake or a new dress, especially if you surprise some one with it. And the satisfaction you get out of it when you can stick up your chin and say: "Oh, yes; I made it *myself!*"

* * *

While we are on the subject of making things, I know that there are a lot of men in town that have turned out to be real handy around the house just by showing the folks that they could make things if they really wanted to. They had the bad habit of telling their wives and mothers, "Oh, send for the carpenter. He'll fix it. I'm too tired—hard day at the office," and all of that. But now that they have demonstrated that they can do something if they feel like it the plumber and carpenter don't make so much money driving a few nails or fixing a leaky faucet.

* * *

I had quite a time finding the correct way to solder, and nearly gave it up as a bad job; but by wasting plenty of

solder, burning the table and my hands quite a few times, I finally found out that I had to clean the parts, then put a little flux on it (funny brown stuff that smells terrible when you put the iron on it), and *not* let the iron get red hot. It surely is a great satisfaction to see the parts stick together after you have "muffed" it a dozen or more times and then found out the right way all by yourself.

* * *

The large New York department stores are making quite a lot out of the radio craze these days. Last week a few of my friends and myself went shopping, and, of course, we had to do two things: one was to visit the millinery department and the other was to look around the music department. Imagine our surprise when we found that the store had given over half the space that they had for the music department to an up-to-date radio department, with plenty of sets and nice young men to demonstrate them for us. We listened to more sets and things than we had ever known existed, and the clerk was such an agreeable chap. He never did get tired of explaining just how everything worked, and it was perfectly understandable, too. Some of those radio clerks like to hear themselves talk about "super-impose, self-heterodyne" and any number of fancy technical terms which very few people understand, and it is a welcome relief to have somebody talk in such a way that you can understand. Of course I don't mean that I personally object, but it seems that the "experts" are acknowledging that just because they understand those terms there is no reason why every one should.

Radiograms

ALL police and fire-alarms will soon be broadcast if a series of tests which William B. Quinn, of Jersey City, is conducting are successful. He intends to install an intercommunicating system in every police and fire station throughout the city, and equip all the police and fire stations with receiving apparatus.

* * *

HOPE can now be held out for the deaf if experiments made by Dr. MacLeod Yearsley, of London, a famous aural surgeon, turn out successfully. He recently was inspired by the report that a deaf man 77 years of age, was made to hear the human voice for the first time in 30 years through a radio receiving set. Taking Harry Shwer, a boy 13 years old, who has been deaf from birth, he made the experiment of placing him before a loud speaker. The youngster quickly evinced the fact that he could hear, by tapping his foot in rythm with the music that was at the time being played. Dr. MacLeod Yearsley holds great faith in re-educating the deaf to hear by means of radio and thinks that this is the biggest step in that line that has been accomplished.

WHAT is said to have been the first time that proceedings of an important stockholders' meeting have been broadcast, was recently accomplished in Chicago, when the Chicago Edison shareholders conducted a long-distance meeting and voted by radio an increase of \$20,000,000 in the capitalization.

* * *

A COMPLETE broadcasting equipment was installed at the Longacre Theatre in order to insure the successful broadcast of "The Laughing Lady" on March 2. This play was broadcast through Westinghouse, but the complete speech-amplifying and power-amplifying apparatus was installed at the theatre itself, to insure the successful broadcast.

* * *

A RECORD for 9 KP, the radio station of A. J. Leonard, Jr., of Chicago, was made recently when reception of his voice and CW signals were heard at the Awarua station at Invercargill, New Zealand. This is a distance of 8,000 miles, and clear reception was reported. This station is an amateur-owned and operated station and is rated at 500 watts. It was constructed entirely by the owner.

New York Department Store Holds Radio Exhibit

AN interesting exhibition of radio goods was held last week at Gimbel's department store, New York City. This exhibit, which occupied half the fourth floor, was one of the neatest laid-out showings yet seen and was appreciated by large crowds.

This exhibit was held mainly to acquaint the public with the latest in radio and also to show people how broadcasting is actually accomplished. For this latter purpose, the Westinghouse station WEAJ installed a complete station in the center of the floor arranged in such a manner that the visitors could see exactly how it is done. The broadcasting was transmitted over land wires through the agency of power amplifiers to the operating and transmitting rooms at Walker Streets, New York City, where the

actual broadcasting was done under the most modern methods.

All of the latest apparatus was shown and quite a few of the exhibits related to the improvements that have been made in radio in the past few years. This was done by arranging the apparatus in use three and five years ago in such a manner as to show by steps the improvements that have been wrought in all the different lines. This was a very instructive and interesting way of conveying to the uninitiated by visual means just what has been accomplished in the way of improvements. The huge ungainly looking keys that take up half a table, the noisy, dirty spark gaps that look like a monstrous static machine, the "coffins," or transformers, and everything that used to be considered the height of perfection was exhibited right alongside of the present up-to-date apparatus that has taken its place.

New Zealand Hears Troy, N. Y.

THE broadcast of radio telephony from the Rensselaer Polytechnic Institute, at Troy, N. Y., on March 1, was heard distinctly in Invercargill, New Zealand. Both the speech and music were reported very clear and fairly loud. Not much interference was noticed. This is a new record for distance, as the receiving station was over 10,000 miles airline distant from the transmitter. The Troy station, WHAM, has recently established several long distance records, but the present one excels them all. It is a noteworthy fact that this station is not a commercial project, being merely established as a medium through which the students of the college may, through actual experience, become acquainted with the theory and practice of radio telephony and broadcasting methods.



(C. Kadel & Herbert)
 Mme. Ganna Walaka, lyric soprano, when she sang for the benefit of a radio audience from the Waldorf Astoria studio of radio station WJZ. This was her initial appearance after her arrival in America.



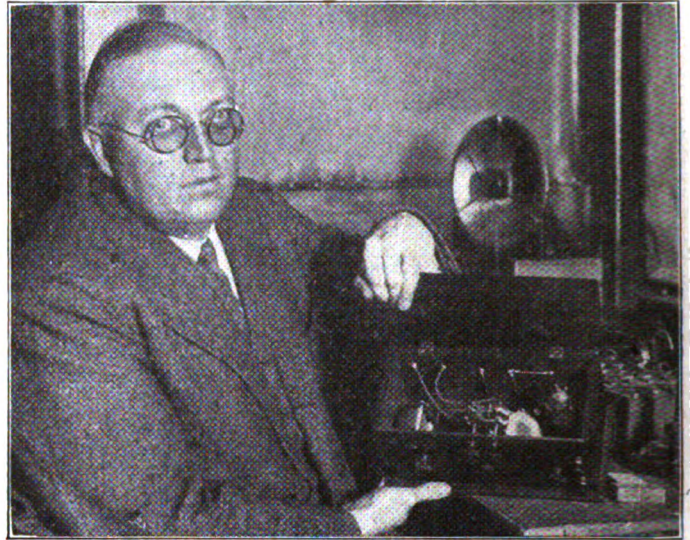
(C. Underwood & Underwood)
 Mlle. André Lafayette, descendant of the famous French general and patriot, listening in to the super-regenerative set, nicknamed the "Rolls Royce" of radio receivers, at the Permanent Radio Fair, Hotel Imperial, New York City. Mlle. Lafayette distinctly heard a message of welcome broadcast from the Los Angeles "Examiner," Station KWH.



(C. Kadel & Herbert)
 Mr. Herschel Jones, the man responsible for the fact that market reports are being broadcast to the agricultural industry. It was only through his constant attention to the matter that the Government finally decided to broadcast reports that help the farmer and people in the outlying districts so much. It is such men as these that realize the importance of radio to the farmers.

Pictorial News Culled For Radio World

Captions by Robert...



(C. Kadel & Herbert)
 Dr. Francis Leroy Satterlee, noted X-Ray specialist, and his famous radio set. This circuit was demonstrated to all the foremost radio engineers of the world and proclaimed to be the most startling thing discovered in a long time. The set is incapable of oscillating and is therefore non-interfering.



(C. Kadel & Herbert)
 The head of the Department of Physics at Fordham University, New York City, Rev. Francis Duffy O'Laughlin, S.J., Ph.D., who realized in the beginning the importance of radio and was instrumental in having one of the finest radio equipments installed at the University. The photograph shows Dr. O'Laughlin operating the model receiving station at the University.



(C. Kadel & Herbert)
 Gladys Ward, of the "Ziegfeld Follies," operating the super-regenerative set at the Permanent Radio Fair, New York City. Miss Ward, who is not very well acquainted with radio, hearing a buzz in the receivers and hearing somebody mention "B" batteries, immediately laid down the receivers and fled, saying that she didn't want to be stung. She wasn't.

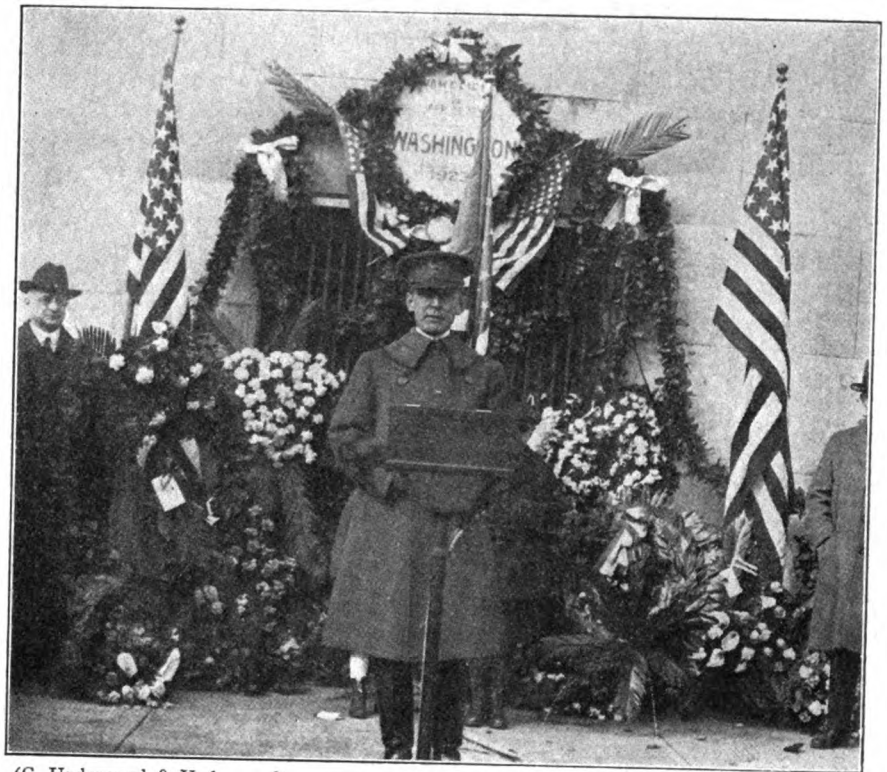


from Everywhere ld Readers

. Dougherty



(C. Kadel & Herbert)
Thousands of listeners have heard the chimes ring out when Station WOR, of L. Bamberger & Co. Newark, N. J., signs off. The photograph shows Miss J. E. Koewing, one of the operators of the station, ringing the evening chimes of WOR. Miss Koewing has the distinction of being one of the first women broadcast operators.



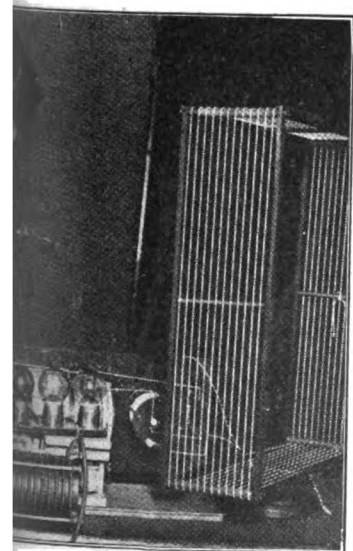
(C. Underwood & Underwood)
Broadcasting the address made in honor of the "Father of His Country" at the foot of Washington Monument at Washington, D. C. Col. C. O. Sherrill, master of ceremonies, is shown making the introductory address. This ceremony was broadcast through station NOF located at Arlington.



(C. Photo News)
A miniature radio receiving set built into a small filing cabinet. The set is a one-tube receiver and utilizes honeycomb coils for the inductances, as can be seen in the photograph. It was built by Milton E. Brounshield, of New York, and was one of the prize-winning entries of the amateur radio set contest held at the Hotel Imperial New York City.



(C. Kadel & Herbert)

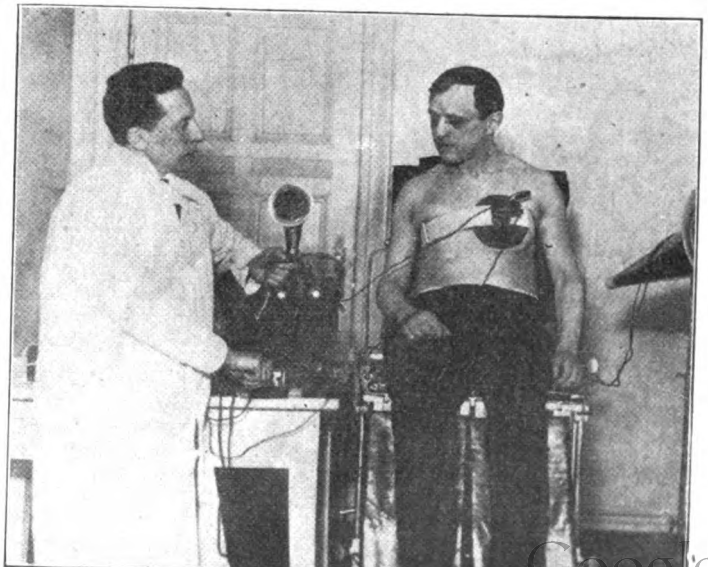


A modern plumber has installed a radio set in his shop to draw trade and also to keep the men contented, while "sitting around." I have never seen a plumber who has been at a loss for "time to sit around," even in his shop, so must take it for granted that the owner is either an ardent radio fan or else must want to be.



(C. Fotograms)

A new device which calls radio into use has been perfected by Prof. Leo Jacobson, of Charlottenburg, Germany, for strengthening the beats of the heart. It was found especially useful in the cases of men doing strenuous labor, such as athletes and people called upon to perform serious physical tasks.



Answers to Readers

1. I have an antenna of two wires, each 175 feet long. Is this too long?

2. What coils should I use to tune in POZ?

3. Please give me a panel layout for a honeycomb coil set.—Jack Alison, 374 Broadway, New York.

1. Your antenna is too long for efficient short-wave work, but for receiving the long-wave stations, such as Germany and France, it is O. K. For broadcast receiving and 200-meter work a single wire, 80 to 100 feet long, is sufficient.

2. You should use 1250 as a primary, 1500 as secondary and 750 as tickler. This is approximately the correct set of coils for the work, although you may have better success with 1300 as a secondary, depending entirely upon the construction of your set and what condensers you use.

3. A layout such as you want will appear in an early issue of RADIO WORLD, with a complete description of a very flexible set embodying honeycomb coils.

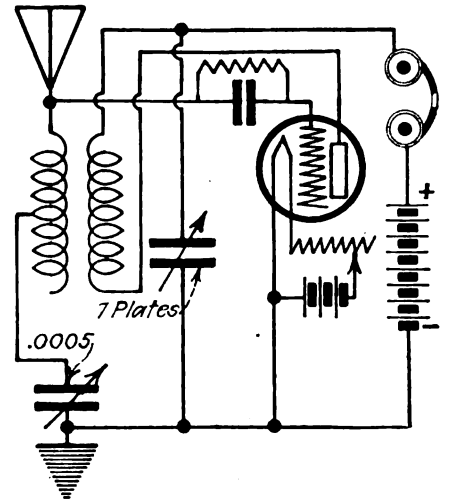
I am unable to erect an outdoor antenna. Having had to use a flat loop or wire, as shown in the accompanying drawing. It is 125 feet long and located in the attic, 20 feet high. Will it work with the enclosed hook-up which was published in RADIO WORLD, dated February 17, on page 11, by G. W. May? Will I be able to receive NAA by using this circuit?—Joe P. Harner, Nevada, Missouri.

Yes, this circuit will work with the antenna you mention. Care should be taken that the antenna is well insulated at all places. This circuit will allow you to receive all wave lengths by slipping in the honeycomb coils in the space left for them. This circuit also permits you to load up to 24,000 by the use of the honeycombs.

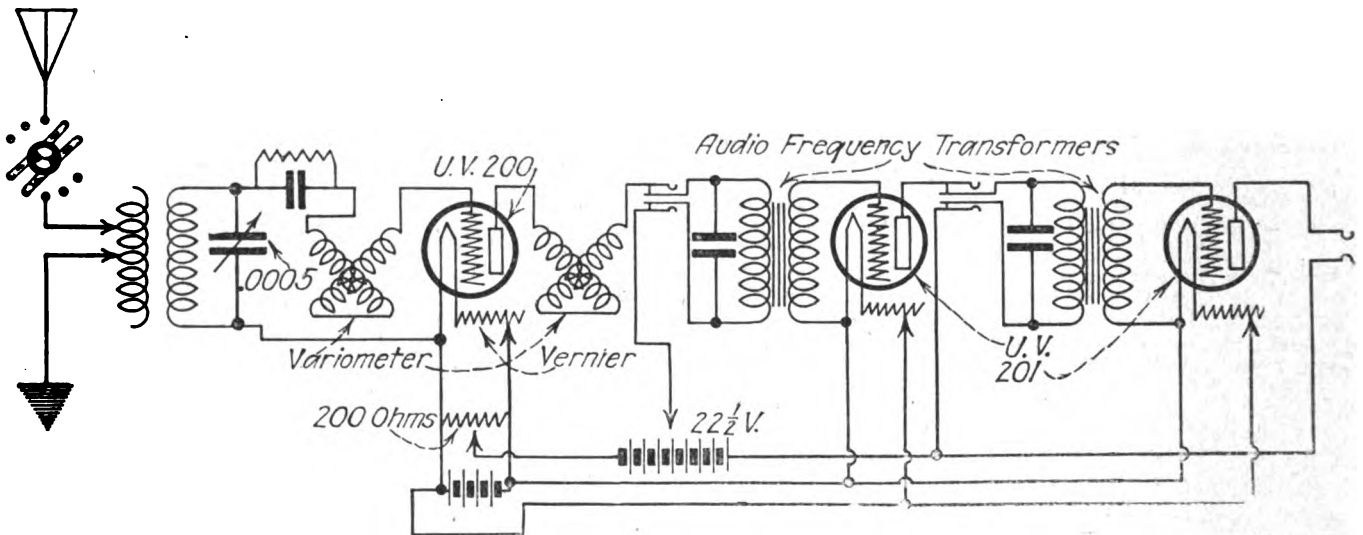
* * *

In connection with the Flewelling circuit published in RADIO WORLD, dated February 24, will you kindly advise me of the following: I constructed the set exactly

1. Your hook-up is entirely wrong. It should be as per diagram. As it is the line shorts the tickler and also the plate battery, which is absolutely wrong.
2. It is not absolutely necessary to use



Hook-up given in response to inquiry of Mr. Carl Hausing. The 7 plate condenser connected across the primary and tickler circuit tends to increase regeneration and affords easier control.



Hook-up furnished in response to query of Mr. G. W. Jamieson. It is the conventional regenerative hook-up embodying two variometers, a variocoupler and two steps of audio frequency amplification. The condensers across the primary of the transformers may be dispensed with if necessary, but, if used, will tend to decrease any tendency of the amplifier to howl and distort signals. The potentiometer should be 200-400 ohms resistance for most tubes.

Kindly send me a hook-up for the following apparatus: One moulded bakelite variocoupler; two moulded variometers; one 43-plate variable condenser; one 23-plate variable condenser; one potentiometer; three rheostats; three tubes; two transformers; two double-circuit jacks; one single-circuit jack; necessary grid leaks and condensers.—G. W. Jamieson, 209 Wellington Street, W., Chatham, Ontario, Canada.

The hook-up you request is published herewith.

* * *

On page 16 of RADIO WORLD, dated February 10, you publish a picture of Dr. R. S. Piper and his one-tube set with patented coupling transformer. Where can I obtain this transformer? Where can I obtain a copy of the hook-up used?—Lewis McMahan, 112 1/2 S. Denver Street, Dallas, Texas.

We refer you to the photographers of this picture—Underwood & Underwood, 417 Fifth Avenue, New York City. They can give you all information on this subject if you will write them.

as per instructions with the exception of using a 43-plate vernier in the circuit instead of the .0005 mentioned. I am using a WD-11 with 90 volts on the plate, and cannot get anything but local stations very weak. What is my trouble?—Michael Van Praag, 73 West 95th Street, New York City.

As explained in the text, this circuit is somewhat critical, and it is absolutely necessary to use the correct capacities as shown. If you deviate the circuit will not work properly. The condenser bank is also very important. It should be hooked up with the correct capacities just as shown. Try rehooking this set, using the correct capacities. The antenna should be hooked to post marked A in the circuit.

* * *

1. I am enclosing a hook-up that I copied out of a radio paper we get out here, but fail to get any results. What is the trouble?

2. Is the apparatus specified absolutely necessary? I am using an all-wave coupler instead of the one specified. Will this make a difference?—Carl Hausing, Box 61, Topeka, Kansas.

the exact apparatus specified to such a great extent. Any coupler can be used. This also applies to the condensers. As long as they are of the correct capacity it does not matter what make they are.

* * *

1. Where can I get a wiring diagram of the Reinartz tuner circuit?

2. What parts are necessary?

3. How many plates in a .0005 and .001 condenser?

4. Is radio frequency advisable with the Reinartz hook-up?—Richard Burgess, 230 Main Street, Burlington, Vermont.

1 and 2. We refer you to the Reinartz tuner circuit, published in RADIO WORLD, dated January 13, in answer to a question on the same subject by C. W. Stewart.

3. The construction of a .0005 variable condenser generally incorporates 12 stationary and 11 movable plates, which make 23 plates. In the .001 there are 22 fixed and 21 movable plates, which make 43 plates.

4. Radio frequency with a circuit such as this is not advisable, but more audio-frequency can be added. Preferably not more than two extra steps as it is not advisable.

Latest Radio Patents

Modulating System for Transformers

No. 1,442,146: Patented Jan. 16, 1923. Patentee: Raymond A. Heising, East Orange, N. J.

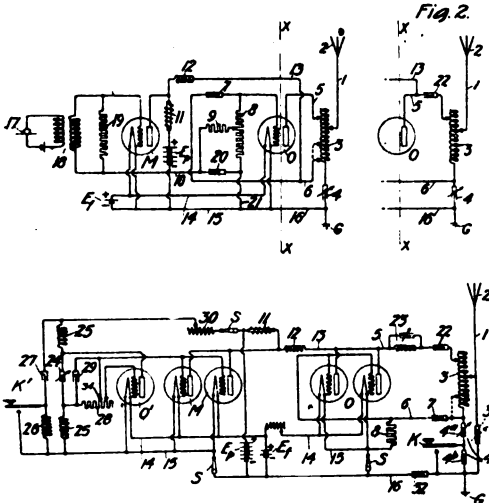
MR. HEISING'S invention relates to means for generating, modulating and

transmitting electrical oscillations, and more particularly to generating oscillations, by means of electrical discharge devices.

An object of the invention is to effect an improvement in the manner in which electrical discharge devices may be associated in signaling and other systems, and also to provide a system in which a plurality of electrical discharge devices are associated with suitable circuits to act as oscillation generating means.

Further objects are to produce a signaling system with which modulated and unmodulated signals may be sent, and in which a vacuum tube oscillates directly into an antenna.

The invention is exemplified herein in a radio signal transmitting system wherein the antenna itself is included in and forms a frequency-determining element of a high-frequency oscillating circuit, and is directly associated with a vacuum tube oscillator or a series of vacuum tubes acting as an oscillator. The oscillation frequency is determined by the circuit, which includes the antenna. Vacuum tubes for modulating have been provided to effect the signaling modulation of the oscillations to be transmitted.



Heising's Modulating System for Transmitters.

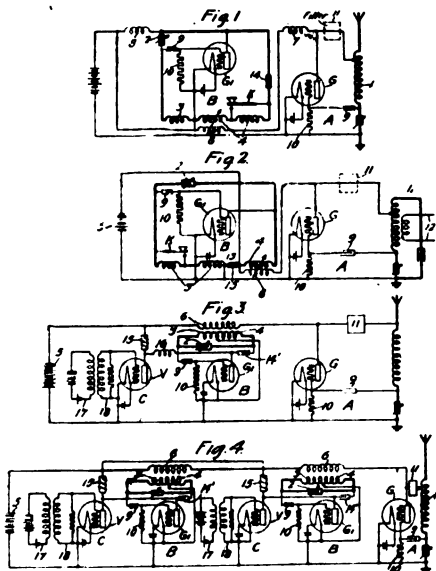
New Method of Modulating Carrier Waves in Telephony

No. 1,444,685: Patented Feb. 6, 1923. Patentee: Raymond A. Heising, Millburn, N. J.

THE invention of Mr. Heising's relates to oscillation generator circuits and to signaling by means of modulated carrier currents or electromagnetic waves.

of this invention to provide combinations of devices for and methods of signaling through the agency of successively modulated currents, the devices being so designed and associated that the above mentioned or other undesirable modulation is prevented.

Since it is sometimes desirable to transmit a plurality of signals upon a single high frequency carrier wave, arrangements for multiplex signaling are also provided. In the operation of these there is produced a high frequency carrier current modulated in accordance with a plurality of intermediate frequency currents, each of which is itself modulated in accordance with a signal or low frequency current.

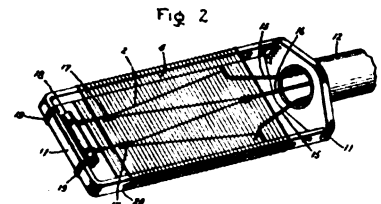
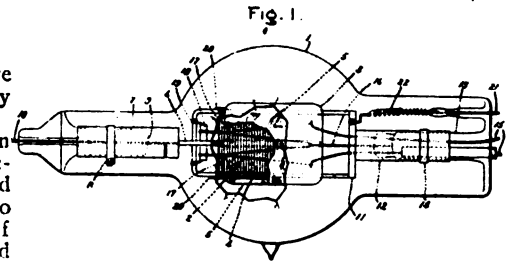


Signalling by Means of Modulated Carrier Currents.

One object of the invention is to associate, in a novel manner, two or more electron discharge oscillation generators.

In the operation of signaling systems wherein the principle of successive or plural modulation is employed, it is sometimes desirable that direct modulation of the high frequency carrier current by the signal current should be avoided. It is another object

spacing between turns will be maintained. In carrying my invention into effect I place along each side of the framework over which the wire is wound a closely coiled spiral of fine wire. When the grid is wound on the framework each turn slips between two adjacent coils of the spiral, and one or



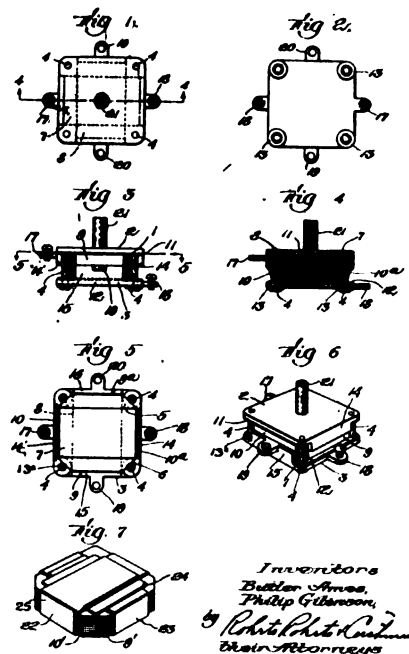
White's Method of Vacuum Tube Construction.

more of the coils of the spiral will be interposed between adjacent turns of the grid wire.

A Compact Condenser

No. 1,444,534: Patented Feb. 6, 1923. Patentees: B. Ames and P. J. Gillinson, Lowell, Mass.

THE invention of Messrs. Ames and Gillinson relates to electrical condensers and has for its object a condenser which is simple to construct, which is compact in form, which can be tightly compressed to expel any air trapped therein, which will



Ames and Gillinson's Compact Condenser.

fit into a magneto rotor or other restricted space, which has a large area of contact between the layers of conducting material and the terminals, whose layers of insulating material are symmetrical and imperforate, whose layers of conducting material are imperforate and formable from a band or ribbon of material, whose parts are secured together by means not extending through the alternate layers of insulating and conducting material, and which is of generally improved construction.

Internal Construction of Vacuum Tubes

No. 1,444,438: Patented Feb. 6, 1923. Patentee: Wm. C. White, Schenectady, N. Y.

MY invention may be applied to electron discharge relays or amplifiers of the pliotron type, and particularly to the construction of grids for such devices.

In apparatus of the type mentioned, which comprises an evacuated vessel containing an incandescent cathode, an anode and a grid electrode interposed between the cathode and anode, it has been customary to form the grid by winding a plurality of closely adjacent turns of fine wire about a supporting framework. Difficulty has been experienced in the construction and operation of such apparatus by reason of the fact that the turns of wire are apt to become loosened by reason of the unequal expansion and contraction of the wire and the framework. As a result the spacing between the turns may be changed, and in some cases the wire may move so as to come in contact with other parts of the device.

The object of my invention is to overcome the above mentioned difficulty and provide a simple and efficient construction in which the grid wires will always be retained in their proper position upon the supporting framework and the desired

New Records of The DX Nite Owls

Wants to Hear from You

From Weston C. Libbey, Harlowton, Montana
HERE they are: WAJZ, 1,612 miles, heard once. The following heard any nite: WBAP, 1,025 miles; KUO, 850; KPO, 850; KFI, 850; WFAF, 470; KLZ, 470; KFGL, 470; CFCN, 350; KFCK, 725;

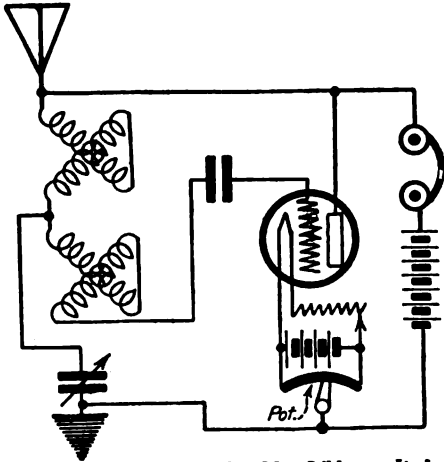


Fig. 1. Hook-up used by Mr. Libbey. It is practically the same as the Miller regenerative hook-up. The variometers should both be the same.

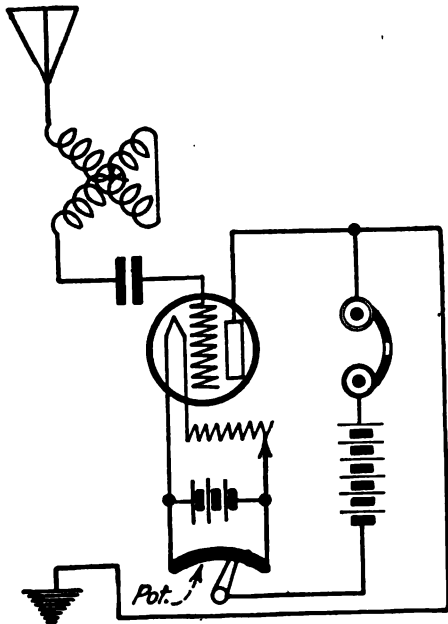


Fig. 2. One of the simplest regenerative circuits, but one that is efficient on phone work. The potentiometer is absolutely essential.

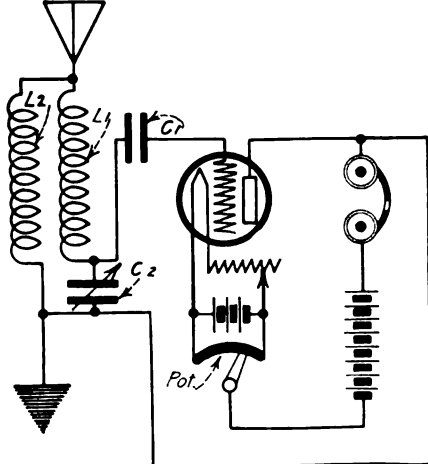


Fig. 3. Modification of Circuit 1. L1 can be a variometer but must be placed in inductive relation to L2, which is a coil of 175 turns.

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

WOC, 900; WLAG, 712 miles. CFCA, 1,325 miles, heard twice; WOI, 800, numerous times; WLAL, 900, numerous times; 9XU, WDAP, and KYW, 1,010, hear often.

The equipment that I got these stations with consisted of 1 Cunningham detector tube, 2 Duck variometers, 1 Remler potentiometer, 1 Duck socket, 1GR grid condenser and leak, Murdock condenser, a Remler aerial, 80 feet long, 30 feet high at lead-in end, and 15 feet high at free end.

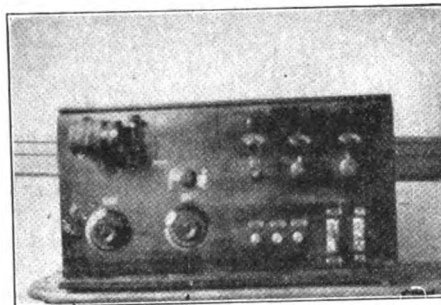
Honeycomb coils ought to work all right in O2, or a bank wound coupler. I've not tried either yet, but am going to.

I would like to hear from any one trying either D1 or D2, letting me know what results they get.

NPG at 1 A. M.

From Dr. Arthur R. Garvey, 154 Moody St., Waltham, Mass.

I ENCLOSE picture of my latest home-made regenerative set, three stage audio frequency. It will be noted that I am using the duo lateral coils which I consider the best and only tuning inductance; one jack for the detector tube, and two jacks con-



Dr. Garvey's Home-Made Regenerative Set

nected in series which may be used on either the second or third stage by means of an anti-capacity switch mounted nearest the last jack. The other anti-capacity switch is for disconnecting the A and B batteries.

My first set, if I may call it a set, was in 1908, when all that could be heard was an occasional dash or dot and the time signals, from Boston, I believe. A 75 ohm receiver, a crystal detector and a home-made tuning coil completed the outfit. I had only reached the loose coupler stage when the war brought about the end of the amateur radio activities. The first time the voice was heard through the air stimulated interest again and led from one bulb to the present outfit.

The box is not compact, but is about 24 by 15 by 10 inches. Everything is so arranged that new hook-ups may be tried out with a minimum of trouble, and to this end I have a terminal rack or shelf under the bulbs and transformers. All battery connections and jacks come to these terminals, and it can be seen that there is no cutting of soldered connections for trying a new hook-up. There is room in the box for the B batteries and these also go to separate

terminals, and a dead battery is easily removed or tested.

Many have found trouble working a third stage and so did I. A poor or dead B battery will cause much trouble and the inductance of each circuit must be under control. I have obtained excellent results with a slight loss of volume by using a fixed condenser .0005 across the plate and grid connection of the last tube. I think, however, this would be an excellent place for a small variable condenser.

Although it is claimed that duo lateral coils are harder to tune, I do not find it so, and enjoy the advantage of listening on any wave length, making it possible, as I have done, to listen to the high power French stations and time signals all over this country. Recently I listened to NPG, at San Francisco, ticking off the 1 A. M. signals.

P. S.—My antenna is wholly indoors, being about 120 feet of bare wire in the attic of the house.

* * *

"Clear and Loud"

From Lloyd R. Dickens, 222 Windsor Ave., Windsor, Ont.

POSSIBLY some other readers of RADIO WORLD may be interested in the performance of WD-11 tubes, so I will describe results obtained here.

Some months ago I constructed a regenerative circuit, using hook-up shown and installed it in my home in Stratford, Ont., 150

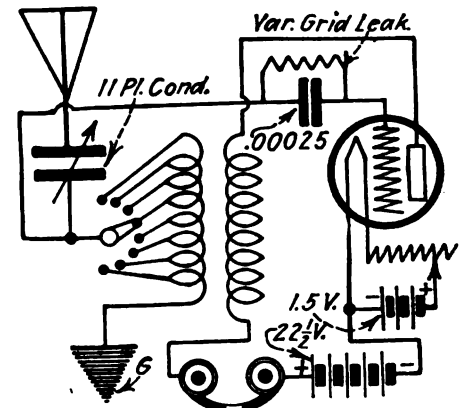


Diagram of circuit with which L. R. Dickens had accomplished marvellous results. It is a single circuit receiver using the rotor for a tickler.

miles northeast of here. I use WD-11 tube and my aerial consists of 100 feet of wire strung in the attic. Some of the stations heard from follow: WWJ, 150 miles; WCX, 150; WBV, 350; WGY, 350; WFAF, 400; WJZ, 375; WOC, 525; WKAG, 450; WDAF, 775; CKCB, 900; WDAO, 1,140; WPA, 1,175; KDZP, 2,100 miles.

These are not all by any means, but will give some idea of range covered and I think the last one, KDZP, Los Angeles, will open the eyes of some. This was logged on the night of Feb. 6, and again on Feb. 8. It came in quite clear and loud.

* * *

Glad to Hear from DX Fans

From M. F. Drudy, Jr., Woodhaven, N. Y.

MY experience with the short wave regenerative receiving sets and the honeycomb, or duo lateral coil receiving sets, prompts me to defend the latter, notwithstanding the criticism that the honeycomb is inefficient and unsatisfactory.

In one evening I have heard as many as seventeen different stations, distances ranging from a few miles to thirteen hundred and fifty miles; tuning out local stations and bringing in the most distant with perfect

(Continued on page 21)

DX Nite Owls

(Continued from page 20)

ease. Furthermore this is done with an outside aerial only fifty feet long, including the lead-in.

My location is 8825 Seventy-sixth street, Woodhaven, Long Island, N. Y., and would be glad to hear from any DXers.

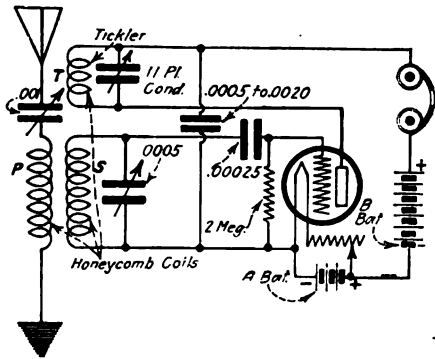
From January 8 to February 8 I have received the following stations: WAAM, KDKA, WGY, WEA, WHN, WOR, WJZ, WGAA, WDT, WDAP, WBAN, KYW, WIP, WWJ, WFI, WSB, Atlanta, Ga.; WRW, WBZ, WHAS, WBS, WDAF, Kansas City, Mo.; WLW, Cincinnati, O.; PWX, Havana, Cuba; WOC, Davenport, Iowa; WHAM, WGM, Atlanta, Ga.; WGI, WOO, KQV, WEW, St. Louis, Mo.; WAAB, New Orleans, La.; WGAM, Orangeburg, S. C.; WGR, WBAP, Fort Worth, Texas; WMAK, WMAQ, WHB, Kansas City, Mo.; WBT, Charlotte, N. C.; WMC, Memphis, Tenn.

With a loud speaker I was able to bring in such stations as Schenectady, Pittsburgh, Atlanta, Memphis, Springfield, Buffalo and Chicago. Sitting twenty-five feet from the set, we could all hear plainly and pleasantly.

And Without Amplification

From A. Riddell, Chicago

ENCLOSED find the hook-up of my honeycomb receiver which you may publish on the "DX Nite Owl" page. The stations I have heard from Jan. 1 to date are: KYW, WMAQ, WAAF, WDAP,



Hook-up used by A. Riddell for one WD-11 tube. The condenser across the secondary and tickler enables the set to oscillate easier over much lower wave lengths.

WBU, WHB, WPAD, WGAS, WGY, WWJ, WGM, WAAK, KDKA, WSB, WOC, WGAN, WHAS, WDA, WOAG, WCAF, WAAM, CFCF, WJZ, 9ZAF, WOR, WGAK, WWI, GFGA, WKY, WOE, WLW, WIAO, WHAL, KSD, WBAP, WCAE, WNAV, WDAF. All were heard on a WD-11 tube without amplification.

Records By Three Sets

From Floyd Meyers, Du Quoin, Ill.

ENCLOSED you will find record of the stations that I have received with my three sets:

Crystal Detector—WOC, WSB, WHB, WDAF, WGM, WWJ and KSD. Record with my 1-tube set (variable condenser and variable coupler) is nearly the same as that of my honeycomb coil 2-stage set.

The record of both combined is as follows: WOH, WLK, WSY, WOK, KHJ, KFI, DM4, KFAF, WDAL, WSW, WGM, WDAJ, KYW, WAAF, WMAQ, WEAC, WOZ, WOI, WIAS, WOC, WGAM, WJAM, WEAB, WHAE, WGF, WBL, WAAP, WEAH, WHAS, WIAR, WCAO, WAAC, WMAF, KOP, WWJ, WCX, WMAT, WLAG, WAAH, WOS, WOO, WMAJ, WEAK, WCK, WEW, WMAF, WOAL, WNAL, WOR, WMAK, WEA, WHAM, WBL, WGY, WLW, WJAX,

WKY, WLAL, WNAD, KDKA, WCAE, WQAA, WFAT, WQAO, WCM, WFAA, WBAP, WPA, WKAL, WOAI, WFAH, KDYL, WIAO, WPAH, WGR, KFDF, CFCN, CGCJ, CFCA, PWX, KLZ, WAAZ.

I also receive PWX, KHJ, and Canadian stations regularly and will be glad to furnish hook-ups for either of the three sets. My sets are all home-made. I constructed them all myself.

Listens Every Night

From Thos. A. Peacock, 645 Portage St., Westfield, N. Y.

HERE is a list of stations I hear from every night. I can hear them very plainly: WGY, WGR, WOR, CFCA, WHAS, WEAO, WEA, WDAP, WJAX, WWJ, WJZ, WPAB, WJZ, WLAB, WHB, WEAE, WBAP, WDAJ, 9XD, KDKA, WOC, LMC, and also have heard from Omaha, Neb.

On a Two-Stage Amplification

From Richard Loughran, Greensburg, Pa.

I HAVE received the following on a two-stage amplification and one detector:

WSB, WLC, KFV, WEAD, WLW, WNAP, KYW, WDAP, WMAQ, WWI, WNAC, WNAF, NBZ, WEA, WGV, WRW, WHAZ, WHAM, WDR, WCAE, KDKA, WJAS, WBAK, WIP, WFI, WQAA, WHAS, KSD, WHB, CFZC.

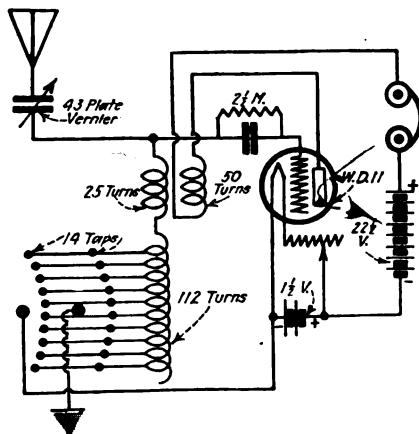
Every one of these I heard plainly and distinctly.

A Happy Family

From M. J. Wigman, 1450 Addison St., Chicago, Ill.

BEING one of the happy family of readers of your magazine I am sending you the hook-up of my outfit that has been a great comfort to our whole household. We have so far been able to hear on just the one tube the following broadcasting stations:

WDAP, KYW, WAAY, WBAA, WBAD, WBAP, WBAY, WBS, WBT, WBU, WBZ, WCAE, WCX, WDAE, WDAF, WDAJ, WDAY, WEAB, WEA, WFAA, WFAC, WGAY, WGM, WGY, WHAA, WHAS, WHB, WJAD, WJAF, WOC, WRR, WHB, WJZ, WWJ, CFCF, WBZ, KSD, WYJ, WPA, KDN, KHJ, KLZ, WOS, WPM, KDKA, WEAB, CHBC, KDYL.



Single circuit receiver used by Mr. Wigman. Note the novel method of getting feedback by the use of separate coils in connection with the tuner.

My place of residence, where my family and outfit are, is at Green Bay, Wis. My business being in Chicago I do not personally hear very much, but my wife and children have the pleasure every night.

My hook-up and record you may publish in one of your issues if you wish as there may be some brother or sister fans who may be interested.

(Continued on page 25)

The Power Amplifier for your Magnavox Radio

THE Magnavox, in reproducing with extreme sensitiveness every signal supplied to it from the receiver, must necessarily reproduce any extraneous sounds which may originate in the receiver or power amplifier itself.

Therefore, to obtain all the wonderful results of your Magnavox Reproducer, use it with the Magnavox Power Amplifier.



R-2 Magnavox Radio with 18-inch horn



THIS instrument is intended for those who wish the utmost in amplifying power: for large audiences, dance halls, etc., but requires only .6 of an ampere for the field.

R-3 Magnavox Radio with 14-inch horn

SAME in principle and construction throughout as Type R-2. Is ideal for use in homes, offices, amateur stations, etc.

Requires one ampere field current from your filament battery.



Magnavox Power Amplifier—Model C

CAN be used with any "B" Battery voltage which the power tube may require for best amplification.

2-Stage and 3-Stage

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Advertising Rates: Display, \$5.00 per inch, \$150.00 per page.

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word.

Telephone Bryant 4796

New Radio Firms

(The new firms and corporations mentioned in these columns can be reached directly or by communicating with the attorneys, whose addresses are given when ever possible.)

Moss Radio Sales Co., 1 Beacon St., Boston, Mass.; Henry C. Lynch.

Instrument Co., manufacture electrical and radio instruments, \$50,000; William E. Orth, D. L. Diehl, John F. Whittaker, Harrisburg. (Corporation Service Co.)

Iowa Radio & Electric Co., Ollie, Ia.; V. Gilbert Fye, successor to F. M. Andrews.

Central Illinois Supply Co., 119 N. Main St., Abingdon, Ill.; Fred B. Ferris and Guy E. Bonney.

Baldwin Radio Sales Corporation, 1800 Montrose Ave., Chicago; Henry T. Roberts and others incorporators.

Schott Radio & Electric Co., Emington, Ill.; F. H. and Wm. P. Schott.

W. T. Rock, 2115 N. Main St., Bridgeport, Conn.

Liddell Electric Co., 89 S. Main St., Waterbury, Conn.

Sunflower Radio Co., Room 333, Sunflower Bldg., First and Main sts., Wichita, Kan.

Alexander Radio Electric Co., 1515 Olive St., St. Louis, Mo.; J. G. Alexander and others.

International Electric Co., electrical supplies, \$500,000, Wilmington, Del. (Corporation Trust Co. of America.)

Firth Radio Corp., New York City, \$5,000; M. Bernheimer, S. McGovern. (Attorney, E. Bernstein, St. George, Staten Island.)

Hoosic Engineering Co., Hoosic Falls, N. Y., make electric specialties, \$20,000; F. S. and S. P. White. (Attorney, E. Tiffany, Hoosic Falls.)

Owing to confusion caused by a similarity of names between the Radio Corporation of America and the Radiola Wireless Corporation, of New York City, the latter has decided to adopt the name of The Aerovox Wireless Corporation, based on its trademark.

Radio Stocks

(Quotations as of February 28, 1923, furnished by Frank T. Stanton & Company, 35 Broad Street, New York City, Specialists in Wireless Securities.)

Stock	Bid	Asked
American Marconi Stamped.....	5c	15c
American Marconi Stamped.....	\$5	\$7
American Tel. & Tel.....	123	123 3/4
Canacian Marconi.....	2 1/2	3 1/4
De Forest Radio.....	7	10
Dubelier Condenser.....	4 1/2	5
English Marconi com.....	11	15
English Marconi pfd.....	11	15
Federal Tel. Calif.....	5	6
General Electric.....	185	186
Hennessey Radio Corp. Pub.....	9	11
Manhattan Elec. Supply.....	55	56
Mackay Company com.....	115	116
Marconi Int. Marine.....	8	10
Radio Corporation com.....	3 3/4	3 1/2
Radio Corporation pfd.....	3	3 1/4
Spanish Marconi.....	1	3
Western Union.....	116 1/2	117
Westinghouse E. & M.....	64	65

Coming Events

PERMANENT RADIO FAIR FOR BUYERS,
Hotel Imperial, New York City. Open from
September, 1922, to May, 1923.

**SOUTHWESTERN DIVISION, NATIONAL
ELECTRIC LIGHT ASSOCIATION,** Oklahoma
City, Okla., March 14 to 16; S. J. Ballinger, secretary,
San Antonio Public Service Co., San Antonio,
Tex.

ILLINOIS STATE ELECTRIC ASSOCIATION,
Chicago, March 16 and 17; R. V. Prather, secretary,
Mine Workers' Building, Springfield,
Ohio.

Prevents Phone Tips Falling Out

THE difficulty of preventing phone tips from falling out of binding posts and the poor contacts that often occur have been eliminated by Union radio phone tip jacks, made by the Union Radio Corporation, Newark, N. J. Union radio jacks are especially convenient in CW circuits, WD-11 connections, coil mountings, experimental circuits, or, in fact, any part of a set where quick changes are needed. In addition to accommodating any telephone cord tips manufactured they also can be used with several sizes of bare wire. To mount Union radio tips on any panel a hole is drilled, using a 7/64 drill, then the bushing inserted and the lock nut which holds the combination tension spring and soldering lug in place is screwed on.

New High Power Wireless Station for Canada

IT is reported that the Marconi Company has matured plans for the erection of a powerful wireless station at Vancouver, British Columbia, which will cost \$2,000,000. This station, it is said, will be one of the giant stations of the world, exceeding in power any other Marconi station at present in existence, and which will in effect make western Canada an important factor in world wireless communication, linking it up on one side with Australia and the Orient and on the other with Europe.

Relaying and Broadcasting on Different Wave Lengths

REPORTS coming from Cleveland that radio concerts from KDKA, the East Pittsburgh, Pa., broadcasting station of the Westinghouse Electric & Manufacturing Company were being received with greater volume than the broadcasting of local concerts occasioned little surprise to members of the radio engineering department of the Westinghouse company who had been experimenting with short wave broadcasting and relaying of KDKA's concerts.

It had been confidently expected that radio enthusiasts in Cleveland would be surprised to hear KDKA coming in with great volume as experiments in the relaying of short wave signals had been going on for some months under the direction of the radio engineers.

Many fans of Cleveland are still puzzled at the good volume of KDKA's signals because their city seems to be a perfect dead spot and has been so recognized by radio men for years. It has been said that getting into Cleveland via the ether is a task that radio experts have been working on for some years but with little success.

This characteristic of Cleveland is one of the reasons that Frank Conrad, assistant chief engineer of the Westinghouse company and a radio inventor who is recognized all over the country, chose to relay his short wave signals from KDPM, broadcasting station of the Westinghouse company located in Cleveland. His experiments were carried out through the assistance of L. W. Chubb, manager, and other members of the radio

engineering department and the results attained through this method of broadcasting have been so good that a new era in radio entertainment may result.

Short wave relaying is the newest method of radio broadcasting. To those who are unfamiliar with the terms it means in short broadcasting on 100 meters or lower wave lengths by a powerful station. These short wave signals are then picked up by a short wave receiver and in turn relayed through a broadcasting station tuned to 360 meters. The person operating a 360-meter receiver, of course, hears the 360-meter signals and will not hear the 100-meter waves as most of the receivers in common use will not work such short wave signals.

Relaying these short wave signals as the Westinghouse company does through its Cleveland station is interesting to the radio amateur, particularly as the 100-wave meter signals are sent out simultaneously with the 360-meter concerts, neither interfering with the other. It requires special apparatus.

For instance, at East Pittsburgh for this short wave broadcasting there has been installed two transmitters controlled from the same microphone, one transmitter operating on 360 meters, the other on 100 meters. There are also two antennae, KDKA's long antenna which is 105 feet high and 200 feet long used for sending on 360 meters and the short wave antenna which is 35 feet high and 40 feet long, used, of course, for sending the 100-meter signals. A significant feature of this extremely short wave broad-

casting is that very short antennae are used both for sending and receiving.

In Cleveland the 100-meter waves are received on an eight-foot square loop for the reason that a short antenna is needed and that seems the best way out of the problem. The antenna is located inside the building and is connected to a single circuit tuner, detector and two stages of amplification. The output of this receiver is put into a 250-watt transmitting set, containing one oscillator and one modulating tube. The sending antenna at Cleveland is a duplicate of the one at East Pittsburgh used for sending on 360 meters, being 105 feet high and 200 feet long.

There are, naturally, difficulties encountered in relaying these short wave signals. For instance, the small size inductances and capacities are difficult to construct. A slight change, like the swinging of an antenna will change the wave length and throw the receiver out of tune. One of the reasons for using the loop as a receiving antenna is to guard against such mishap. Also a separate building on the roof of the Cleveland foundry of the Westinghouse company, located on the lake end of West 58th Street, had to be erected as the rattle of the foundry set up interference with reception.

On the other hand the efficiency at 100 meters is much better on account of the lower electric losses, which condition permits more radiation from a given antenna from the same amount of power input than is possible when sending at 360 meters.

PROTECTION

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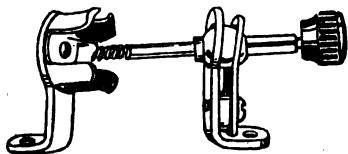
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- .006 Fixed Condensers..... .35
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- D. L. 75 Honeycomb Coil..... 1.45
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- High Grade Bakelite Rheostat..... .50
- W.D. 11 Tube Socket..... .35
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- Hard Rubber Panel, 7x10..... 1.00

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Broadcasting Bill's Radiolays

By WILLIAM E. DOUGLASS

I N last month of many birthdays when
we heard so much on "Truth" just be-
cause one bright young feller pulled a good
one in his youth, I have often stopped to
wonder, after all, if it was true that the
world is gettin' better ev'ryday. I wish I
knew. Just the other night by radio some
wise gazaboo's son handed out a lengthy
lecture on the life of Washington. Yes, we
told how George chopped cherry trees an'
wouldn't tell a lie—said the Father of our
Country couldn't do it if he'd try. But I
reckon Father Georgie never fooled with
Radio, or stayed up all night to "listen in"
or else I guess he'd know how hard it is to
tell the truth 'bout stations you can get,
when you've gone bugs on Radio an' got a
wireless set. An' of course he never had
to try new hook-ups every night that are
printed in the papers. There ain't half of
'em that's right. Gosh I reckon Ananias with
his whiskers to his knees would be tickled
half to death if he could work with some
of these. He could tell the world about 'em,
how with just a single tube he could "pick
up" far off Russia—if you b'lieve him yer a
boob. Down in our town there's a feller
with a hook-up that's a peach, when you
hear him talk about it, it's an outfit with a
reach. So I've often stopped to listen on
this "wonder set" of his, hopin' he'd make
good his story if his set is such a whizz.
But of course when I drop in on him he's
got a tale of woe how his set wuz working
beautiful until an' hour ago, when this thing
er that had happened. I remark "That may-
be true." Then he springs a lot of alibis
until the air is blue. Now you take that
little set of mine with only the detector, it's
surprizin' how I get 'em, it's a regular col-
lector. With a pair of rubber earmuffs
fastened on my head real tight, I pick up
a hundred stations just as easy any night.
Distance don't make any difference I can get
'em without tryin'. "I can't hear yet!" wha'
ja say Min? No, of course not, I'm not
lyin'.

(Copyright, 1923, Westinghouse Electric &
Manufacturing Company.)

FREE CATALOGUE

Make D X Records With D X Supplies

This Catalogue should be called
"Recipes for Long Distance."
It was written to help ama-
teurs pull in the most distant
stations.

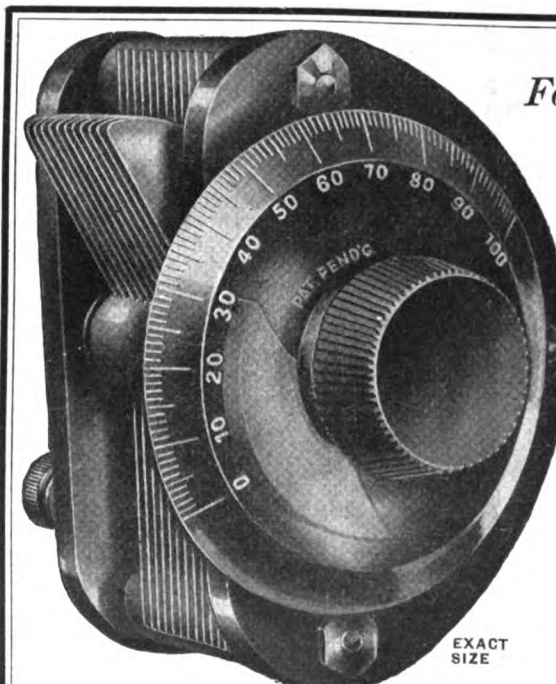
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Subscribe direct or through your
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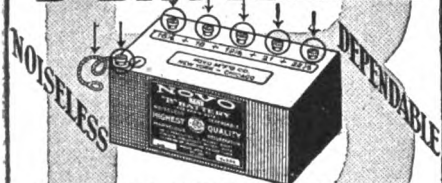
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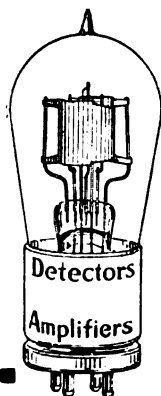
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Do Magnets Affect Tubes?

There has been considerable mention lately in radio literature regarding the effect which a strong, permanent magnet exerts upon the action of audions. Experiments conducted by John Stone Stone are recorded wherein the author describes a magnetic field created in and around the tube in such a manner that the vertical axis of the magnetic field is approximately parallel to that of the filament, grid and plate elements. When the proper location of the magnetic field was found an increase in tube efficiency resulted.

The presence of an electro-magnetic field is said to increase the flow of electrons from the filament through the grid, to the plate, and this increased flow means an intensification of the volume of amplification.

When used on a two- or three-element detector the accelerated electron flow due to the presence of the magnet is indicated as being the means of giving the detector tube additional amplifying qualities.

In whatever form the magnet is used, however, its position relative to the tube elements must be according to a definite space relationship between the filament and the poles of the magnetized cup, cylinder or other shaped mass of magnetically-charged iron.

It is well known that only certain kinds of iron will retain a magnetic charge. Certain grades lose their charge almost immediately after being charged, while other alloys requiring special heat treatment will retain their magnetism almost indefinitely. This is an interesting field for amateur and professional experimentation, and one which will probably result in hanging up some new distance records in the radio hall of fame.

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PATENTS

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RICHARD B. OWEN, Patent Lawyer
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DX Nite Owls

(Continued from page 21)

Two Interesting Logs

From Robert H. Anthony, Boston, Mass.

I **N**ASMUCH as you were kind enough to publish in a recent issue stations received with our No. 3500 Amrad radio-frequency outfit, I thought you might be interested in extracts from our log book, covering two recent evenings' reception. The logs are as follows:

- FEBRUARY 10TH AND 11TH**
(10:30 p. m. to 1 a. m.)
- PWX Havana, Cuba. Piano Solo.
 - KHJ Los Angeles, Cal. Woman Singing.
 - WBAP Fort Worth, Texas. Speaker.
 - KYW Chicago, Ill.
 - WOC Davenport, Ia. Mississippi Syncopation.
 - WHAD Milwaukee, Wis.
 - KJJ Sunnyvale, Cal. Radio Shop. Singing and Orchestra.
 - WFI Philadelphia, Pa.
 - WOO Philadelphia, Pa.
 - WDAP Chicago, Ill. Drake Hotel Orchestra.
 - KOE Spokane Chronicle, Washington. (Signed off 7:34, Pacific Coast Time.)
 - WOR Newark, N. J.
 - WNAT Philadelphia, Pa.
 - KUO San Francisco Examiner, California. Music.
 - WCAE Pittsburgh, Pa.
 - WDAF Kansas City Star, Missouri. Jazz Orchestra.

Total, 17,972 miles. Time, 2 hours 40 minutes.

FEBRUARY 15TH, 1923

Time P. M.	Call	Location—City	State	Country
8:10	WBZ	Springfield	Mass.	U. S.
8:10	CFCF	Toronto	Can.	Can.
8:10	WEAF	New York City	N. Y.	U. S.
8:17	CHVC	Montreal	Can.	Can.
8:25	KVKA	Pittsburgh	Pa.	U. S.
8:27	KNAC	Boston	Mass.	U. S.
8:29	WGY	Schenectady	N. Y.	U. S.
8:30	WOC	Davenport	Ia.	U. S.
8:31	WWJ	Detroit	Mich	U. S.
8:45	WFNA	Dallas	Tex.	U. S.
8:50	WSB	Atlanta	Ga.	U. S.
8:55	CJCE	Vancouver	B. C.	Can.
9:08	KYW	Chicago	Ill.	U. S.
9:10	WHAS	Louisville	Ky.	U. S.
9:17	CFCA	Toronto	Can.	Can.
9:25	WGI	Medford	Mass.	U. S.
9:40	WCAE	Pittsburgh	Pa.	U. S.
9:55	WJZ	Newark	N. J.	U. S.
10:00	PWX	Havana	Cuba	Cuba
10:11	WBAP	Fort Worth	Tex.	U. S.
10:20	WAAA	Parksburg	Pa.	U. S.
10:40	WGM	Atlanta	Ga.	U. S.
10:50	KLZ	Denver	Colo.	U. S.
10:55	WLW	Cincinnati	Ohio	U. S.

Total, 17,484 miles. Average, 5,828 miles per hour. Time, 2 hours 45 minutes.

* * *

Not Claiming Special Honor

From Theo. Newsom, Lawton, Oklahoma

I **A**M taking the liberty of writing you in regard to some DX records I believe to be good. However, I am not claiming special DX honors, and also am not sending a list of stations that I can't duplicate every day. Also I receive these stations on my magnanox, using a single circuit detector and two stage three to one transformers. Stations: KYW, WCX, WWJ, WDAP, WLAG, WOC, KHJ, WSB, WHB, and many other nearer stations. The above stations were loud enough to be heard all over a four-room house, using 90 volts B battery.

* * *

From Canada to Corona

From T. Eisenstein, Corona, N. Y.

I **A**M a constant reader of the RADIO WORLD and have read some of the DX records. I am somewhat of a "DX Nite Owl." I have a senior set, using a WD 11 tube and have heard the following stations:

Local—WEAF, WJZ, WBAY, WRW, WAAM, WOR, WHN, WBS. DX Stations—KSD, KYW, KDKA, WBZ, WDAP, WFI, WEAN, WGI, WGY, WHAZ, WOO, WSB, WWJ, WLW, WMAC, WNAC, WMAQ, WOC, WIP, WMC, WHAS, and one station in Canada CFCF.

Has Caught 80 Stations

From Donald Crowl, Wenatchee, Wash.

I **A**M sending my receiving record of the past three months.

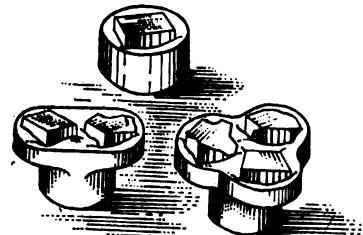
WLAG, Minneapolis; WMAT, Duluth; WGF, Des Moines; WHB, WDAF, Kansas City; WBAP, Fort Worth; WFAA, Dallas; WOC, Davenport; WPAH, Waupaca, Wis.; KSD, St. Louis; WDAP, KYW, Chicago; WCX, WWJ, Detroit; WLW, Cincinnati; WCAE, KDKA, Pittsburgh; WDAJ, College Park, Ga.; WSB, Atlanta; WGY, Schenectady; WHAZ, Troy—distance, 2,300 miles; WIP, Philadelphia—distance, 2,300 miles.



Patent Pending **THE JIFFY CLIP!**
On in a jiffy, it does away with soldering. Saves time, temper and money. 10c, stamps accepted, from **HERBERT M. HILL, Dept. D, Leonia, N. J.**

RADIO TUBES REPAIRED

"Guaranteed Equal to New"
FOUR DAY SERVICE
6 V. Detectors, \$2.50; Amplifiers, \$2.75;
5 Watt Power Tubes, \$4.00
Refilled Tubes Always in Stock
Our repaired tubes speak for themselves.
Radio Tube Laboratories, Inc.
776 Broad Street Newark, N. J., U. S. A.



FOOTE'S HAND-MADE TRIPLE-TEST CRYSTAL

"Puts its Best Foot Foremost"
Its supersensitive side is up and has loudly received broadcasting. Guaranteed QSA (your signals are strong). Look for the "T" on the back.

Distributors and Travellers
Wanted. Liberal Commissions. Large sales. Quality Production. Wire Territory desired.
FOOTE MINERAL CO., Inc.
Manufacturers and Wholesalers
107 N. 19th St. Philadelphia, Pa.
Established 1876

Yours Sincerely **Greenwich Radio Co.**

185 GREENWICH STREET

NEW YORK, N. Y.

TUBES

Western Electric V. T. 1.....\$7.00 Western Electric V. T. 2.....\$8.00

Crown Transformer for 1 1/2 Volt Tube\$3.25 Crown Triple Coil Mountings\$3.25

Pathe Moulded Variometers and Variocouplers.....\$2.95

PHONES

Berwick 2200 Ohms.....\$3.45

Pathe Loud Speaker....\$17.50 Bristol Loud Speaker ..\$18.00

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FOR IMMEDIATE DELIVERY

Every item listed in this advt. is guaranteed by us to be new and in original cases. Our guarantee of satisfaction or money refunded still prevails.

BARGAINS EVERY DAY



SUNBEAM

Dictograph Loud Speakers.....	\$15.00	Armo Transformers.....	\$4.25
Dictograph Phones.....	5.00	Columbia Moulded Variometers.....	3.85
Federal Phones.....	4.85	Ever Ready Batteries, 22 1/2 V., large.....	2.00
Brandes Phones.....	5.90	Ever Ready Batteries, 45 V.....	3.75
Radio Corporation Transformers U. V. 712.....	5.80	Mignon Variable Vernier Condensers .0005.....	\$5.40
Radio Corporation Transformers U. V. 1714.....	5.45	.0008.....	5.80
Federal Potentiometers.....	1.25	.001.....	6.75
Klossner Vernier Rheostats.....	.70	Daytan Moulded Variometers, bank wound, 1250 meters.....	7.50
Fitzgerald Rheostats with dial.....	.76	Daytan Moulded Variocouplers, bank wound.....	8.00
Curtler Hammer Vernier Rheostats.....	1.28	United States Tool Co. Vernier Condenser, 43 plates.....	6.00
Curtler Hammer Plain Rheostats.....	.85	Freshman Variable Grid Leak and Condenser.....	.60
Radio Stores Variable Condensers, Bakelite Shaft, Bakelite Ends with knob and dial.....	4.10	Triple Bank Wound Coil for N. A. A. 150 to 3000 meters.....	
43 Plate.....	3.75	Silk Wire on Bakelite Tube \$2.75	
23 Plate.....	.65	Hook-up using this coil, which has brought in Havana, furnished upon request.	
Na-aid DW-11 Socket.....	9.50		
Baldwin Phones, Type "Q".....	5.50		
Master Baldwin Loud Speaker Phone.....			

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SUNBEAM ELECTRIC CO.

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Farm Lighting Plants at Bargain Prices.



LETTERS TO THE EDITOR

A Farad Symposium

EDITOR, RADIO WORLD: I note with interest the article on page 2 of RADIO WORLD, January 20 issue.

It looks to me as though Mr. Godfrey does not know the physical dimensions of a condenser which would have a capacity of .001 farads. The largest size condenser—that is, variable condenser—with which I have worked in radio work had a capacity of about .01 mfd., and it had quite a few more plates than the ordinary air condensers seen in the radio supply stores. Besides it had mica between the plates, which, of course, increased the capacity, due to the fact that the dielectric constant of mica is from 4 to 8.

Now Mr. Godfrey or any one else never saw a variable air condenser with a capacity of .001 farads, or any capacity anywhere near that much. I doubt if he has seen one with a capacity over .005, which is much larger than is used in any ordinary receiving set.

The term .001 mfd. is correct. It is written decimally .00000001 farad. Mr. Godfrey states that if the value .00025 mfd is correct then the capacity of that condenser is only 250 millionths of a millionth of a farad, which seems rather smallish to him. It is small, but, nevertheless, it is correct. This value written decimally is .00000000250 farad, or 250 micro-farad, which is a term being used more and more by radio engineers, as this is about the most convenient unit to use in radio work when dealing with receiving apparatus. Then an ordinary .001 mfd. condenser would have a capacity of 1,000 micro-farad. One micro-farad would be written decimally .00000000001 farad, which would be one millionth of a millionth of a farad.

I am sending this in with the hope it will make this matter clear to Mr. Godfrey and your other readers, as any one reading Mr. Godfrey's article who did not really know which was correct would be confused and perhaps misguided.

Very truly yours,

G. G. ADAMS.

Belmar, N. J., Feb. 23, 1923.

Home-Made Set Works Well

EDITOR, RADIO WORLD: In a recent issue of RADIO WORLD you published a letter from Burdette Bowman in regard to results secured by him with a receiving set consisting of two home-made honeycomb coils, a variometer, 23-plate variable condenser, rheostat, one WD-11 tube, one phone condenser and a grid leak. Being his roommate I made a set like it, and on the night of February 19, between 8 and 11:55 o'clock, I caught the Kansas City Star; Atlanta, Ga.; Minneapolis, Minn.; WBAP, WGY, WMAQ, WOF; the Missouri State Prison; the Manitoba Free Press, Manitoba, Canada; WLW, WSY and WJZ. The set is perfectly satisfactory. Instead of an aerial I used a Ducon light socket plug. The honeycomb coils were 25 and 50 turns. I also used 22½-volt "B" battery and one dry cell.

Yours truly,

J. A. O'NEAL.

Marion, Ind., Feb. 23, 1923.

The A. R. R. L. in Albion, Mich.

1212 Highland Avenue,

Albion, Mich., February 16, 1923.

Editor, Radio World:

Replying to your request in your February 17th issue, tabulate the Albion Radio Club (ARRL). Ed. Williamson, president; John Bryden, vice-president; N. F. Lovah, treasurer. It is an amateur organization.

Yours truly,

FLOYD B. QUIGG,

Secretary A. R. C.

Original Nathaniel Baldwin

Headsets

Type C Complete Special Price \$11.75

FREE

with each pair of phones — a \$5.00 Shelton Loud Speaker.

Phones can be used as head set or on speaker. Both for less than the regular price of the Baldwin's.

Cash with order or C. O. D.

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Mentclair, N. J.



THE ACOUSTICAL AMPLIFIER. BEL-CANTO TRADE-MARK

10 Reasons Why Loud Speaker



Beautiful in Design. Pure in Tonal Qualities. No Auxiliary Batteries. Absolutely No Distortion. Disperses Sound in All Directions. Gets Away from the Grotesque Horn. Guaranteed for 12 Months Against Mechanical Imperfection. Developed by an Acoustic Engineer of Recognized Ability. Endorsed by Ignace Paderewski. Listed at \$36, F. O. B., New York

Is adjusted for regenerative two stages of amplification, also five tube radio and audio frequency.

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Jolley LOUD SPEAKER

LOUD SPEAKER

Scientifically Perfect. Artistically Beautiful. The JOLLEY Loud Speaker Eliminates Howling and Extra Batteries, Power Amplifiers and Adjusting. Just connect receiver and

Enjoy Perfect Radio Entertainment

Written Guarantee of Satisfaction or Money Back.

Type D. H.

No. 1020, \$35

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New York

Excellent 43 Plate Condenser .001..... \$1.30
Excellent .0005 Variable Condenser..... 1.10
Variometers, Baldwin Style, Wood..... 1.50
King Amplifier Loud Talker..... 4.50
Four-Can-Listen Multiphones..... 2.90

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New York City

White's "Varioment" Cement

Make your own cells. Construct variometers, varioscopes, etc. No distributed capacity. Holds windings securely and permanently.

Send 25c. for sample bottle

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The Na-ald Small-space Socket is moulded from genuine Condensite. Requires but small space for mounting. Special slot reinforcement; virtually unbreakable. No excess metal to interfere with efficiency. Phosphor bronze contacts. Cannot be affected by heat. Exceptional value.

Equal in quality to any socket using bottom contact.

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35c each
3 for \$1.00

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By P. E. EDELMAN

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Uniform Size—24 in. x 38 in.—Price 35c. Each.

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In this chart all parts of a typical double ignition system using battery and magneto current are shown, and suggestions are given for readily finding ignition troubles and eliminating them when found. Includes latest Delco, Connecticut and other systems. (24 x 38.) Price, 35 cents

Lubrication of the Motor Car Chassis.

This chart presents the plan view of a typical six-cylinder chassis of standard design and outlines all important bearing points requiring lubrication, and is a valuable guide to the correct lubrication of any modern car. A practical chart for all interested in motor car maintenance. (24 x 38.) Price, 35 cents

While each of the above three charts is complete, the set covers all maintenance instructions for the entire automobile.

Location of Starting and Lighting System Faults.

The most complete chart yet devised, showing all parts of the modern automobile starting, lighting and ignition systems, giving instructions for systematic location of all faults in wiring, lamps, motor or generator, switches and all other units. Invaluable to motorists, chauffeurs and repairmen. Size 24 x 38 inches. Price, 35 cents

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An enlarged and revised chart showing clear sectional views depicting all portions of the Ford power plant and auxiliary groups. It outlines clearly all parts of the engine, fuel supply systems, ignition group and cooling system, that are apt to give trouble, detailing all derangements that are liable to make an engine lose power, start hard, or work irregularly. This chart simplifies location of all engine faults, and includes instructions for locating Ford electric starter troubles. Size 24 x 38 inches. Price, 35 cents

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The Six Charts Sent for \$2.00

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FREE A HYDROMETER (Battery Tester) with each purchase of \$1.00 or over **FREE**

HAVE YOU ENTERED OUR ADVERTISING PRIZE CONTEST?

FIRST PRIZE—

\$250.00 Radio Set Free—Six Tube Radio-Audio Frequency Set

SECOND PRIZE—

\$150.00 Radio Set Free—Four Tube Set, Detector and 3 stages Amplification

THIRD PRIZE—

\$100.00 Radio Set Free—Three Tube Set, Detector and 2 stages Amplification

To advertise our business we will give the above prizes to the three persons sending us a list of five or more names of Radio fans and who compose the best slogan or phrase of words we can use for our advertising matter. We are interested in sending our catalogue and price lists to Radio fans.

If you are interested in Radio and in its future possibilities don't overlook this opportunity to get acquainted with us, secure low prices on your purchases and an opportunity to win one of the above prizes free of charge.

In the event of two or more persons submitting the slogan judged the best, second best, or third best, each will receive the full amount of the prize tied for. All entries must be received by us not later than *March 31, 1923*.

Our Peanut Tube Does the Work of WD-11

For Detector and Amplifying uses. Can be used on 1½ volt dry cells or regular 6 volt A Batteries. Fits standard V.T. socket. Uses about 1/10 ampere, on two 1½ volt dry batteries. Price of tube, \$2.50, includes adapter.

1½ VOLT TUBE (not WD-11, but for same use). For detector and amplifying uses. Used on 2 Dry Cell batteries (1½ volt)..... \$5.00

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Biggest Radio Bargain Ever Offered—Order Promptly

200 RADIOLEAN CRYSTAL SETS, \$12.50 Value..... \$6.50 each

Includes Receiving Set and All Antenna Equipment

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U. S. Navy (Pilotron) used as a detector, amplifier and transmitting tube, all in one, type V. T. 14..... List \$3.00, now \$4.00
 U. V. 200 Detector..... 4.25
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 U. V. 201A Amplifier..... 8.50
 WD-11 1½ Volt..... 6.50
 Cunningham Detector..... 4.25
 Cunningham Amplifier..... 5.25
 Myers Audion High-Mu..... 4.50

Vacuum Tubes Repaired. Broken and burned out tubes repaired. Mail them parcel post insured. Price, \$2.79 each, cash with your order. Tubes returned by Parcel Post, prepaid. We guarantee them to burn equal to new tubes.

BUSS BAR WIRE—6 two-foot lengths..... \$0.25

DX TRANSFORMERS, \$9.00 Value, Special..... 6.50

HEADSETS

200 Ohm, equals best \$3.00 phones on market, now..... \$4.50
 Brandes—2000 Ohm..... 5.50

VERNIER CONDENSERS

11 Plate..... List \$4.00, now \$3.00
 23 Plate..... " 5.00, " 4.00
 43 Plate..... " 6.50, " 5.00
 Freshman Grid Leak and Condenser for Flewelling Circuit..... " 1.00, " .75

TRANSFORMERS

Thordasen..... List \$4.50, now \$3.00
 Atwater Kent..... " 5.00, " 3.75
 Acme..... " 5.00, " 3.75
 WD-11..... " 5.00, " 3.75

Dictograph..... \$5.00
 Federal..... 5.30

HOW TO ORDER

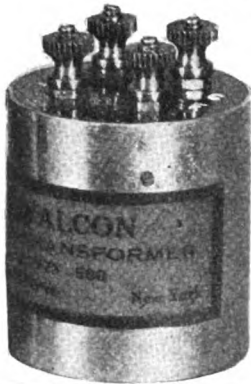
All goods forwarded by Parcel Post. Send Money Order with order, and include the following rates with same for postage:

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 Mail Order Dept., 509 FIFTH AVENUE NEW YORK



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Radio Frequency Transformers

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WALCON Transformers are tested and guaranteed. Particularly adapted for use with W.D.-11 tubes.

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Price, \$4.00. We pay postage.

Dealers and jobbers: Write for our attractive sales proposition, backed by national advertising.

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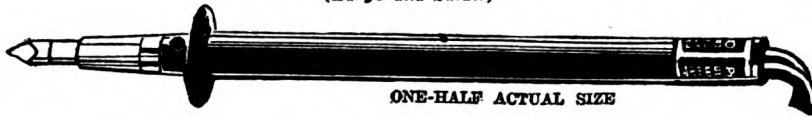
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Both the manufacturers' and amateurs' problem on all fine work is readily solved by the instrument constructed for this particular purpose.

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Platinum Heating Unit—Interchangeable Tips—Universal Current
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ONE-HALF ACTUAL SIZE

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TYPE HR REGENERATIVE RECEIVER \$25.00
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Baldwin "C" Headsets.....	\$12.00	Federal Closed Circuit Jacks.....	\$.45
Baldwin "C" Units.....	5.50	Frost Plugs for Tips.....	.65
Frost 2000 ohm Headsets.....	5.00	Eveready "B" Batteries.....	1.75
Frost 3000 ohm Headsets.....	6.00	Red Seal Dry Cells for WD-11.....	.40
Murdock 2000 ohm Headsets.....	5.00	Red Seal Sparkers for WD-11.....	1.00
Murdock 3000 ohm Headsets.....	5.50	Acme Amp. Transformers.....	4.50
Double Headbands.....	.75	R. Corp. Amp. Transformers.....	7.00
Single Headbands.....	.50	R. Corp. Radio Transformers.....	6.50
Double Phone Cords.....	.35	Thordarson Amp. Transformers.....	4.50
G. A. Phone Condensers (.001).....	.20	Bradleystats.....	1.85
G. A. Grid Condensers (.0005).....	.20	Paragon Rheostat.....	1.50
Moulded Condensers (.001).....	.50	R. Corp. Rheostat.....	3.00
Fesco 3 Plate Var. Cond.....	1.50	R. Corp. Potentiometers.....	2.00
Fesco 11 Plate Var. Cond.....	2.25	Whitall Variocouplers.....	2.75
Naald 3-in. Dials, Condensite.....	.35	Paragon Galena Detectors.....	1.00
Whitall 3 1/4-in. Dials.....	.50	Reinhardt's Wound Coils.....	1.75
Whitall Condensite Sockets.....	.50	Switch Points, per doz.....	.10
Naald WD-11 Sockets.....	.75	Switch Stops, per pair.....	.09
Whitall Moulded Rotors.....	.50	Tested Galena.....	.25
Federal Z Circuit Jacks.....	.00	Woodsmetal.....	.10
Federal Open Circuit Jacks.....	.50	Copper Lugs, per doz.....	.10

WD-11 TUBES, \$6.50

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SPRINGFIELD, MASS.

FILL OUT AND MAIL NOW
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Please send me RADIO WORLD for.....months, for which please find enclosed \$

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Single Copy	\$.15
Three Months	1.50
Six Months	3.00
One Year (52 Issues).....	6.00
Add \$1.00 a Year for Foreign Postage, 50c for Canadian Postage.	

Milwaukee Amateurs' Radio Club

THE design and construction of station 9AAP, Milwaukee's only station to have its signals span the Atlantic, was the subject of a paper presented at the Milwaukee Amateurs' Radio Club's first meeting in February by Marian Szukalski, Jr. E. G. Nickel and E. A. Cary, both of 9ATO and members of the club's publications committee, have given digests of current radio literature in their reports. The topic of one of the most interesting of these was station 6KA, its design and records.

District Superintendent C. N. Crapo announced in his monthly report that Milwaukee County, the smallest of the districts, with 415 messages handled, ranked second in the race among A. R. R. L. traffic districts of the state. A silver cup, known as the Wisconsin Cup, has been offered by B. A. Ott, assistant division manager in charge of the state, to the stations which monthly handle the greatest amount of traffic. Members of the Milwaukee Club are now out for this honor. City Manager I. H. Strassman, 9AHO, announced the presence of several unlicensed stations in the air and that he and his staff were taking steps to clear up the situation.

Incorporation of the Club under the laws of Wisconsin has been assigned to Attorney L. J. Topolinski, the society's general counsel. Business Manager L. S. Baird has opened negotiations with the South Side Radio Club and the West Allis Radio Club with the idea of bringing about consolidation with the Milwaukee club at the time of incorporation and forming one large county association.

Solid Wire Favored Over Litzendraht

LITZENDRAHT WIRE, which is a special cable consisting of a number of strands of fine insulated wire, has long held the reputation of giving lower losses with radio-frequency currents than any other type of wire. In most cases coils of high-grade Litzendraht may show a 5 to 50 per cent. decrease in resistance compared to solid wire, if all the strands are perfect. On test, according to the New York Globe, it has been found that a coil employing Litzendraht may act perfectly for six months or a year and then develop troubles which indicate a broken strand. This often occurs no matter how carefully the coils are manufactured, mounted and tested, although it does not make the set inoperative, and would pass unnoticed by many users.

Even with this drawback Litzendraht is the superior of the two. Actual tests have shown apparently no difference so far as sharpness of tuning is concerned or for its qualities in an oscillating circuit. But the desire to safeguard users from the freakish effects of broken strands is enough to throw the balance in favor of the solid wire.

Information for Sea-Going Radio Operators

READERS of RADIO WORLD who are desirous of securing information as to the proper procedure to follow in applying for positions as radio operators on American merchant vessels are invited to address Mr. Claude Cathcart Levin, associate editor, The American Officer, 37 Maiden Lane, New York City. Mr. Levin has very kindly offered to answer questions along these lines from RADIO WORLD readers who will enclose a self-addressed and stamped envelope. Mr. Levin served during the war as a commissioned officer in the Navy and holds both radio operator's and marine engineer's licenses. He is qualified to answer questions regarding the service.

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for repairs. All makes. Satisfaction guaranteed. Reasonable charges.
Box, 101 West 42nd St., New York City

CABINETS
Hinged Top, Beautifully Rubbed Mahogany Finish.
7x18\$3.25 7x21\$3.50
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Ask your dealer for the E.O. Type.
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"The Little Wonder"
FOR BOYS AND GIRLS
CRYSTAL SETS
Unassembled-Net **\$3.50**
Catches distinctly everything broadcasted within 30 miles. We also manufacture the "Little Wonder" assembled set at \$5.00.
GUARANTEED TESTED CRYSTALS
Galena 15c Radiosite 20c
Write for Free Catalog
It lists all our radio parts and supplies.
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CUT RATE RADIO
Every article sold on a written Money Back Guarantee
A Few of Many Specials
Hydrometer, accurate32c
7x18 Cabinet, Mahogany, hinged top\$2.69
7x18 Panel, high finish\$1.79
Rheostat with Dial, 6 ohms.....59c
Rheostat, tapered knob.....44c
3 Plate Vernier Condenser.....79c
11 Plate Variable Condenser.....89c
23 Plate Variable Condenser\$1.09
Variable Grid Leaks, 1/2 to 3 1/2 .43c
Shielded A-A Transformer, 10-1 or 3-1 ratio\$3.69
Marle Transformer\$2.89
22 1/2 Volt Variable Battery.....79c
Write for Catalog.
Enclose Money Order for at least 25% when ordering. Balance C. O. D.
THE RADIO SHACK
338 W. 42nd St. New York

Farmers Benefit Greatly by Radio Service

ACCORDING to a survey recently conducted by the United States Department of Agriculture radio market news is proving of national practical use. Nearly 50 per cent. of the hundreds of returns to an inquiry sent out by radio were from farmers who had radio-receiving equipment. The remainder were from grain dealers, mills, elevators, banks, telephone companies, co-operative organizations, farm bureaus, and other agencies which disseminate the reports among large groups of farmers.

Greatest interest was shown in the grain market reports, which inform farmers of wheat, corn and oats prices at the leading grain markets. Next in importance came the live-stock reports of prices and movements at the principal live-stock markets of the country. The weather reports came next, followed by reports on poultry products, fruits and vegetables, dairy products, hay, cotton, and other farm crops.

Radio has developed more rapidly in the Middle West in the corn, wheat and live-stock growing regions than in other farm sections of the country, the survey shows. Missouri, Illinois and Iowa lead in number of responses to the survey. Many farmers in this territory own radio equipment and praise the practical value of the service. In other sections farmers congregate at central points to get the reports, but an increasing disposition toward installation of sets for private use is indicated.

This was the first survey made by the department to determine how widely its radio market reports are being received and used by farmers, and afforded much valuable information for developing the service to the maximum of efficiency. It had been known in a general way that the service has been of value to producers and other agricultural interests in the marketing of crops and to consumers through the regulating of market supplies, but definite data were not available until developed by this survey.

The department practically covers the country with its radio market news, and farmers everywhere are using the service to aid them in conducting the business end of their industry. In the replies received, numerous farmers gave instances of specific savings resulting from use of the information, one farmer declaring radio as a "direct gift from God." Numerous general stores and banks in small towns say that establishment of their places of business as a central point for receiving the reports has resulted in tremendously increased business in many directions.

Prospects Good for New Radio Stations

THERE are good prospects this year of a number of good stations being erected in parts of the country not now supplied with satisfactory broadcasting service. Outside of the more populated centers there are few really powerful stations, although there are many small ones with from twenty to forty watts of power in the antenna. These are obviously insufficient to supply service even to receivers close by, except to really good sets, which in any event can pick up the more distant stations. It will be a great day for radio, says the *New York Globe*, when every tube set in the country at least will be in range of a first-class broadcasting station, and, in addition, can pick up at will the next best station.

Vaudeville Stars on Radio

BLOSSOM SEELEY and her company and George Rockwell and Al Fox, while playing the Davis Theatre in Pittsburgh recently, broadcast parts of their acts from station KDKA, Pittsburgh Post.

NATIONAL RADIO SERVICE CO.

140 W. 32nd St. New York, N. Y.

- Fischer Variocoupler (Small).....\$2.15
- Fischer Variocoupler (Large)..... 2.75
- Fischer Variometer (Small)..... 2.15
- Fischer Variometer (Large)..... 2.50
- Arrow Variocoupler 2.15
- Arrow Variometer (Small) 2.15
- Arrow Variometer (Large)..... 2.50
- A. B. C. 43 Plate Condenser..... 1.85
- A. B. C. 23 Plate Condenser..... 1.65
- Freshman Var. Grid Leak and Cond... .70
- Freshman Var. Grid Leak..... .65
- De Forest Rheostat95

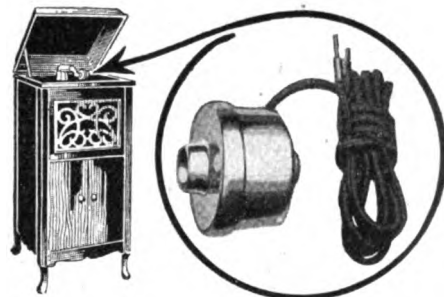
TRANSFORMERS

- Acme (Audio)..\$4.25 Rasla (Audio)..\$5.95
- Acme (Radio).. 4.25 Rasla (Radio).. 5.95
- Marle (Audio).. 3.45 W.D.12 (Audio) 4.25
- General Radio.. 5.00

- Socostat (Socket and Rheostat Combined)\$1.65
- Bannard Phones 1.68
- Dr. Siebt Phones 5.75
- Federal Phones 5.25
- Four Way Plug..... 1.10
- Firth Bull Dog Plug..... .79
- Framingham Rheostat (Plain)..... .75
- Framingham Rheostat (Vernier)..... 1.25
- General Radio Amplifying Unit for W.D. 11 Tubes 7.50
- General Radio Amplifying Unit for U. V. Tubes 8.00

ALL PARTS FOR LATEST CIRCUITS LIKE FLEWELLING AND REFLEX

WE PAY THE POSTAGE EAST OF MISSISSIPPI



RADIO LOUD SPEAKER FOR PHONOGRAPHS

The MORRISON Loud Speaking Unit, for use on phonographs, takes the place of awkward headsets. Possesses a tone value 100% true—an achievement never before attained in a loud speaker.

Attaches in Place of Reproducer

Slips on tone-arm of phonograph in place of reproducer, or can be used with horn. Adapted to any bulb set with one or more stages of amplification. Adjustable from soft to loud tone. Cannot possibly rattle or loosen through excessive amplification. A popular-priced Loud Speaker that compares with most expensive instruments on the market. Thousands in use, giving perfect satisfaction. Handsomely nickel plated, complete with 5 ft. cord, \$10—at your dealer's or direct. Sent C. O. D., if desired. Fully guaranteed. Money back if not satisfied. (When ordering, specify make of phonograph).

MORRISON RADIO LABORATORIES

Dept. 12, Lewis Block Detroit, Mich.

Book on Chemistry

How to Make and Use a Small Chemical Laboratory.
By **RAYMOND FRANCIS YATES**. The treatise covers all of the essentials of elementary chemistry. The law of definite proportions, solutions, crystallization, colloids, electrolysis, etc., are explained. The second part of the book is devoted to chemical and electro-chemical experiments. 76c. The Columbia Press, 1493 Broadway, N. Y. C.

DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS
DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. If copy is received at this office ten days before publication, RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

RADIOPHONO Adapter—Your Edison, Brunswick Victrola or other talking machine has the finest acoustic properties possible. Radiophono Adapter enables you to use it as a loud speaker. Patent (Pend.) Molded Construction. Sent on money back guarantee. At your dealers or direct from us. \$2.00 post prepaid. Industrial Sales Engineering Co., 671 Broad St., Newark, N. J.

HIGH GRADE ENGRAVING done on your radio panels at reasonable prices. T. Johnson, 15 Rosemont Rd., Worcester, Mass.

PHONES, TRANSFORMERS REWOUND. L. Werts, 409 St. Julian St., Pekin, Ill.

SELL—Regenerative set (unwired), \$8.00 with circuit. CARL MASSON, 76 Boylston St., Jamaica Plain, Mass.

VARIABLE CONDENSERS at factory prices. 3 plate, \$1.05; 11 plate, \$1.35; 21 plate, \$1.60; 43 plate, \$2.05. Send cash with order. GREEN-LEAF, 34 Merchants' Row, Boston, Mass.

VERNIER VARIABLE CONDENSERS—Capacity, .0006. \$1.48 postpaid. Fully guaranteed. Cherpeck Company, 3123 Davlin Court, Chicago.

RECEIVING SET, \$10.00. Loose Coupler, \$4.00; Battery, \$7.00. Mele, 39 Foxon, East Haven, Conn.

R3-MAGNAVOX—BRAND NEW. First \$30 takes it. Ted Boston, Marion, Kentucky.

PHONES, TRANSFORMERS REWOUND—L. WERTS, 409 St. Julian St., Pekin, Ill.

R3-MAGNAVOX—BRAND NEW—First \$30.00 takes it. TED BOSTON, Marion, Ky.

VARIOMETERS, \$1.50 each. These are regular 4 1/2-inch square variometers. Couplers, \$1.00 each. Both usually sell at three times the price. THE RADIO SHOP, 261 East Broadway, Milford, Conn.

SUPER-SIMPLICITY CIRCUIT

Hear Europe, Asia, Africa and Australia's long wave stations and LOCAL broadcasting, on ONE TUBE, one control. NO rheostats, storage battery, variocouplers, variometers, three-coil mounting, variable inductance, taps, switches, dead end losses or radio frequency. Cats, hookup, everything. Nothing to guess about. Price \$1.00. RADIO EXPERIMENTAL LABORATORY, Box 194A, Berkeley, California.

EXCHANGE LETTERS with friends everywhere. Pleasant pastime. Information for stamp. Smith, Box 3125, M. Portland, Ore.

VACUUM TUBE RESULTS WITH A CRYSTAL SET! Cover distance with a "PT" ULTRA-SENSITIVE CONTACT in your crystal detector. Beats gold and other ordinary catwhiskers. DOES NOT JAR OUT. Myrtle Wood, Rhineland-er, Wisconsin, writes: "That 'PT' Ultra-Sensitive Crystal Detector Contact I purchased is sure a wonder. Using the 'PT' contact and galena, I have heard over 43 different broadcasting stations, up to 1,000 miles distant." The "PT" has received code 3,300 miles. Price, only twenty-five cents. "PT" CRYSTAL CONTACT COMPANY, Box 1641, Boston.

AMATEURS—LOOK! Send in 15 cents to RADIO WORLD for issue of January 20 containing panel layout, hookup and full explanatory data on the construction of a D-X receiver, which simply lays the long distance on your table. Or start your sub. with that issue. RADIO WORLD, 1493 Broadway, New York City.

STANDARD ELECTRICAL DICTIONARY. By Prof. T. O'Connor Sloane. Just issued an entirely new edition brought up to date and greatly enlarged—as a reference book this work is beyond comparison, as it contains over 700 pages, nearly 500 illustrations, and definitions of about 6,000 distinct words, terms and phrases. The definitions are terse and concise and include every term used in electrical science. 700 pages, 47 illustrations. (See page 18 for fuller description.) Price, \$5.00. The Columbia Print, 1493 Broadway, New York City.

RADIO TUNING RODS

(Patent Applied For)

Eliminates body capacity when tuning in. With Tuning Rod in your hand you can stop unnecessary noises and shrieking. Every radio fan should have Radio Tuning Rod. Send 35 cents stamps or money order. Radiophona Co., 505 Fifth Avenue, New York City.

TWO one stage amplifiers, Acme, \$8; Remler, \$7. King Amplifying horn, \$7. Condensers. J. B. Rich, Hobart, New York.

THE IDEAL RECEIVER tunes with SINGLE CONTROL. No variometers, variocouplers, taps or switches. Cheapest to build. Particulars. ROKAY ELECTRIC COMPANY, Ingomar, Ohio.

CASH FOR OLD GOLD, Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magnets Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 337 Hippodrome Bldg., Cleveland, Ohio.

DO YOU WANT TO SAVE MONEY in making your set? Send for the Jan. 27 issue of RADIO WORLD, containing a full-page drawing of how to make filament control rheostats, as well as an easily understandable text, which makes the construction easy. 15c a copy, or start your subscription with this issue. RADIO WORLD, 1493 Broadway, New York.

OLD MONEY WANTED—\$2.00 to \$500.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. Clarke Coin Company, Ave. 83, Le Roy, N. Y.

RAND-MCNALLY RADIO MAP OF UNITED STATES—Is 28 x 30 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover. Price, 35c. The Columbia Print, 1493 Broadway, New York City.

MODEL MAKING. By Raymond Francis Yates. A new book for the mechanic and model maker. This is the first book of its kind to be published in this country, and all those interested in model engineering should have a copy. The first eight chapters are devoted to such subjects as Silver Soldering, Heat Treatment of Steel, Lathes Work, Pattern Making, Grinding, etc. The remaining twenty-four chapters describe the construction of various models such as rapid fire naval guns, speed boats, model steam engines, turbines, etc. 400 pages. 301 illustrations. Price, \$3.00. The Columbia Print, 1493 Broadway, New York City.

TWENTIETH CENTURY BOOK OF RECIPES, FORMULAS AND PROCESSES. Edited by Gardner D. Hiscoc. This book of 800 pages is the most complete book of recipes ever published, giving thousands of recipes for the manufacture of valuable articles for every-day use. Hints, helps practical ideas and secret processes are revealed within its pages. It covers every branch of the useful arts and tells thousands of ways of making money and is just the book everyone should have at his command. The pages are filled with matters of intense interest and immeasurable practical value to the photographer, the perfumer, the painter, the manufacturer of glues, pastes, cements and mucilages, the physician, the druggist, the electrician, the dentist, the engineer, the foundryman, the machinist, the potter, the tanner, the confectioner, the chiropractor, the manufacturer of chemical novelties and toilet preparations, the dyer, the electroplater, the enameler, the engraver, the glass worker, the gold-beater, the watchmaker, the jeweler, the ink manufacturer, the optician, the farmer, the dairyman, the paper maker, the metal worker, the soap maker and the technologist in general. A book to which you may turn with confidence that you will find what you are looking for. A mine of information up-to-date in every respect. Contains an immense number of formulas that everyone ought to have that are not found in any other work. New edition. 807 octavo pages. Cloth binding. Price, \$4.00. The Columbia Print, 1493 Broadway, New York City.

BATTERIES—Edison Storage "B" Battery Elements, 5c per pair; 18 will make one 22.5 volt Battery. GILMAN'S BATTERY SHOP, Chelsea Sq., Chelsea, Mass.

HOW TO REPAIR Vacuum Tubes. Complete literature, \$1.00. Box 103, Station C, Toledo, Ohio.

RADIO-APPLAUSE Post Cards. Encourage broadcasting by such acknowledgment. 2 dozen, 25c, postpaid. D. J. SPANGLER, Elkhart, Ind.

GUARANTEED Radio "A" Batteries, 40 ampere hours, \$12.00. 4" hard fibre tubing, 30c. per foot. Variocouplers, \$2.25. RADIO ASSEMBLY, 1109 Valley St., Joplin, Mo.

EXCHANGE JOLLY, INTERESTING LETTERS through our club. Stamp appreciated. Betty Lee, Inc., 4254 Broadway, New York City

4 INCH HARD FIBER RADIO TUBING, any length to 4 ft., 20c. per ft. Variocouplers, \$2.25. Radio Assembly, 1109 Valley St., Joplin, Mo.

AGENTS—Are you interested in radio? If so drop us a card. We have a proposition no live agent should turn down. Meets the needs of 90 per cent. of the public. THE WILKENDA CO., 500 Fifth Avenue, New York City. Dept R.W.

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NEWS AND GOSSIP OF THE STAGE—Send 10c. for specimen copy of the NEW YORK STAR, the great illustrated theatrical weekly. \$4.00 year, \$2.00 six months, \$1.00 three months. New York Star Co., 1493 Broadway, N. Y.

IF YOU ARE A REGULAR RADIO fan and like to hear the stations in the four corners of the United States come in with a bang, then you will want the Flewelling Circuit. If you do, send 15c for RADIO WORLD, issue of Feb. 27, which contains complete description and directions for the manipulation of the circuit. RADIO WORLD, 1493 Broadway, New York.

ATTENTION, Amateurs! Have you seen the RADIO WORLD's page of hook-ups in the Oct. 21 issue? 15c a copy or start your subscription with that Number. Many people are writing in for the hook-ups listed here. RADIO WORLD, 1493 Broadway, New York City

ADVERTISING SOLICITORS to represent RADIO WORLD. The best quick action radio advertising medium. State territory you can cover. Tell us about your past experience. Write Fred S. Clark, Manager, RADIO WORLD, 1493 Broadway, New York.

WIRING A HOUSE. By Herbert Pratt. Shows a house already built; tells just how to start about wiring it; where to begin; what wire to use; how to run it according to insurance rules; in fact, just the information you need. Directions apply equally to a shop. Sixth edition. COLUMBIA PRINT, 1493 Broadway, N. Y. C. Price, 35 cents.

A COURSE IN MECHANICAL DRAWING. By Louis Rouillon. The author has written a most practical book on the subject of Mechanical Drafting. It fully explains the art of Drawing, Lettering and Dimensioning. It is, by far, the most practical book ever published on this subject, for use in day and evening schools, and more especially adapted for the teacher and for self instruction. Fifteenth edition, revised and enlarged. Fully illustrated. Oblig. COLUMBIA PRINT, 1493 Broadway, N. Y. C. Price, \$1.80.

HOW TO BECOME A SUCCESSFUL ELECTRICIAN. By Prof. T. O'Connor Sloane. An interesting book from cover to cover. Telling in simplest language the surest and easiest way to become a successful electrician. The studies to be followed, methods of work, field of operation and the requirements of the successful electrician are pointed out and fully explained. 202 pages. Illustrated. Nineteenth revised edition. Cloth. Price, \$1.50. The Columbia Print, 1493 Broadway, New York City.

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Mounted in special prepared metal 30c. Unmounted 35c. All guaranteed. Manufacturers, dealers and jobbers write for quantity prices.
We also manufacture Radio parts to order.
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Let Radio Radiate Your Home

List	Our Price
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1.75 Bright Star "B" Batteries, 22 1/2 volts.....	1.10
7.70 43 Plate Vernier Condenser.....	4.75
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5.00 WD-11 Transformer.....	3.75
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22.50 Bristol Loud Speaker.....	18.00
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Perfection Radio Corp. of America
119 WEST 23RD STREET, NEW YORK

Howls from a Loud Speaker
NOW, if I were you, I would put another step on there and then you would hear everything." * * *

"Say, you are doing that all wrong! Don't you know that if you tune your set that way, you can't get any results?" * * *


"If I were the president of the RC, I would sell the tubes for cost, just to popularize them. Who wants to pay that price for them? It's ridiculous!" * * *

"— now as I was saying, just as I got KJH in nice and loud, I hear a terrible generator hum, and who do you think it was? You'd never guess! It was SPC down in South America. That's some little circuit I am using. No, I won't give it to you—I'm going to patent it first." * * *

"So I sez to him, 'What do you think you're doing, putting up an aerial right over mine? Don't you realize that you won't be able to receive anything? I'll get it first and you won't get any,' and he turns around and looks at me and takes the wire down."


Church Broadcasting
A SURVEY made by the National Chamber of Commerce develops the fact that there are eighty-three radiophone stations in this country broadcasting religious services. It is estimated that the territory covered represents about 65.2 per cent. of the total area of the United States.

RADIPHONO ADAPTER \$2.00



Here is an efficient economical way to use your Victrola, Edison, Brunswick, etc., as a wonderful lead speaker.
This adapter is constructed of milled composition. It eliminates metallic and distorted sounds. Guaranteed to be satisfactory or money refunded.
If your dealer cannot supply you send us \$2.00 and we will mail one by parcel post prepaid.
Industrial Sales Engineering Co.
671 Broad Street, Newark, N. J.
Phone, Market 9023

American Radio Stores



BACK MOUNTING INDUCTANCE SWITCH, \$1.00
TUBE SET

- 1 Rheostat
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- 1 "B" Battery, 22 1/2 volts
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- Wires for Hook Up Free
- 1 Panel, 7 1/2 x 10 1/4
- Hook-Up Only Given with Set
- Complete.....

\$15.50

Spider Web Inductance Coil for Rheinartz Tuner, \$2.00 each

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All orders must include postage, and all checks must be certified.

WILLARD
WILLARD RADIO CO.
DEPT. R.W.
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REINARTZ CIRCUIT EVERY PART COMPLETE

1 Reinartz wound coil, 1 tube socket, 1 Vernier rheostat, 1 23-plate .0005 MFD variable condenser, 1 13-plate .00025 MFD variable condenser, 3 inductance switches, 25 switch points and nuts, 8 binding posts, 1 variable grid leak, 1 .002 MFD phone condenser, 25 feet bus bar wire, 1 high grade Radion panel and diagram and complete instructions **\$10.00**

FLEWELLING CIRCUIT EVERY PART COMPLETE

2 honeycomb coils, 1 2-coil mounting, 2 coil plugs, 3 .006 condensers, 1 variable grid leak, 1 grid leak, 1 23-plate .0005 MFD variable condenser, 1 Vernier rheostat, 1 tube socket, 8 binding posts, 20 feet bus bar wire, 1 high-grade RADION panel, 1 3" dial and the Radio Digest Booklet on Operation and Construction of Circuit **\$11.00**

We Also Have a Full Line of Variable and Vernier Condensers, Transformers, both Audio and Radio Frequency, Sockets, Rheostats, Couplers, etc.

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RADIO WORLD has no free list. The only copies sent out by the publishers are to fill the ever-increasing orders of the American News Company, the large numbers of subscription orders received at the office of publication, and one voucher copy to each advertiser and advertising agent represented in current issues.
RADIO WORLD, 1493 Broadway, N. Y.

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JAYNXON
GUARANTEED 50' LONG DISTANCE RECEPTION 50'
THE VACUUM TUBES ONLY RIVAL

Reflex and R.F. Crystals
Approved by radio experts. The very best crystal known to radio science.
Will make your set sound like Sousa's Band.
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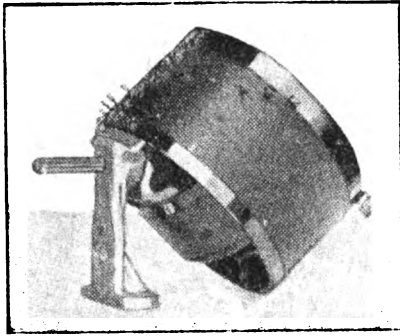
Reliable merchandise first, then price. We will refund, at any time, for Radio material purchased from us which is not up to standard and as represented.
No Checks. N. C. O. D. Add Parcel Post. Reference: Radio World.

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YOU NEED THESE PARTS!

Designed by the Same Radio Engineers Who Designed Much of the United States Navy Radio Apparatus. Built with Micrometer Precision Throughout.

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GENUINE BAKELITE
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This is a remarkable instrument and a remarkable value. Accurately calculated. Micrometer precision. Made of natural UNDYED bakelite. Avoids dielectric losses due to coloring materials. Special 2 to 1 rotor movement. 180° on dial turns, 90° on rotor. Very delicate adjustments. Made for table or panel mounting.

\$2.25

(or \$3, with dial)



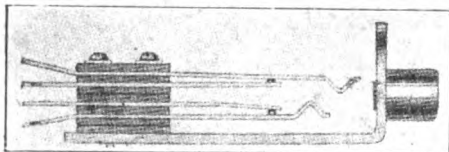
New RHEOSTAT

Every radio enthusiast wants one of these. NEVER over-heats because it has a porcelain base. Suitable to table or panel mounting.

50c

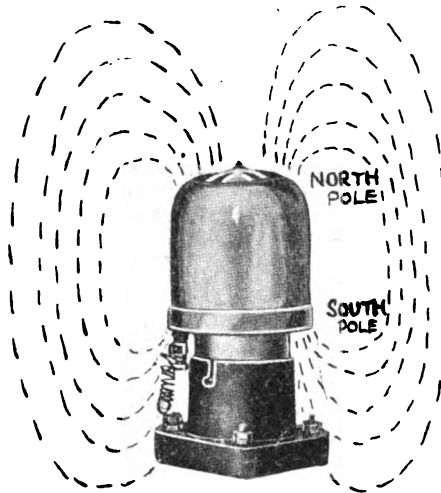
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- Closed Circuit 35c.
- Double Circuit 45c.



Increase Your Vacuum Tube Sensitivity 25% With This New

TUBE SENSITIZER



A recent editorial in a radio journal states, "The placing of a strong magnet in a certain space relationship to the vacuum tube often gives an increase in tube efficiency of 25%."

\$1.50

The Dyna Tube Sensitizer serves 2 purposes: First, as a powerful permanent magnet, the electro-magnetic field existing between its North and South poles tends to increase the flow of electrons from the plate to the filament, thereby increasing tube power. Second, it acts as a shield which prevents electro static coupling with other elements in the set, also tending to eliminate stray capacity effects.

MADE OF SPECIAL PERMANENT MAGNETISM-RETAINING ALLOY. FOR LONG OR SHORT DISTANCE WORK YOU CANNOT AFFORD TO BE WITHOUT IT.

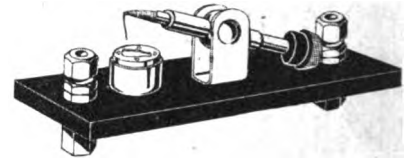
RADIO RECEIVER, Model 235, with power amplifier combined in one cabinet, as illustrated. Without equipment or horn.List. **\$65**

Power Loud Speaker, extra **\$25**

COMPLETE RADIO RECEIVER SET, with full installation equipment, including vacuum tubes, batteries, complete antenna equipment, telephone headset, telephone plug and horn. Free installation within 50 miles of New York... **\$150**

SET AS ILLUSTRATED → MODEL 235

A Super-Sensitive, Complete
CRYSTAL DETECTOR

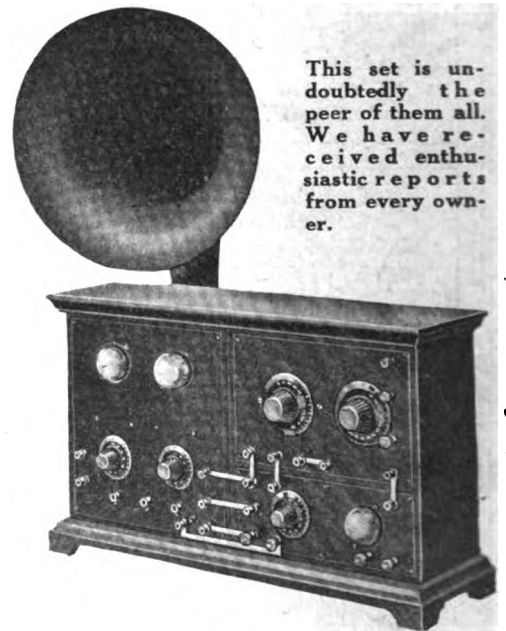


Includes triple-tested, guaranteed, million-point synthetic crystal. Base is of polished Bakelite arranged for table or panel mounting. Note new sensitive spring contact for delicate adjustment.

75c

Guaranteed Super-Sensitive CRYSTAL

Triple-tested Galena Radio Crystal. Absolutely Guaranteed Sensitive. Set in special mounting. Sealed in wooden box..... **20c**



This set is undoubtedly the peer of them all. We have received enthusiastic reports from every owner.

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USE REGISTERED MAIL

Have Your Old Dead Phones Re-Magnetised 50c. or Taken in Exchange.

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DEALERS WRITE

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N. E. Cor. Fourth Ave. at 20th St.

Telephone: Gramercy 4088

New York, N. Y.

How to Make a Radio Set Cabinet (See Inside)

15c. a Copy

March 17

\$6.00 a Year

52 Numbers

RADIO

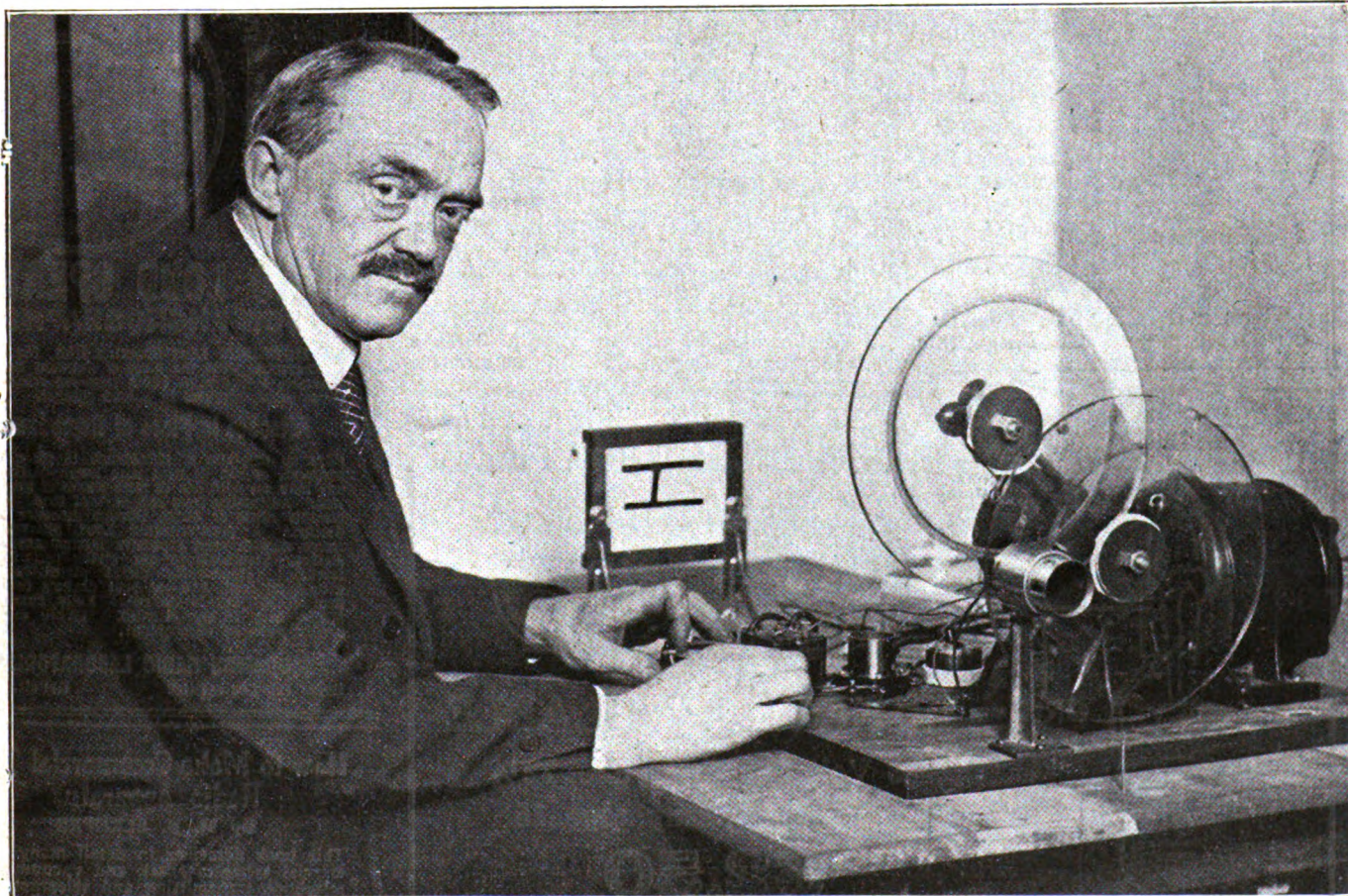
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PHOTOGRAPHS SUCCESSFULLY TRANSMITTED BY RADIO



(C. P. & A. Photos)

While sending photographs over land wires has been accomplished and has been done for some time, the first photograph to be sent and received successfully by radio was transmitted from Washington, D. C., to the Evening Bulletin, Philadelphia, March 3, 1923, a distance of 130 miles. Mr. C. Francis Jenkins, of Washington, is the inventor of the apparatus used.

The principle of the invention is to transform the light impulses or waves from the photographs into electrical impulses by means of special glass discs and light cells, and then to change them from electrical impulses to radio waves. In the reception of the photograph the process is reversed, the waves being received as radio impulses, transmuted into electrical impulses which actuate light cells and by means of the discs seen in the illustration above being impressed on a sensitized film as a photographic negative. The photograph thus received must be developed in the usual way. Some photographic detail was lost in the experiment due to outside interference which was not controllable at either the receiving or transmitting stations. These interfering impulses in the form of static, or signals from other stations, went through the apparatus and registered, thus causing the loss of detail. The pictures transmitted were those of President Harding, Vice-President Coolidge and Governor Pinchot, all of them being successfully received.

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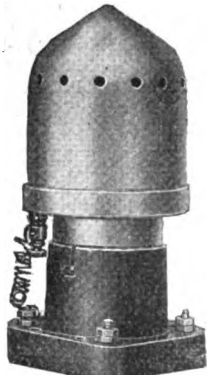
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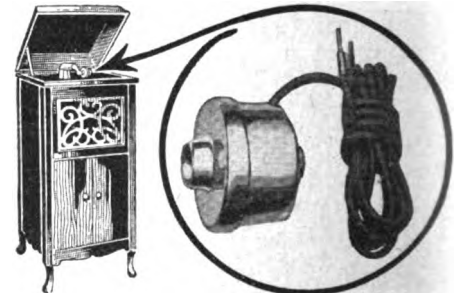
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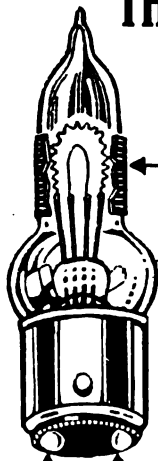
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VOLUME TWO OF
RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. II, No. 25. Whole No. 51

March 17, 1923

15c per copy, \$6.00 a year

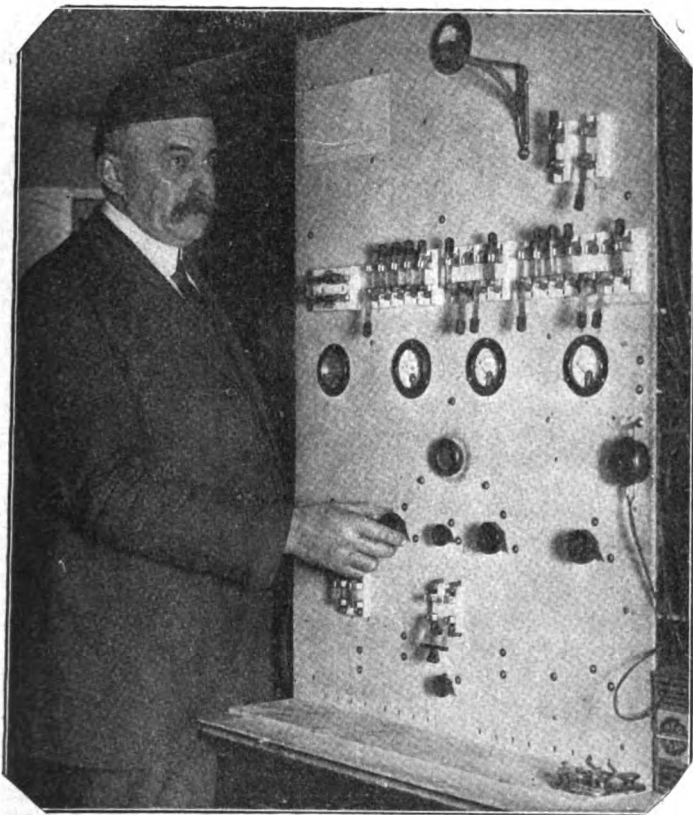
The First Church Radio Broadcasting Station

CALVARY Baptist Church, New York City, has installed a complete radio broadcasting system for sending out Dr. Straton's sermons and the special music in the regular services of the church. This is a regular licensed station and the call letters are WQAO. Calvary is the first New York church to install its own independent broadcasting station.

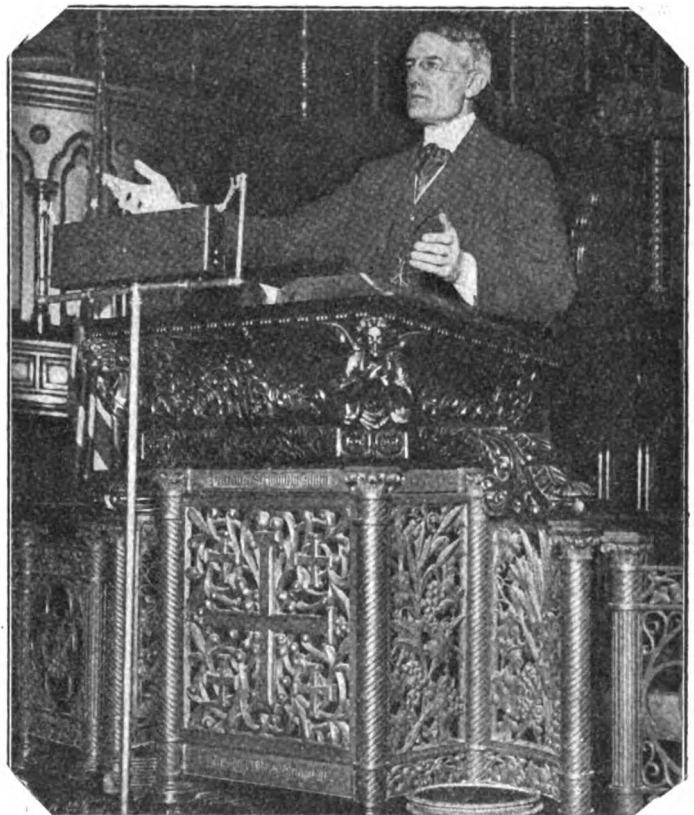
Dr. Straton, in speaking of this advance step in the church, said: "I am delighted with it. We have given the system a thorough test and it has proved very successful. I am a hearty believer in the use of radio for broadcasting the truths of religion. I believe that radio

"We had, too, another evening a most interesting and remarkable incident when we were testing out to see whether the system would successfully broadcast the music from our great new organ. In the preliminary announcement our operator had requested any outstations who picked up and heard the music to notify us, if possible, by telephone whether or not it was going successfully.

"While our Choirmaster was playing the organ here in the auditorium in this test, the telephone bell rang and my secretary answered. He was told that the music was coming perfectly to a receiving station far



(C. Kadel and Herbert)
Radio room of WQAO, the first church broadcasting station established. George F. Koster, sexton of Calvary Church, New York City, who installed and built the set.



(C. Kadel and Herbert)
Rev. John Roach Straton, pastor of the Calvary Baptist Church, New York City, preaching a sermon into a special transmitter. This was the first church to operate its own broadcasting station.

is destined to take a place second only to the newspapers as a means for immediately and directly reaching the masses of the people.

"The people will not get any doubts or negations or question marks from the Calvary pulpit. I shall try to continue to do my part, as the Bible expresses it, in 'tearing down the strongholds of Satan' and I hope that our radio system will prove so efficient that when I twist the devil's tail in New York, his squawk will be heard across the continent!

"I gave a brief talk the other day from the Calvary pulpit simply to test the apparatus, and I was delighted with the responses that came in from far and near.

away, and when Mr. Wilson expressed his pleasure, the friend at the other end of the line said: 'It is just as clear as if I were sitting in the auditorium.' Then he said: 'Here, you can hear it over the phone; I will hold my amplifier horn to the telephone and you can hear it.' He did this and Mr. Wilson heard the music that was going out by radio from the Calvary auditorium to the far away radio receiving station, and then coming back to him over the telephone with perfect distinctness."

Dr. Straton has stated that, in his opinion, the broadcasting of sermons and services from the city pulpits would not tend to keep people away from church.

How to Make a Cabinet for Your Radio Set

By *Kenneth Malcolm*

MANY radio bugs devote their entire energies to the working of their sets and completely overlook the appearance. Some even believe that a shabby set will produce better results than one more carefully dressed up. However, it will be found that a correctly designed set will actually work better if the parts are neatly arranged and carefully wired. Further, if your set is properly housed in a good cabinet, it will find greater respect in the eyes of the outsiders who do not know and appreciate your set as well as you do; therefore, its apparent value will be increased.

Then, again, there are many other radio bugs who would like to have a good cabinet, but don't know just how to make one. It is for them that this article was prepared.

eighths of an inch thick. Heavier wood is clumsy and thinner wood is not strong enough for any but very small cabinets. The base may be thicker—say one-half to three-quarters of an inch. If you can get the wood "dressed," meaning planed smooth, at the place where you buy it, do so. In most cases you can have it cut to width on the machine; if you can, so much the better.

Choose wood to suit your taste and pocket-book. The better cabinets are usually of oak, mahogany, or walnut. Cheaper cabinets, easily made and finished up nicely, are made of bass or whitewood. This wood is good for beginners to practice with, at least until a certain amount of proficiency is achieved. It can be stained in any shade.

It is advisable to make out a list of necessary stock before you go to buy your wood. This will save the possibility of having too much or too little. Be careful to allow for the waste in cutting and truing to exact measurements. Always remember whether you are following inside or outside dimensions. The same general rules maintain for a cabinet of any size. Allow for the cover when determining the width of the back piece. Also allow for the cover when cutting the ends. Allow for the thickness of your panel when determining the projection of the front of your base. If you cannot get the side edges dressed be sure and allow extra width for smoothing and truing them up. It is customary for the grain of the wood to run in the direction of the longest dimension of a piece.

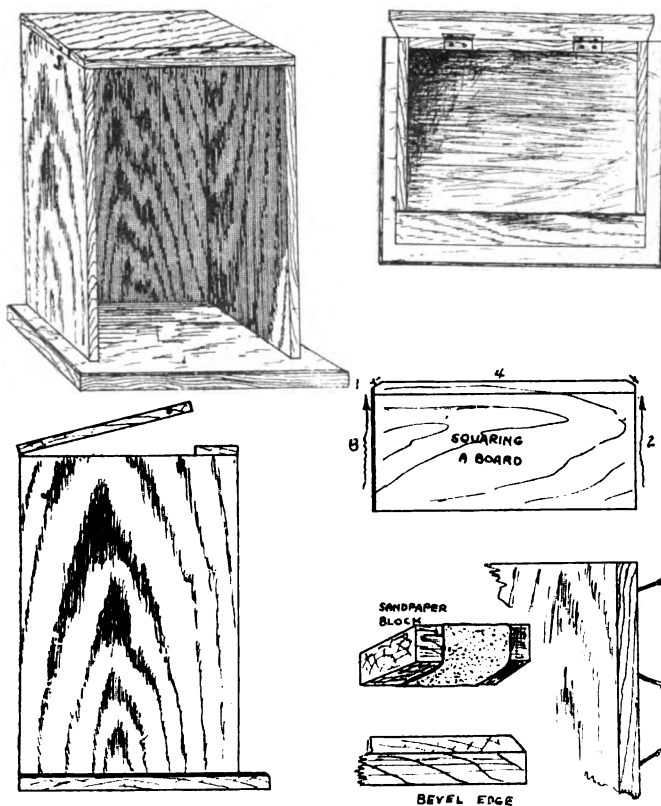
For those who must take wood as it comes there is a definite procedure for truing up. The drawings illustrate this clearly. Select an edge running with the grain and straighten it up with your plane. Move your plane in the direction the grain runs, and not against it. Try both ways if you are uncertain and you will soon recognize the right one. The mistake is made by many beginners of setting the cutter of the plane too heavy. Use the minimum projection of the cutter sufficient for smoothing, otherwise you only waste time and wood. This is edge No. 1. From this edge, with a pencil, mark the opposite parallel edge, at the correct distance. Now select the end that appears the most square and snip its farther corner off, within the waste space, with your plane. The plane should move in the direction of the little arrow. When you work on end grain you should set your plane cutter very fine, and instead of heading the plane straight along with the wood you should push it forward at an angle. Work toward the chopped off corner and never against it. When that end is true, and squared with the first side, mark it No. 2.

Next go to the other end and snip its corner off as you did with its neighbor. Carefully mark the length from the first end and plane down to the line, this time also moving in the direction of the cut end. Test occasionally with your try-square. Never try to make the plane do the work of a saw. If there is much wood to be taken down it is best to first saw near the line, and then true up with a plane. This is edge No. 3.

The truing of the remaining edge finishes the job. All pieces should be squared up the same way. If you have no plane, be careful and saw close to the line you have made. Some very good boxes may be cut out with the use of the saw alone.

The base takes on a more finished appearance if three of its edges are bevelled. This is done with a plane. As

(Continued on next page)



Diagrams illustrating the various steps in making a radio set cabinet.

The purpose is to help the person with limited means and few tools make an unpretentious but adequate cabinet to house his pet radio set.

All the tools necessary comprise a saw, hammer, screw-driver, try-square, pencil, foot-rule and several sheets of sandpaper of different grades. A plane, nail-set and small hand-drill would also be useful. For certain classes of finish a brush is necessary.

If you haven't all the tools mentioned, the first thing to do is to buy the best or borrow what you can. You can do better work with a few good tools than with many poor ones. If you can afford only one saw, get the cross-cut variety. Select a hammer and screw-driver to suit yourself. A smoothing plane with an 8 or 10-inch face will be best.

The wood, or stock, may be found about the house, or can be bought of a cabinetmaker or lumber dealer. The stock for the average size cabinet should be about three-

Valuable Loop Antenna Hook-Up for Single Tube

By Arthur G. Shirt

AMATEURS who are not experimenting with the Flewelling super-circuit or with other circuits employing super-regeneration, find it very difficult to operate a single tube set on an indoor loop. A loop is a comparatively poor absorber of radio energy, but on the other hand, its directive powers make possible the bringing in of one station to the exclusion of all others. For this reason, it is preferred by some amateurs, while others use the loop because it is the only device they conveniently can use.

Whichever the case, the hook-up accompanying this article will prove of value. It is for use with a single tube regenerative set. It will be noted that the loop is grounded, which really makes it function more like an outdoor antenna than as an indoor loop. Some of the directive qualities are lost, of course, by having the loop connected to the ground in this way, but this is more than made up for in the increased efficiency of the circuit.

This circuit tunes very sharply and demands fine adjustment. For this reason a vernier condenser and vernier rheostat are recommended in their respective places as shown. For amateurs who cannot afford three, four or five tube sets, and who cannot, for

various reasons, employed an outside antenna, this hook-up, permitting a loop to be used successfully with

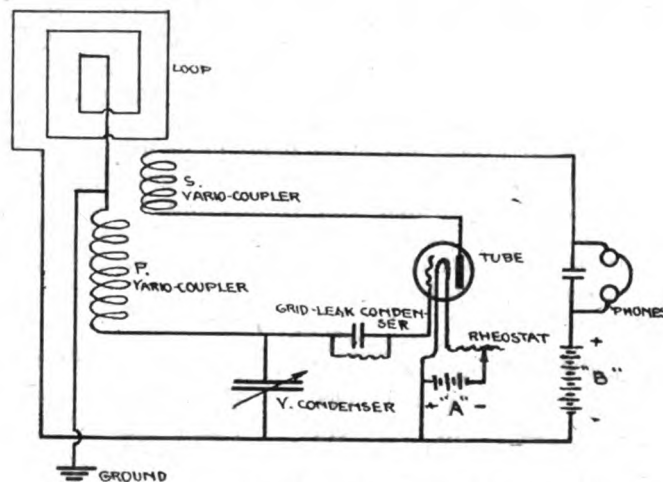


Diagram of connections for hook-up using a loop antenna.

a single tube, will prove of inestimable value. Other amateurs should find a place for it in their notebooks.

(Continued from preceding page)

the box must be as strong as possible, the top is sawed down its length about an inch and a half from one edge and the small piece is made stationary—that is, providing you want a hinged cover—otherwise the whole top is fastened down. Now comes the assembling of the parts.

Either nails or screws may be used for the joining. If properly driven, nails are entirely satisfactory. Gluing, in addition to nailing or screwing, will make a stronger job. Finishing nails an inch long are about right for cabinets using the size stock mentioned. If you use glue you might find the liquid prepared glue more convenient, although not quite as strong as the hot glue. Two little brass hinges will be needed, and also a little flat hook, if a hinged cover is wanted.

Coat the two edges (the edges that fit against the side pieces) with glue (if glue is to be used). Put it on thin, for it is the glue-coated surface and not the glue itself that is strong. Now nail or screw on the two end pieces. Don't drive the nails straight in, but at an angle, as shown in the drawing. Now put on the narrow top piece. Next you can fasten on the bottom. Flat-headed screws would be preferable to nails in this case. If you have a hand-drill you can first drill the holes for the screws in the bottom piece and then countersink them by twirling the tip of a knife blade in the hole. If the screws go in hard, a little soap or oil on them will ease them up.

The hinges can be fitted next. To do this you will have to place them in the position you want them to go and then carefully trace their outline on the wood. Between the lines where the hinges are to go the wood must be cut away to the depth of the thickness of the hinge plate. This may be done with a chisel or a sharp knife. It must be done on both the under side of the cover and on the top edge of the back. After this is done the hinges may be placed and fastened in position. The hook on the side can better be fitted after the finishing of the cabinet has been completed.

The next process is the sandpapering. In order to be able to get an even pressure, and to prevent rounding the edges, the sandpaper should be mounted over a block as shown. Use a medium coarse paper first, and then a fine one. Be sure and remove all the scratches and other sur-

face marks, for upon this preliminary work depends to a large extent the final finish. With the aid of a nail or a nail-set drive the heads of the finishing nails a little below the surface. Fill the holes above the heads with putty, wood plugs, or wood filler.

The most popular finish for radio cabinets seems to be mission or early English oak and mahogany. A wood dye or stain is the first thing to be applied. You can get this from any paint shop in the shade you want. It can be either applied with a brush or a piece of cotton waste and dries thoroughly in a few hours.

If you are using mahogany, oak, or any other rather open grain wood, or wood where the pores plainly show, you must use a filler for best results. This comes prepared in paste form in different tints. Use the tint that most nearly matches the stain. It can be applied with some blunt-edged tool, such as a putty knife. Be sure and fill all the little holes, but rub all off the surface of the wood, so that it is finally perfectly smooth. Close grained woods such as pine, birch and white wood do not need a filler.

Next comes the final finish. This usually consists of several thin coats of shellac. One coat should be applied with a brush and allowed to dry thoroughly—and be sure it is thoroughly dry. Now go over this surface with a piece of very fine sandpaper or a piece of steel wool, to take off any rough spots, and to make an anchorage for the next coat. Brush off any dust and apply the next coat. You must work fast with shellac, for it dries quickly. Two coats are generally sufficient to give a pleasant luster to your work. If you want a dull or satin finish you can go over the second coat with the fine sandpaper or with steel wool, and afterward give the cabinet a rubbing with furniture oil or with prepared wax. Use very fine sandpaper for this purpose—No. 00, preferably—otherwise you will ruin the work you have already done.

For those who prefer less trouble in finishing, what is known as a varnish-stain can be applied directly after the sanding. This stain contains both color and gloss, and while it does not make as nice a finish as the longer method, it is quite satisfactory for those whose requirements do not include a "piano" finish.

With the addition of the hook and screw-eye your cabinet is finished, and but awaits its panel and set.

Make Your Taps Neater

By Arthur S. Gordon

AFTER you have wound the primary of that home-made variocoupler so tightly and have taken out taps that are the proud equal of any found on commercial instruments, it is somewhat discouraging to have them pull away from the cardboard tube, as most tapped turns have a habit of doing. The fault is not in the cardboard tube nor in the wire used, but in the method of taking out the taps.

The usual procedure is to bend back a loop in the wire and twist it close down to the tube, leaving a small eyelet to which the connecting wire can be soldered. While this arrangement will stay taut for a while, it is bound to loosen and, in many cases, the whole coil has had to be re-wound.

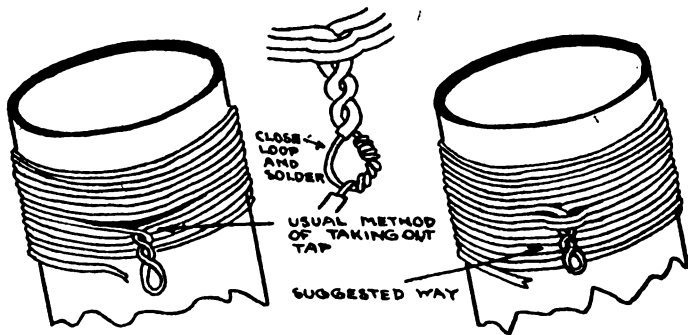


Diagram Showing Arthur S. Gordon's Method of Making Neat Taps.

In the interests of neatness and thoroughness, therefore, the following method of making taps is suggested: After you twist the loop as before, instead of going on with the winding, bend the tap down and wind the next two turns over it. Then bend the tap up again and continue until the next tap.

Now, with every tap held down by the two succeeding turns, there is no danger of stretching or loosening. Even if collodion or coil cement is not applied, the turns will hold together, and not only will you have a tuning coil that is exceptionally neat but you will also have one that will remain exceptionally neat until its last and probably distant day of service.

Broadcasters Increase Eleven in February

AN increase of eleven broadcasting stations is shown on the records of the Department of Commerce during the month of February. On February 1 there were 570 stations licensed to broadcast entertainment data and news while on March 3 there were 581 broadcasters operating.

During the past month 24 new licenses were issued to broadcast, but 13 old stations ceased to function. Of the total stations transmitting entertainment today, 28 are Class B stations operating on 400 meters, the balance being on 360.

Four new stations licensed during the week ending March 3, follow:

Call	Station	
WSAC	Clemson Agricultural College, Clemson College, S. C.	500 watts
KFDV	Gilbrech & Stinson, Fayetteville, Ark.	100 watts
WWAY	Marigold Gardens, Chicago, Ill.	500 watts
WRAB	Savannah Board of Public Education, Savannah, Ga.	100 watts

The thirteen stations which were dropped during February follow:

Call	Station
KFED	Billings Polytechnic Institute, Billings, Mont.
WKAG	Bruce, M. D., Edwin T., Louisville, Ky.
WIAX	Capital Radio Co., Lincoln, Neb.
WNAF	Enid Radio Distributing Co., Enid, Okla.
WOH	Hatfield Electric Co., Indianapolis, Ind.
WLAF	Johnson Radio Co., Lincoln, Neb.
WDAR	Lit Brothers, Phila., Pa.
WLAR	Mickel Music Co., Marshalltown, Iowa.
WDY	Radio Corp. of America, Roselle Park, N. J.
WHAF	Radio Electric Co., Pittsburgh, Pa.
WJK	Service Radio Equipment Co., Toledo, Ohio.
WJAE	Texas Radio Syndicate, San Antonio, Tex.
WDV	Yeiser, Jr., John O., Omaha, Neb.

Radiograms

THE suggestion has been made that a course in the practical building of radio sets be established in the manual training departments of the public schools of the country. No better training for a boy could be imagined than this.

* * *

IN its issue for October 7, 1923, *Radio World* published a list, complete to that date, of the broadcasting stations of the United States and Canada. In earlier issues had appeared other complete lists. In response to numerous inquiries, *RADIO WORLD* is preparing another list of broadcasters which will be corrected up to the date of publication in an early issue.

* * *

A SNAPSHOT, taken by a wireless operator on a small Pacific coastwise steamer, is the latest clue in the possession of the authorities in the nation-wide hunt for Clara Phillips, former chorus girl, the escaped hammer murderess. The picture was taken secretly when the wireless operator, disguised as a waiter, carried a meal into the cabin occupied by the supposed "tiger woman."

* * *

DURING the year 1919 only 50,000 words were transmitted by Italian radio stations. Based on the year 1922 it is estimated that in 1923 Italian radio stations will transmit 7,000,000 words. Station IDO, Rome, operating on the 11,000-meter wave length, sends press messages direct to the *New York Times* radio-receiving station daily at 12 o'clock and 5 p. m. A new station at Coltano soon will be in operation with sufficient power to send traffic direct to New York.

LOHENGRIN" was the second complete opera to be broadcast from WJZ, following the success of "Die Meistersinger," which was given at the Manhattan Opera House to the radio audience via the Radio Corporation-Westinghouse station in Newark, New Jersey.

* * *

A WIRELESS press dispatch from Berlin, Germany, to the *New York Times* states that during the last few days experiments with a new system of wireless telephoning were made from a new sending station near Berlin. Letters received from Holland and Switzerland brought news that the German electric waves did not progress on their mission without fierce opposition from the Eiffel Tower in Paris.

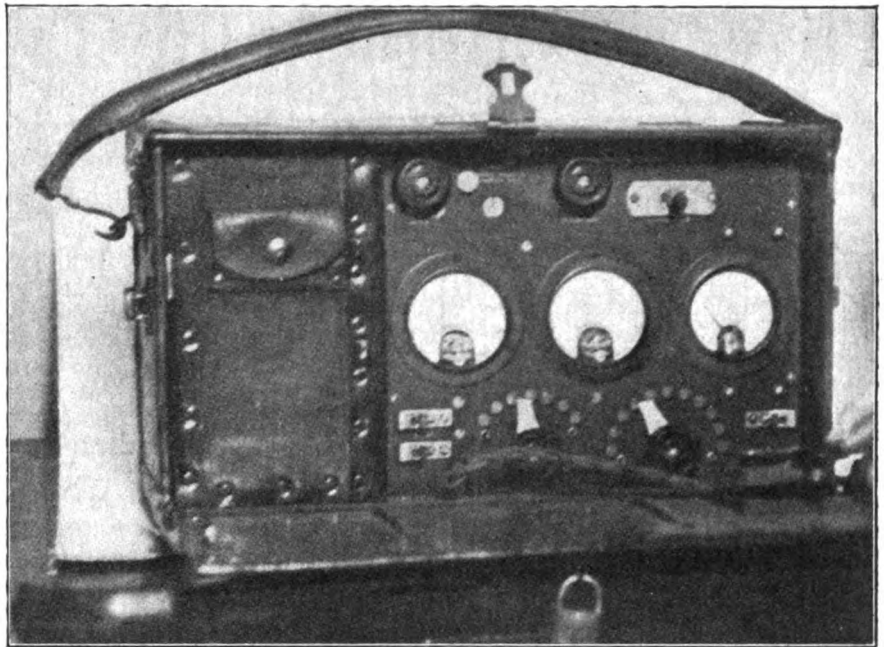
* * *

THE American Telephone and Telegraph Company proposes to increase its capital stock from the present authorized total of \$750,000,000 to \$1,000,000,000. If approved by stockholders, who will meet on March 27, this will make the company the largest corporation in the United States. No new stock offering is contemplated in 1923. The additional stock is needed to meet commitments under the offer made stockholders on August 24 last; for conversion of convertible bonds and for subscriptions already made under the employees' stock plan. During the year 1922 over 600,000 stations were added to the Bell System, a larger increase than in any preceding year, bringing the total to more than 14,000,000. Studies and experiments in wireless telephony have also been continued. The annual report refers to the series of trans-oceanic experiments which were undertaken by the company late in the year, which culminated in continuous messages being sent for a period of about two hours on January 14, 1922, which were distinctly heard in London.

The Royal Flying Corps Designs a Compact Set

(C. Photonews, N. Y.)

The portable set designed by the Royal Flying Corps and used by them in great numbers. This set is enclosed in a leather case, smaller than the regulation suitcase, and is absolutely complete in itself. When not in use the cover folds up and the set can then be carried wherever it is necessary, with no more trouble than taking your dress suit to the train.



THE Royal Flying Corps, of England, recently brought out a portable transmitter and receiver which for utility and usefulness, goes a long way toward being a perfect instrument. It is all contained in a small suitcase and when not in use can be carried very easily from place to place. In the matter of size, it is much smaller than the regular dress suit case, as can be seen by comparing the size of the meters and switches in the illustration herewith with the width of the case itself.

The compartment on the extreme left houses the necessary batteries for the operation of the set, in case the current that generally is furnished by the small

generators on the airplane should go out of commission. They are of course small and not capable of delivering much power, and therefore cannot be expected to operate the set over long distances.

The meters shown in the center are for the determination of the different current values such as the radiation current, etc., when the set is used in the air. This, of course, furnishes the operator with an accurate check on all his instruments and he can tell how his signals are going out.

The receiver is of the type in which the coupling is fixed, and the variation of the inductances is accomplished by means of the switches shown.



London Restaurant Provides Radio for Patrons

(C. Keystone View Co.)

Four ardent English radio fans who have adopted an up-to-date restaurant in London as their recreation point because of the fact that the owner and proprietor of the restaurant has very thoughtfully equipped all the tables with receiving sets. A good way to draw trade and a tip American restaurateurs.

WHAT is probably one of the most novel developments in the way of radio entertainment was recently brought out by an enterprising London restaurateur. He had noticed that a great many of his patrons were radio fans and that instead of sitting quietly at the table after a bit of food they would all put on their hats and "go up to Romey's 'ouse, to listen to the radio." Now that couldn't be allowed. It was simply unbearable to the proprietor to see his trade jog away in such fashion. So he thought and thought and finally questioned himself something like the following: "Why not put up one of the bally things, and then instead of going to Romey's 'ouse, why they'll sit 'ere and henjoy a quiet

cup o' tea." No sooner said than done, and now the happy patrons can sit in "Jackie's" and have their bit to eat and then listen in at the same time they are having a quiet little game of rummy.

This innovation has not only helped the restaurant keeper to retain his old trade, but it has attracted a lot of new customers to his place because "it's the only place in deah ol' Lunnon where you can listen in while you're having your joint and ale."

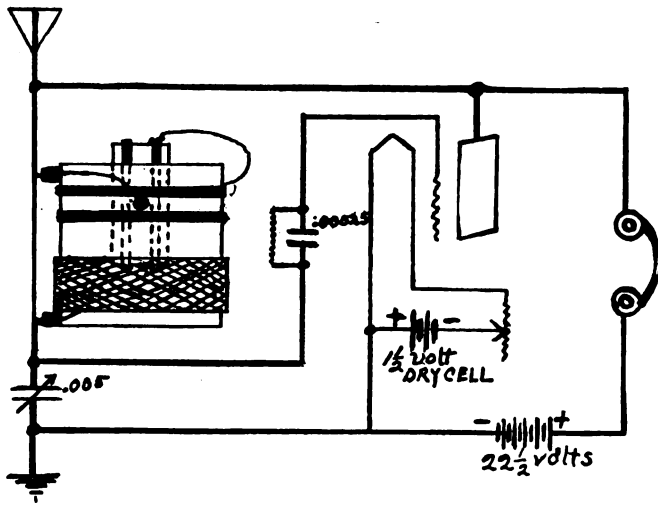
The above statement is not a mere supposition, but is an actual fact as can be seen by the illustration herewith, where is seen a group of radio fans enjoying a radio concert, while in the midst of an exciting game of "nap," a game that is somewhat similar to our rummy.

How to Build a One Tube Dry Cell Set

By P. F. Albright

SINCE the publication of the report of my DX record with my WD-11 one tube dry cell set in RADIO WORLD of February 10, 1923, I have been fairly buried in inquiries from every state in the Union for a detailed description of my set. It is impossible for me to answer each inquiry directly. I am, therefore, asking RADIO WORLD to publish the following brief description of my set.

I do not claim that I have anything revolutionary in radio, but I do know that my set works, and works wonderfully well, for as I am writing, at Englewood, Col., I am hearing with surprising volume and clearness a program being broadcasted over Radio WSY, Birmingham, Alabama, by the Booker T. Washington Glee



Club, of the Tuskegee Institute. I see no reason why any one cannot duplicate my experience, if he follows the description and uses care and patience in the construction of his set.

The only change I made in the Miller circuit as published in RADIO WORLD was the substitution of a specially wound inductance for the regulation fifty-turn honeycomb coil. This inductance was made as follows: At one end of a cardboard tube three inches in diameter and three inches long I wound fifty turns of No. 22 DCC wire honeycomb style. On the remainder of the tube was wound eight single turns of the same wire—plain winding—in two groups of four turns

each and connected to the inner end of the honeycomb winding. The two groups of four turns each function as the stator of a miniature variometer and are spaced about three-eighths of an inch apart so as to allow for a shaft carrying a rotor in the form of another cardboard tube one inch in length and of as large diameter as will turn in the larger tube and clear. This is also wound with eight turns of the same wire and spaced as on the stator, and is mounted on the shaft so that the rotor windings come directly under the stator windings. The coils of the rotor, stator and honeycomb coil are connected in series and placed in the circuit so that the aerial lead goes first through the rotor, then the stator, then through the honeycomb coil. This little variometer acts as a vernier on the inductance and accounts for the fine selectivity of the set. As many as six different stations have been tuned in within the range of a 100 degree dial without changing the condenser setting, and I am able to separate two stations with a movement of but four or five degrees on the dial.

I am giving herewith a diagram of the circuit and the values of the parts. I want to assure you that too much attention cannot be given to the grid leak as it is extremely critical. I used a Remler of the pencil mark type and a very hard pencil and then found that its adjustment required considerable patience. The rheostat must be of the vernier type for long distance work and the more sensitive it is the better. Mine is home-made. My set is wired with No. 14 tinned copper wire and every possible joint soldered. The parts are mounted on a 6x12 inch bakelite panel and carefully shielded with tinfoil and grounded. Mount the inductance as far from the variable condenser as possible to avoid capacity effects while tuning. My aerial is stranded copper 100 feet long and 25 feet high with lead-in at one end. A good ground is essential. Mine is a water pipe with connection made as near the entrance from the street as possible. These things may seem of minor importance, but I have found that one cannot be too fussy about such things as good ground, soldered joints, etc., if he expects his set to reach out and bring in the distant stations.

I shall be interested to hear from brother DX Night Owls who build their sets from this description telling me about their results.

Amateurs Increase 601 Since January 1

THERE is still great interest in amateur radio telegraphy. This fact is shown by the increase in general and restricted amateur licenses issued by the Department of Commerce since January 1, which number 601. On January 1, there were 17,102 amateur licenses in effect, and on March 1, there were 17,703.

These figures do not include 617 other non-commercial stations, which comprise 134 technical and training school stations, 297 experimental and 186 special amateur stations.

The distribution of special amateur licenses by districts is as follows, showing the Chicago District, including northern peninsula of Michigan, Wisconsin, Illinois, Kentucky, Indiana, Minnesota, Iowa, Missouri,

North and South Dakota, Nebraska, Kansas and Colorado, points:

District	Headquarters	Total March 1
1.	Boston	2,490
2.	New York	2,589
3.	Baltimore	1,919
4.	Norfolk	420
5.	New Orleans	825
6.	San Francisco	2,019
7.	Seattle	863
8.	Detroit	2,749
9.	Chicago	3,729
Total	Special amateurs	17,703

A One Tube Super-Regenerative Loop Receiver

By *W. S. Thompson*

THE trend in modern receiving sets seems to be toward simplicity in tuning and construction. This gives rise to the problem of simplifying the best circuits without losing their advantages. Probably the most powerful amplifier of signals that is known today is the set that Major Armstrong calls his "flivver." This set can be built using one, two or three tubes, depending upon whether each tube has one or more duties to perform. In the one-tube set one might say that the tube is made to work overtime, but as long as one tube can accomplish the work satisfactorily it would be extravagant to use more.

Our problem, then, is to design a one-tube, super-regenerative set, making the tuning and the construction as simple as possible without losing the tremendous amplifying power that is a characteristic of this circuit.

A loop to pick up signals is used because there seems to be no advantage in using an outdoor antenna. If we use an antenna and couple it to this set the coupling will have to be so loose to eliminate noise that we gain no signal strength. The simplest way to tune the grid circuit of a set using a loop is to make the loop of the correct number of

nearby stations than a long-distance receiver. For use on 360 to 400 meter work it will give amplification enough so that, using a good loud speaker, it will fill a small room when the station is within a radius of 75 miles. Therefore, this distance is practically the limit for broadcast entertainment. However, due to the peculiarities of the circuit, long-distance work may be expected on the amateur wave lengths. The above causes the writer to recommend this

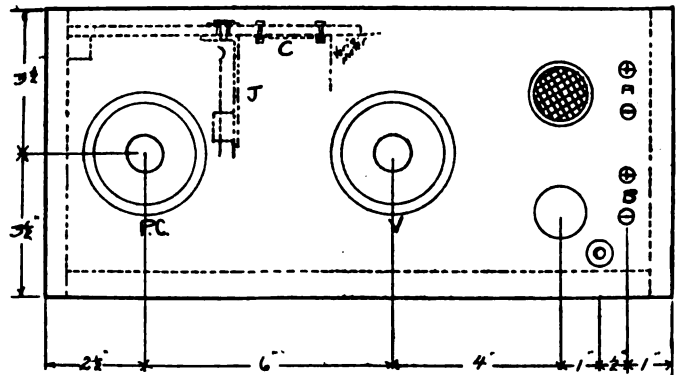


Fig. 2. Front view of panel layout, showing the method of mounting the jack on sub-panel so as to allow ease of manipulation of the loop.

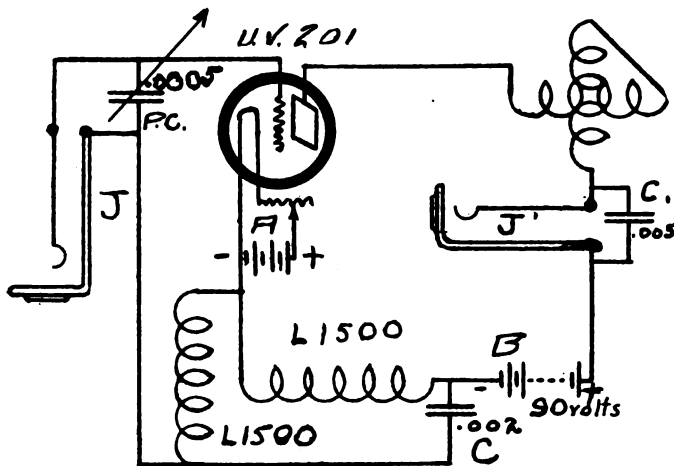


Fig. 1. Diagram of the super-regenerative set as described in the accompanying text. The jack J1 is for the insertion of either loop or antenna and ground.

turns and tune with a condenser in parallel with it. But to effect regeneration we must have a coupling between the grid and the plate circuits, so we will use the internal capacity of the tube for this purpose. This means we must have a tuned plate circuit, which is accomplished by placing a variometer in this circuit. The advantages of this type of regeneration are many, and, inasmuch as it suited our purpose, it was used. The next detail was how to make the tube oscillate at the high frequency necessary in this circuit. The usual method is to place in the grid and plate circuits honeycomb coils of high inductance, shunt them with variable condensers and couple them inductively. This method means that the operator must adjust the two condensers and the variable coupling in order to tune. By matching the honeycomb coils, omitting the variable condensers and coupling the coils with the fixed condenser, this part of the set needs no attention at all after once built. A rheostat for varying the filament current is necessary; so in the completed set there are only two tuning controls and the rheostat.

A word as to the advantages and limitations of this set. Primarily, it is more of a power amplifier for signals from

set for home entertainment when near a broadcasting station or for a good long-distance receiver for short wave length work. The values for the constants that will allow either use have been given.

As to the construction, the writer does not want to bind the builder to any fixed measurements, but to give a few suggestions and pointers that may make the task a little simpler and the product a little better. A good loop can be made by winding ten turns of No. 18 copper wire around a form three feet square, spacing the wires about 1/2 inch apart. On the bottom of the vertical standard attach the brass parts of an ordinary torpedo plug. Most plugs easily can be fixed for this purpose by removing the tip posts and screwing the plug to the loop.

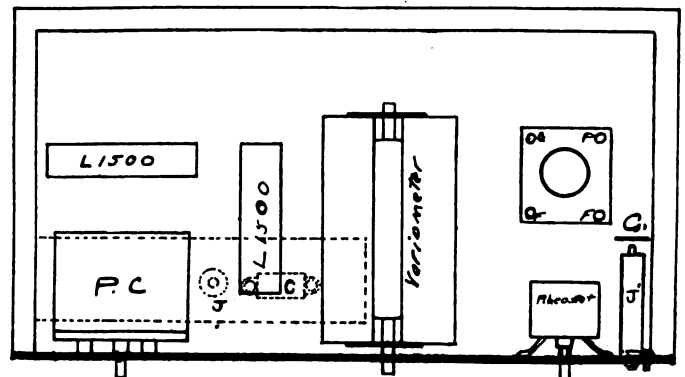


Fig. 3. Top view, showing the method of mounting all the instruments. Note the fact that the two honeycomb coils are mounted at right angles.

In Figures 2 and 3 the dotted lines represent the mounting of jack J for the loop and the coupling condenser C on a sub-panel back of the main panel. This sub-panel, as shown, is fastened to the top of the variometer and to a cleat on the end of the cabinet, or to a panel brace if the set is not to be enclosed in a cabinet. The sub-panel should

(Continued on next page)

Radio Control Up to Secretary Hoover

THE White radio bill died in committee along with a number of other important legislative documents when the 67th Congress adjourned on March 4th. The House and Senate do not convene until December 4th, when a new bill probably will be introduced—but that is nine months away.

Whether Secretary Hoover can manage to keep the ether from getting more jammed with broadcasts and other radio communications without legislation, remains to be seen. Lack of a new law makes it necessary for the Department of Commerce to continue under legislation enacted ten years ago when broadcasting was unknown and there were few commercial and amateur stations.

It is probable that the Secretary will undertake the partial re-allocation of wave lengths, within the limits of the existing radio law, in an effort to reduce interference and make for peace in the ether.

Just what plans the Department of Commerce has for improving conditions in the present radio pandemonium are not known but a plan for execution within a few months is being worked out, it is understood.

The decision of the District Court of Appeals requiring the Secretary of Commerce to re-issue a license to the Inter-City Radio Company of New York, although that station had been severely complained of due to interference will be appealed.

Secretary Hoover and his solicitor have taken the matter up with the Attorney General's office requesting that the case be appealed to the Supreme Court of the United States. It was the action of the Court of Appeals that caused Secretary Hoover to state recently that: "This removes the last shred of the department's authority over radio."

RADIO WORLD'S ANNIVERSARY NUMBER

RADIO WORLD is now at work on its Special Anniversary Number, dated March 31, published March 28.

This issue will celebrate the beginning of the third volume of RADIO WORLD, the great national illustrated weekly.

Last page of red form goes to press March 19. Last page of last black form closes March 23.

Our regular advertising rates will be in force as follows:

One page: One time—\$150.00.
Half, Quarter, Third and Two-thirds pages at proportionate rates.
On inch, one time—\$5.00. Per agate line, \$0.40.
On four consecutive issues, 10 per cent discount.
On thirteen consecutive issues, 15 per cent discount.
Cover and preferred position rates made known on application.

No extra charge for advertisements in two colors if copy reaches this office on or before March 19.

If you want your advertisement printed in two colors in this unusually important special number, say so and have copy reach publication office on or before March 19.

RADIO WORLD has been increasing in circulation and influence every week, and this has been especially noticeable since the advent of 1923. The radio public has learned that the columns of this publication reflect the news and developments in radio weeks ahead of the monthly publications.

Write or send copy and order now and get the best possible publication value by being represented in the Special Anniversary Number of RADIO WORLD.

RADIO WORLD, 1493 Broadway, New York City.

(Continued from preceding page)

Mounting the apparatus back of the panel, as shown in Fig. 3, allows the grid coil to be very loosely coupled to the variometer, thus aiding to stabilize the regeneration. Standard fixed honeycomb coil mountings can be used for this purpose, although any mounting that the builder may wish to use will be satisfactory. By using a vernier condenser for tuning the loop and a vernier rheostat the results obtained will be well worth the added expense. In purchasing the phone condenser and the coupling condenser be sure and get mica condensers and a type which have the plates and mica held firmly together so there will be no chance for the capacity to change. Always remember that added expense in buying the best apparatus pays good interest by giving better results. The popularity of the A battery is very important, for the grid should have a normal negative potential for best results. The value for the B battery depends upon the tube used, remembering that high voltage usually means greater amplification. Very satisfactory results have been obtained using the tube shown, with 90 volts for B battery, although the best results were obtained using the Signal Corps' tube, VT2, with a higher plate voltage. The two honeycomb coils should be placed perpendicular to each other, using the value for the coupling condenser shown. This value can be changed to suit the builder if he desires to change the pitch of the high frequency note. All connections should be soldered; no wires should be close together or run parallel, and the panel should be shielded, grounding the shield to the A battery.

The following apparatus will be necessary:

1 Vernier air condenser, 0.0005 mfd.....	\$4.00
1 Variometer	5.00
1 Hars amplifier tube.....	6.50
1 Vernier rheostat	1.85
2 Single-circuit jacks	1.00
1 Mica condenser, 0.005 mfd.....	.40
1 Mica condenser, 0.002 mfd.....	.40
1 Vacuum tube socket.....	1.00
1 Panel	2.50
1 Sub-panel .....	.50
Wire, binding posts, etc.....	1.00

Total \$24.15

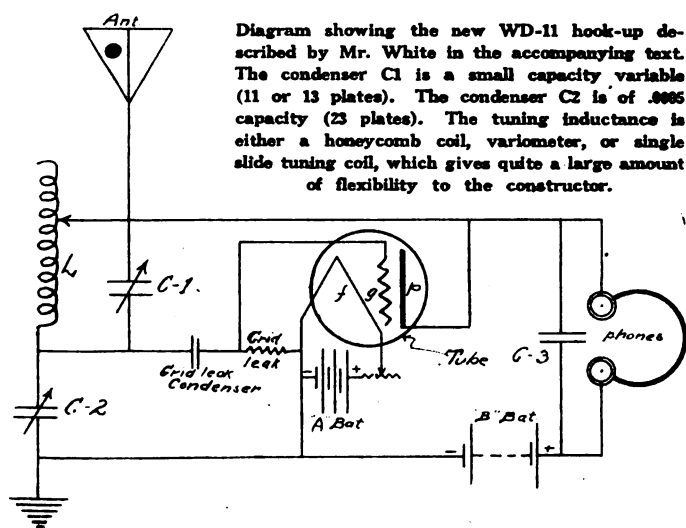
In tuning for the first time turn up the filament rheostat until a very high-pitched note is heard. The filament will usually be a little brighter than customary with the ordinary set. Now set the tuning condenser at about one-quarter mesh and then turn the variometer slowly. The first sign that the set is working properly is a roar that is always heard when a station is very nearly tuned in. When the correct setting is found this roar will stop and there will be no noise when the signals are being heard except those caused by static or other QRM. This set, due to its tremendous amplifying power, will amplify noises of the air so that there will always be some noise present, as with any other set; but this noise will not be found troublesome to any great extent.

Another WD-11 Hook-Up to Try Out

By C. White, Consulting Engineer

THE diagram herewith shows nothing more than a variation of the common type of direct feedback. This style of regenerative circuit has come into amateur popularity largely owing to the fact that with its use it becomes possible to secure a smoother adjustment for the critical regenerative point. With the ordinary feedback system the tickler coil is usually placed in series with the "B" batteries and the phones. As the coupling between the tickler and the main tuning inductance would be increased the adjustment would suddenly begin to get extremely sensitive. With some outfits this adjustment at the correct point would be so sensitive that it would be next to impossible to hold a distant station without the most critical tuning.

To receive distant stations with one tube or one tube and two stages of audio-frequency, the detector tube must be



held on the verge of oscillation, but must not at any time go into oscillation. This particular point is called the maximum regenerative point, and by holding tube at the desired point the greatest volume of the rectified signal is obtained. If, however, the tube slips or rather jumps into oscillation then it is necessary to turn the tickler controls back and try again to approach the right point. The circuit outlined in this article has the advantage of being able to approach the regenerative point with ease and smooth adjustment without getting sensitive and causing the tube to jump into violent oscillation.

Like most good circuits it has a drawback, which is the fact that the value of grid leak resistance and grid leak condenser capacity is very critical, but after it is once ascertained by experiment for the particular bulb that is being used, no further trouble is encountered. Aside from the determination of the grid leak units, the receiver is very flexible as to its other parts. Many slight changes can be made in the types of tuning inductances and arrangement of the condensers without destroying the efficiency of the circuit. The ambitious amateur will try out several changes and additions before placing the set in a cabinet. Hook the parts up, change them around, try out several different

values of grid leak units, change the polarity of the A battery, and purchase an A battery potentiometer if any other type of tube besides the WD-11 is employed.

The condenser C-1 is an air variable containing 11 or 13 plates. C-2 should be of the same type but should have at least 23 plates. The grid leak condenser should be a small mica condenser. With a circuit that is critical as to the value of grid leak units, it is never good practice to purchase any grid leak condenser other than a mica insulated one, because the capacities of other types, such as the paper ones, are apt to be too variable and not hold their calibrated capacity under all conditions. Likewise, the grid leak should be of a good make. The types of grid leak resistances that are mounted in small tubes are very reliable.

Of course, it would not be a bad idea to purchase a good variable mica grid condenser and a variable grid leak resistance. The condenser C-3 is nothing more than the customary phone bypass condenser having a capacity about .001 mfd. Sometimes when one pair of phones only is used, better results are obtainable when C-3 is removed completely from the circuit. With more than one pair of phones in the plate circuit the omission of C-3 will be attended by rather serious and noticeable distortion, especially when voice or music is being received. The tuning inductance L is very flexible. It can be either a simple single slider tuning coil, a spider web coil, a variometer, or a honeycomb coil, although a coil of variable inductance is here preferable. If you are changing over from an old crystal hook-up which used an ordinary tuning coil with one or more sliders, try the circuit out with it first. For panel mounting, however, another style of inductance must be employed, since the single slider tuner does not lend itself well to panel style of control as does the variometer.

The spider-web and the honeycomb are theoretically in the same class, since their inductance can not be varied evenly. Good results have been obtained with both owing to the fact that, because they are practically free from distributed capacity, sharper tuning and selectivity is readily possible. But, on the other hand, their use makes it necessary to be still more critical in the preliminary determination of the grid leak capacity and leak resistance. A spider web coil with taps can be constructed in order to obtain variable inductance. This coil should be wound with No. 24 D. C. C. magnet wire on a form with a two-inch inner diameter and a five to six-inch outer diameter.

Taps should be made about every ten turns. It is far better to purchase a good grade of spider web form already cut out of reliable insulating fiber instead of cutting one yourself from weak cardboard. A spider web coil with taps in this style of circuit will certainly work wonders in bringing in the distant fellows with only one dry cell tube. By winding your own spider web instead of purchasing a variometer you can save enough to purchase a panel, although with a spider web you will have to buy switch points and a switch arm. Some amateurs have found, however, with this type of receiver a spider web coil is superior to a variometer, although costing less to install.

United States Radio Exports in 1922

Radio exports shipped out of the country in December totaled \$163,236 in value, less than the total for November, which was \$223,180. The decrease is explained by officials of the Department of Commerce as due to large shipments of apparatus to Argentine in

November. In December, Canada took the largest amount valued at \$74,344.

Total exports of radio apparatus for 1922 amounted to \$2,897,799, being more than a thirtieth of the total electrical exports for the year, which amounted to over \$63,000,000.

Capital Radiations

By *Washington R. Service*

A RADIO-CONTROLLED drill was a feature of the Annapolis Gymkhana held recently. The midshipmen in the drill team wore Ku Klux costumes and in their conical helmets were installed small radio receiving sets. From a sending station on the roof of the gymnasium, instructions were issued to the men in the drill. These were the only directions they received, yet they are said to have executed their orders in absolute unison. From another radio set the sound of a drum was furnished, to which they kept step. The whole gymnasium was quiet and the drill of the white costumed figures was weird due to the lack of audible orders.

* * *

A pathetic letter from a blind man in Highmore, S. D., was received by the Department of Commerce asking which branch of the Government was distributing radio receiving sets to blind people. The department radio officials were forced to reply that the department had no sets to distribute and knew of no appropriation from which such donations could be made. It occurred to the government officials, however, that there was an opportunity for some charitable organization to perform a great public service for those who cannot see. Most blind, they point out, have no means of receiving information or instruction except when they are read to. Since radio offers an audible means of instruction and entertainment and 570 broadcasting stations furnish programs free during practically every hour of the day, Government radio experts urge that a fund be started from which inexpensive radio receiving sets could be purchased for those unfortunates who are forced to spend their days in darkness. Radio broadcasters are furnishing the material, and some believe there are individuals or organizations who will bring these broadcasts to the ears of those who need them most of all.

* * *

France has introduced a new method of communication which combines the postal and radio service with her colonies. A service called "radio letters" has been established which, when printed, may be mailed to the transmitting station, radioed to a receiving station and there mailed to their destinations. The charge is said

to include postage at both ends of the route and two-thirds of the regular radio charges. The minimum involves a rate applicable to a twenty-word message. Radio letters follow the regular radiograms daily or are moved the second day as day messages.

* * *

A circular describing how to build a tube set, the third pamphlet on radio construction to be published by the Bureau of Standards, is now available from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents. Write for Circular 133, "Description and Operation of an Electron-Tube Detector Unit for Simple Radio Receiving Outfits."

* * *

The Mississippi River is now the dividing line between the "K" calls of the West and the "W" calls of the East, as far as broadcasting stations are concerned. All new calls issued to broadcasting stations east of the Mississippi will begin with "W" and those west with "K," so the stations can be immediately identified as Atlantic or Pacific when the initial letter is heard. The stations already listed under "K," including KDKA, will retain their original calls.

* * *

The air traffic commissioner of Denmark recently ruled that all airplanes must be equipped with wireless telephone apparatus. This is held as an important advance in both aviation and communication in Denmark. It is a progressive step not yet taken in the United States. Although ships of the sea must be so equipped, aircraft do as they please. After many accidents in aerial traffic over sea routes, with some loss of life, two aerial navigation lines have voluntarily begun to equip their aircraft with radio as a safety precaution. Rear Admiral Moffett, chief of the Naval Bureau of Aeronautics, pointed out the necessity of radio equipment or at least pigeons on all aircraft several months ago. All army and naval planes are radio-equipped, at least when on long distance trips, and in addition carry pigeons. The need of legislation for aircraft and aerial navigation already has been pointed out by many American experts.

Government Warning to Broadcasters

THE Department of Commerce has advised broadcasters, through the medium of the Radio Service Bulletin, that they must comply with regulations and confine their radio activities to broadcasting. A broadcasting license does not permit special tests of radio-telephone or telegraph apparatus, communication with specific stations, either ashore or at sea, or any transmission except entertainment, market and weather reports, and news on 360 or 400 meters, as the license may specify.

Some stations have stopped acknowledging letters, telegrams and telephone calls, but they talk to one another, conduct contests, which approximate advertising, and some carry on experiments of various kinds. This practice has become so general that the departmental officials state some new regulations may have to be provided. Special licenses and waves are necessary for code work, station-to-station transmission and experimental work. There are too many stations licensed for such operation now, it is explained,

and when the broadcasters enter this field the interference increases.

All station owners are advised to give their licenses the "once over" and familiarize themselves with exactly what they are permitted to do.

In the interests of life-saving at sea, based upon "SOS" calls, broadcasting stations are cautioned by the Department of Commerce to maintain a careful watch while sending so that they can cease instantly when a distress call is heard and not interfere with the distress signals and messages relating thereto.

This applies particularly on and near the sea coasts. Recently four vessels issued distress calls near Seattle, Washington, on the same day, but so far as was reported by inspectors no broadcasters happened to interfere. The law provides a penalty in the event of interference with "SOS" calls, as is set forth in Section 4, Act of August 13, 1912.

Methods of Measuring Properties of Electron Tubes

Determination of Direct-Current Characteristics and Power Output of Generator Tubes

THIS determination is the usual step-by-step method of determining the characteristic curves as described in any book on radio measurements (such as Bureau of Standards Circular 74, p. 203). Fig. 3 shows the measuring instruments that are necessary and the factors that it may be desirable to vary. The arrangement that has been found convenient to use is shown in Fig. 4 in which

1. Switch for connecting either milliammeter or sensitive galvanometer in the grid circuit.
2. Grid ammeter short circuiting switch.
3. Reversing switch for grid ammeter.
4. Reversing switch for grid voltage.
5. Switch and terminals for connecting grid voltmeter.
6. Switch for connecting R_3 in parallel with R_2 .
7. Switch for connecting to plate or small tube or terminal at 18.
8. Grid return switch, connecting to + or - side of filament.
9. Filament voltmeter connecting switch.
10. Plate ammeter short circuiting switch and terminals.
11. Plate voltmeter switch and terminals.
12. Plate voltage disconnecting switch.
13. Plate voltage disconnecting switch.
14. Grid voltage terminals.
15. Grid voltmeter.
16. Filament voltage terminals.
17. Standard receiving tube socket.
18. Terminals for non-standard or high power tube.
19. Plate voltmeter.
20. Short circuiting switch and terminals for plate impedance.
21. Short circuiting switch and terminals for grid impedance.
22. [Terminals for plate voltage.
23.]
24. Galvanometer shunt.
25. Grid milliammeter.
26. Filament voltmeter.
27. Filament ammeter.
28. Plate milliammeter.
29. Grid voltage disconnecting switch.
30. Filament voltage disconnecting switch.
- C_1 Mica condenser 0.2 /uf capacity.
- C_2 Mica condensers 0.1 /uf capacity.
- R_1 Grid voltage divider, 3,000 ohms.
- R_2 Filament rheostat, fine adjustment.
- R_3 Filament rheostat, rough adjustment.
- R_4 Plate voltage divider, 2,000 ohms.

The operations necessary to obtain the characteristic curves of electron tubes consist of making filament, grid, and plate current measurements with the filament, grid and plate voltages set at any desired value varying one of these by steps over a range sufficient to give the desired curve.

The tube under test is placed in the socket, 17, and switch 7 thrown to the left, if it is a standard receiving or low power transmitting tube, or connected to the terminals, 18, and switch 7 thrown to the right if the tube is non-standard or for high power. The plate circuit is disconnected from the socket 17 and connected to terminal P at 18 for high power tubes in order to prevent a break down of the insulation on the small socket when the high voltage used on large tubes is applied. Switches 20 and 21 are closed.

The grid voltage, of a value slightly higher than the highest required for the measurement is applied to the terminals, 14, and connected by the switch, 29, which is fused with 0.5 ampere fuse wire, to the voltage divider R_1 , and by moving the slider on R_1 the voltage applied to the tube may be varied continuously from zero to the value applied at 14. This voltage is measured by the voltmeter, 15, when switch 5 is closed, and may be reversed by means of switch 4; the grid being positive with 4 to the right and negative with 4 to the left. The grid voltage is ordinarily measured from the negative side of the filament, but by means of switch 8, the grid return may be connected to either side of the filament, to the negative with 8 left and positive with 8 right.

The grid current is read on the milliammeter 25, or on the sensitive galvanometer, either one of which is connected in the grid circuit by switch 1. The milliammeter is used to measure grid currents of about 0.02 to 200 milliamperes, but for smaller currents, the more sensitive galvanometer is used. Its sensitivity can be varied by the shunt 24, calibrations being necessary for each value of the shunt resistance. In order to measure current flowing in either direction, the reversing switch 3 is provided, the current flow being positive, i.e., from grid to filament in the tube, when 3 is to the right, and negative with 3 to the left. The

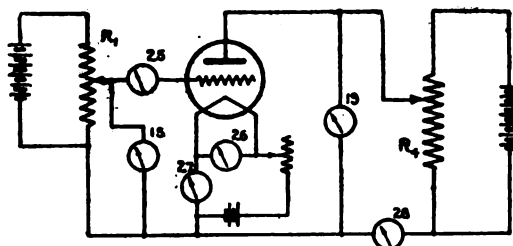


FIG. 3.
SIMPLIFIED DIAGRAM OF CHARACTERISTIC CURVE SET-UP

grid voltage divider and measuring instruments are shunted by the condenser C_1 , to bypass radio-frequency current when this circuit is used to make the power output measurements described below.

The filament voltage is applied to terminals 16, and connected by switch 30, through the filament ammeter 27, and rheostat R_2 and R_3 to the filament terminals of 17 and 18, the voltage across the filament terminals being indicated by voltmeter 26 when switch 9 is closed. This switch should always be open when adjusting the filament current as the current taken by the voltmeter flows through the ammeter 27 and may cause appreciable error, particularly with tubes using a small filament current.

The plate voltage is connected to terminals 22 and 23. The voltage on 23 should not exceed about 200 volts as it is connected through switch 13 to the voltage divider R_4 , any higher voltage necessary being connected to terminals 22. Since 22 and 23 are in series, connection should be made to both of these in order to complete the plate circuit. Switches 12 and 13 are fused with 0.5 ampere fuse wire.

By changing the slider on R_4 , the plate voltage is varied over a range afforded by the voltage connected to 23, and

(Continued on next page)

(Continued from preceding page)

the total voltage applied to the plate, being the sum of that obtained from the voltage divider and that connected to 22, is measured by the voltmeter 19. By means of switch 11, the voltmeter can be connected directly to the plate (switch 11 to left) so as to measure the actual voltage acting between plate and filament, or (11 to right) to the positive side of the voltage supply to measure the voltage applied to the circuit, excluding the drop across any impedance inserted in the circuit at 20. For ordinary characteristics 11 is thrown to the left and switches 20 and 21 are closed.

The plate current is read on the milliammeter 28, which is in series in the plate circuit and can be short-circuited by the switch 10, when not in use. The capacity C_2 is shunted across the voltage supply and measuring instruments to bypass high-frequency current when this circuit is used for power output measurements.

Measurements for the two most important characteristic curves having grid and plate current plotted against grid voltage, with constant filament current and plate voltage are made simultaneously. With the tube in place, and the proper voltages connected, the filament current is adjusted to its proper value, having switch 9 open while reading the current, the plate voltage adjusted and the grid voltage increased toward the negative (switch 4 to the left) until the plate current has been decreased to zero, reading the grid voltage and current. Now the grid voltage is decreased to zero by steps, at each setting the grid voltage and current and plate current being recorded, then switch 4 is thrown to the right and the voltage increased positively, readings being made as before. The plate voltage is read each time to insure that it remains constant. The filament current will vary according to the amount of electron current flowing in the tube. When a positive grid voltage is applied to the tube, great care should be taken to prevent the high plate current from overheating the tube, by leaving the grid voltage on no longer than necessary to obtain readings. This applies more to power tubes than receiving tubes, since high grid voltages are not necessary for receiving tube characteristics. When the grid voltage has been varied over a range sufficient for the characteristic, a few check points are taken to insure that the tube has remained constant during the run.

It may be found necessary to adjust the plate voltage each time readings are made as there may be an appreciable voltage drop in the plate voltage divider, R_4 caused by the plate current, which changes as the grid voltage is varied.

Tubes should be left with the filament burning and the normal plate voltage applied for 2 to 5 minutes before making measurements.

Other characteristics may be obtained in a like manner, adjusting the voltages or currents it is desired to hold constant first, then varying the remaining ones by steps.

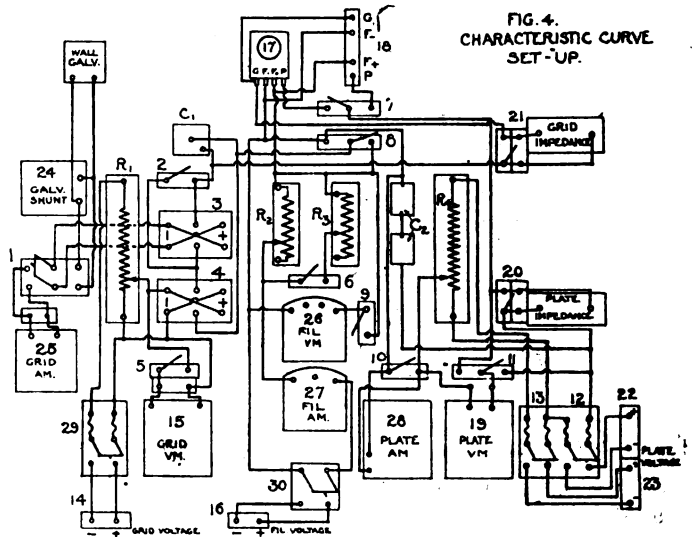
(2) Power Output Measurements.

The arrangements shown in Fig. 4 may be used to control and measure the various currents and voltages of the electron tube when it is used to furnish power to a tuned circuit. The power output of a tube under any fixed condition can be measured by the use of this circuit. For the case of an inductively-coupled circuit Fig. 5 shows the arrangement used, the notation being the same as in Fig. 4.

Measurements are made by connecting to the terminals 20, Fig. 4, a suitable radio-frequency oscillatory circuit of known constants. After adjusting the tubes to the desired operating conditions, the radio frequency current is measured, and the power calculated from the circuit resistance and current. Several coils of varying sizes are provided for the grid and plate coupling coils. The plate and grid coils are respectively mounted on the terminal blocks 20 and 21. If an inductively-coupled circuit such as the "Meissner Circuit" is used (see Bureau of Standards Circular 74, p. 210, Principles Underlying Radio Communication, p. 493) the coil for the tuned circuit is so constructed that the grid and plate coils fit into it and the coils are so

arranged that the mutual inductance between any two of them may be varied.

The tuned circuit containing a hot-wire ammeter is connected to the coils, the tube voltages adjusted to the desired value and the alternating current I recorded. The radio-frequency resistance R , is measured by means of the re-



sistance-variation method* at the frequency at which the circuit is used. The power output is, in watts:

$$P_o = I^2 R.$$

From the d. c. plate input voltage E_b , measured by voltmeter 19, and current I_p measured by milliammeter 28, the power input is in watts.

$$P = E_b I_p \text{ watts}$$

and the efficiency, disregarding the grid and filament power is

$$\frac{P_o}{P} = \frac{I^2 R}{E_b I_p}$$

Unless changes are made in the set-up connections a series plate voltage supply must be used. The capacity C_2 is connected across the plate power supply circuits, and

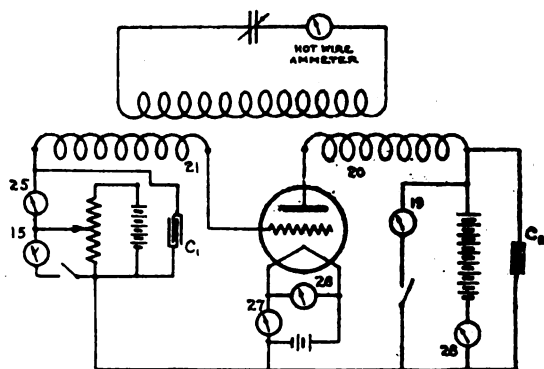


FIG. 5. SIMPLIFIED DIAGRAM OF CIRCUIT FOR MEASUREMENT OF POWER OUTPUT OF ELECTRON TUBES.

serves as a bypass for radio-frequency currents when the power measurement is made. The coupling coils and output coils provided are so constructed as to allow their use in direct coupled, semi-direct coupled or inductively coupled, output circuit.

*Bureau of Standards Circular 74, page 180.

(While this article is complete in itself, it will be followed by others on the same subject, and equally important. The first article in this series appeared in these pages last week.)

Radio and the Woman

By Crystal D. Tector

THE Japanese cook of a very influential lady in our town recently met our maid when going to market, and Mary reported something as follows: "Sure ma'am, but Kito sez th' madam nearly threw him out the house the other night becuz he strung the clothes up on the wireless that her husband put up, and wants to know if you know any nice lady in the city that needs a cook and don't have a wireless." I certainly have lots of friends, but when a cook draws the line at being employed by a person who possesses a radio set, I think that he is going too far. I don't believe that my friends would think of showing their faces in public unless their ears were red from wearing "the muffs."

* * *

A FRIEND of ours dropped in the other day and after we had a cup of tea, we naturally started in to talk "radio." She was very much interested, but couldn't understand "what all those little do-funny little diinkys are twisted for." Then I knew I was in for it, because there is nothing that I dislike more than explaining the theory of tuning to a novice, because they always say, "Oh! I see, then this is that and that is this," or words to that effect, and then I have to go all over it again and explain that this is not that but that that is that, and this is this. Am I right?

GIRLS, you ought to have been with F. H. and myself the other evening. We had the grandest ride in a radio equipped automobile. We went touring all over the city listening to the big broadcasting stations. Finally, the chauffeur was told to drive down to West Street, the location of WEAJ, and when we drew near, the volume of signals was so loud it absolutely was painful to your ears. I can imagine how loud the signals must be received by any one living near that station.

* * *

THE Orphan Asylum gave a party to the kiddies the other day and, of course, it had to be complete and up-to-date. So some of the foremost radio fans of our "metropolis" (according to F. H.) donated their sets and helped make the party a great success for the kiddies. I donated my (I should say our, because if F. H. sees this he will ask me since when "did you ever own a power amplifier") power amplifier and loud speaker and my next-door neighbor donated her husband's radio-frequency receiving set, and so between the whole lot of us the kiddies had a "radio fest." I never thought that a child could be so happy but those little dears just radiated happiness. If it weren't for the fact that the house couldn't hold them why I'd adopt every single soul of them.

WHEN YOU CAN HEAR THESE BROADCASTING STATIONS

(Evening Programs Only)

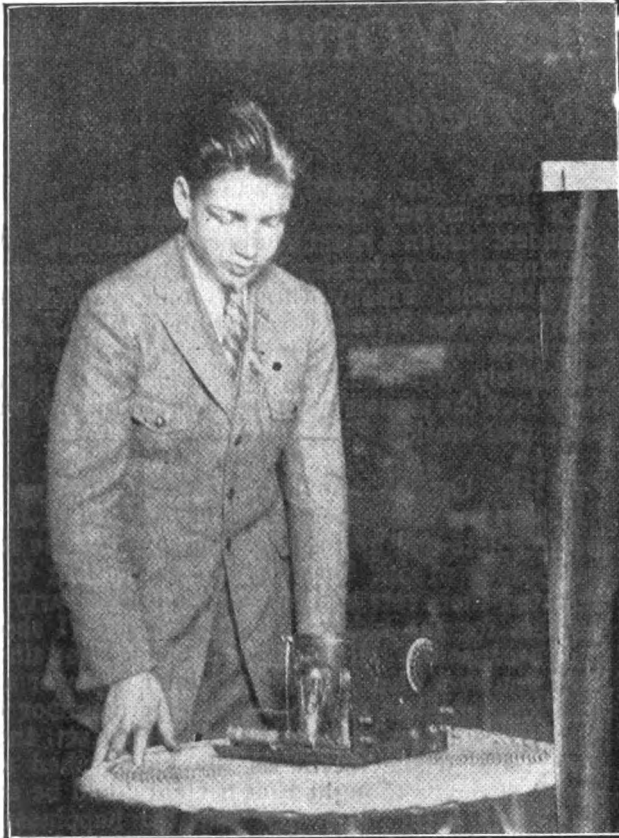
Call	W-L	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
Atlanta, Ga. ....WSB	400	10:45- 1:00	10:45- 1:00	10:45- 1:00	10:45- 1:00	10:45- 1:00	10:45- 1:00
Atlanta, Ga. ....WGM	400	10:30-11:30	10:30-11:30	10:30-11:30	10:30-11:30	10:30-11:30	10:30-11:30
Arlington, Va. ....NAA	710	6:45- 8:00	7:45- 8:40	8:00- 9:40	6:45- 8:40	8:00- 9:40	.....
Boston, Mass. ....WNAC	360	.....	7:00- 8:30	9:30-11:00	7:00- 8:30	8:00- 9:30	9:30-11:00
Buffalo, N. Y. ....WGR	360	7:30-10:00	7:30- 8:00	7:30-10:00	7:30- 8:00	7:30-10:00	.....
Chicago, Ill. ....KYW	400	9:00-10:30	9:00-10:30	9:00-10:30	9:00-10:30	9:00-10:30	9:00-10:30
Chicago, Ill. ....WMAQ	360	7:00- 9:15	7:00- 9:15	7:00- 9:15	7:00- 9:15	7:00- 9:15	7:00- 9:15
Chicago, Ill. ....WDAP	360	.....	11:00- 2:00	.....	11:00- 2:00	.....	11:15- 3:00
Cincinnati, O. ....WLW	360	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00	.....	.....
Dallas, Tex. ....WFAA	400	6:30- 8:30	6:30-11:00	.....	6:30-11:00	6:30- 8:30	6:30-11:00
Davenport, Ia. ....WOC	400	8:00	.....	8:00-10:00	8:30	8:00	8:00-10:30
Denver, Colo. ....KLZ	360	7:30	7:30	7:30	7:30	7:30	7:30
Dearborn, Mich. ....WWI	360	.....	.....	10:00-11:00	.....	.....	.....
Detroit, Mich. ....WCX	400	6:00- 7:30	6:00- 7:30	6:00- 7:30	6:00- 7:30	6:00- 7:30	6:00- 7:30
Detroit, Mich. ....WWJ	360	7:30- 9:30	7:30- 9:30	7:30- 9:30	7:30- 9:30	7:30- 9:30	7:30- 9:30
Havana, Cuba ....PWX	400	.....	.....	8:00- 9:30	.....	.....	8:00-11:30
Indianapolis, Ind. ....WLK	360	.....	8:30-10:00	.....	8:30-10:00	.....	.....
Kansas City, Mo. ....WDAF	400	8:00-10:00	.....	8:00-10:00	.....	8:00-10:00	.....
Kansas City, Mo. ....WHB	360	.....	8:00-10:00	.....	8:00-10:00	.....	8:00-10:00
Louisville, Ky. ....WHAS	360	.....	8:30-10:00	8:30-10:00	8:30-10:00	8:30-10:00	8:30-10:00
Lockport, N. Y. ....WMAK	360	9:15-10:00	9:15-10:00	.....	9:15-10:00	.....	.....
Los Angeles, Calif.†....KHJ	400	10:00	10:00	10:00	10:00	10:00	10:00
London, Eng. ....ZLO	369	*	.....	.....	.....	.....	.....
Medford Hillside ....WGI	360	5:00- 7:00	5:00-10:00	5:00- 8:30	5:00-11:00	5:00-11:00	5:30- 9:30
Minneapolis, Minn. ....WLAGL	400	10:00-12:30	.....	.....	10:10- 1:00	.....	8:30-11:00
Newark, N. J. ....WJZ	360	7:00-10:15	7:00-10:15	7:00-10:15	7:00-10:00	7:00-10:00	8:30-10:30
Pittsburgh, Pa. ....KDKA	360	6:15-10:00	6:00-10:00	6:15-10:00	6:00-10:00	6:15-10:00	6:00-10:00
Philadelphia, Pa. ....WFI	400	6:30- 7:00	6:30- 7:00	8:00-11:00	6:30- 7:00	10:00-12:00	8:30-10:00
Philadelphia, Pa. ....WOO	400	7:30-10:00	9:55-10:10	9:55-10:10	7:30-10:30	9:55-10:10	9:55-10:10
Schenectady, N. Y. ....WGY	400	7:45-10:00	7:45-10:00	.....	7:45-10:00	7:45-11:30	.....
St. Louis, Mo. ....KSD	400	9:00-12:30	9:00-11:00	9:00-11:00	.....	9:00-11:00	9:00-11:00
St. Louis, Mo. ....WCK	360	7:45- 9:00	.....	7:45- 9:00	.....	7:45- 9:00	.....
St. Louis, Mo. ....WMAJ	360	**	8:00	.....	.....	.....	.....
Springfield, Mass. ....WBZ	422	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00
Toronto, Can. ....CFCA	400	8:00- 9:00	8:00- 9:00	8:00- 9:00	8:00- 9:00	8:00- 9:00	8:00- 9:00
Troy, N. Y. ....WHAZ	360	8:00- 9:30	.....	8:00-10:00	.....	.....	.....

* Time not listed.

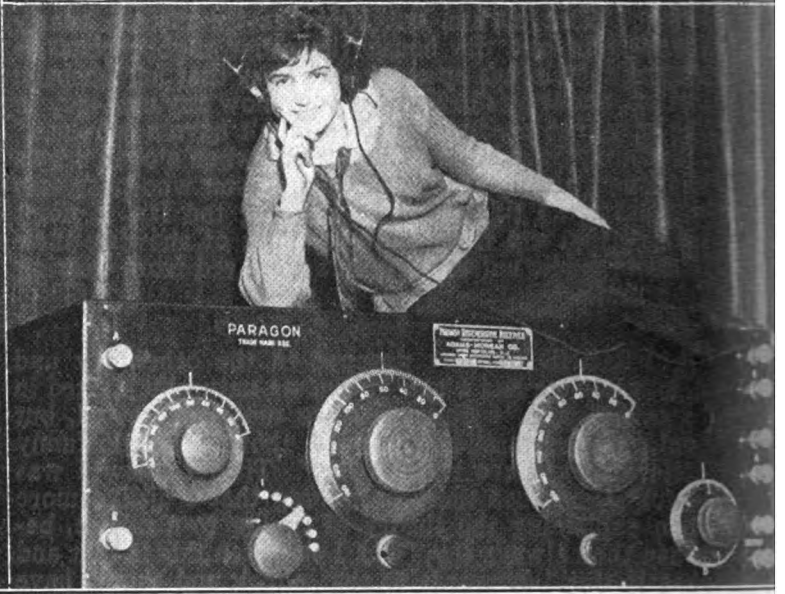
** Sunday—12:00-1:00 and 9:00-10:00 P. M. † Pacific Time.

Note—Type set in bold face is Central Standard Time. Light face type is Eastern Standard Time.

High Lights of the T Second Radio Dis Pictorially Presented



(C. Photonews)
K. Hiler, of Ridgewood, N. J., and his 10-watt transmitter which has been heard 2,000 miles east of New York City.



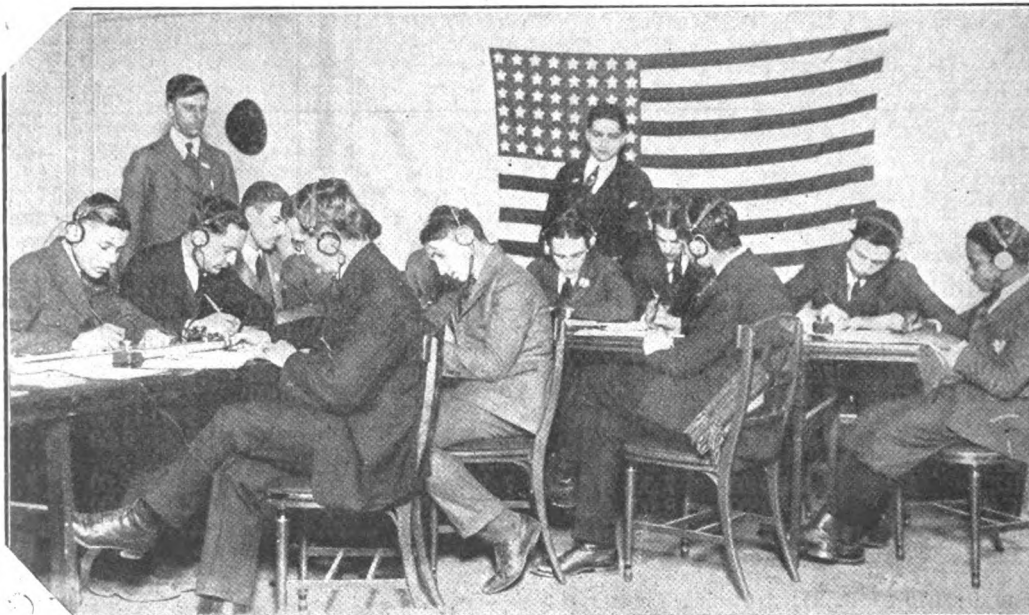
(C. Underwood and Underwood)
Rosalie Deneve, of New York, listening in on the huge Paragon set at the Second Annual Convention.

THE THIRD ANNUAL CONVENTION of the Second Radio District, held at the Hotel Pennsylvania, New York City, on March 1, 2 and 3, was the most successful up to date. From the standpoint of attendance the meeting overtopped those of former years, the attendance passing the 10,000 mark. At the banquet, held on the evening of the last day, the attendance was about 1,000. The speech of Mr. Droste, chairman of the Second District Convention, regarding the attitude of the amateurs and the broadcasters, and how their troubles were amicably settled was a feature of the banquet. Prominent amateurs were then called upon, and told to "Let the folks see what you look like." Some of those called upon were 2BK, 2OM, 2UA and his OW, who sometimes "pounds

the brass" at his station; 2BRB, 2BUL, 1CNI, 3XM, 9AWN and several other well known big-timers. A speech by Hiram Percy Maxim, the "big gun" of the American Radio Relay League, followed.

The next address on the program was by Radio Inspector Arthur Batchelor, who is a figure well known to all the eastern amateurs and very well known to several in particular. A little comedy was then staged. A young man who was supposed to represent CQ was turned loose and started in to run around in circles, much the same as the original CQ hounds do today. He was caught and brought before Judge Public Opinion who sentenced him to bread and water for life. F. B. OM.!

The next feature was Margaret Meerle, the Follies

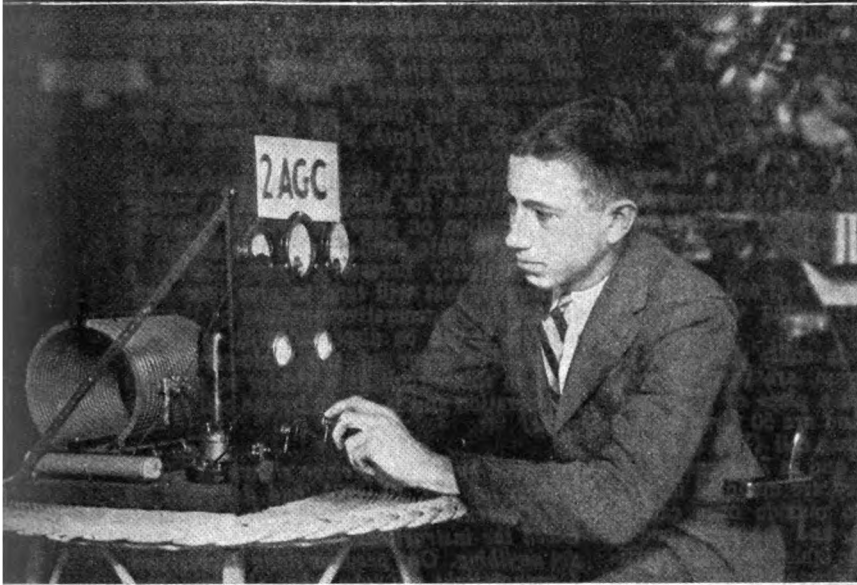


(C. Underwood and Underwood)
Department of Commerce, Radio Division Booth, during the code tests held as one of the features of this convention.

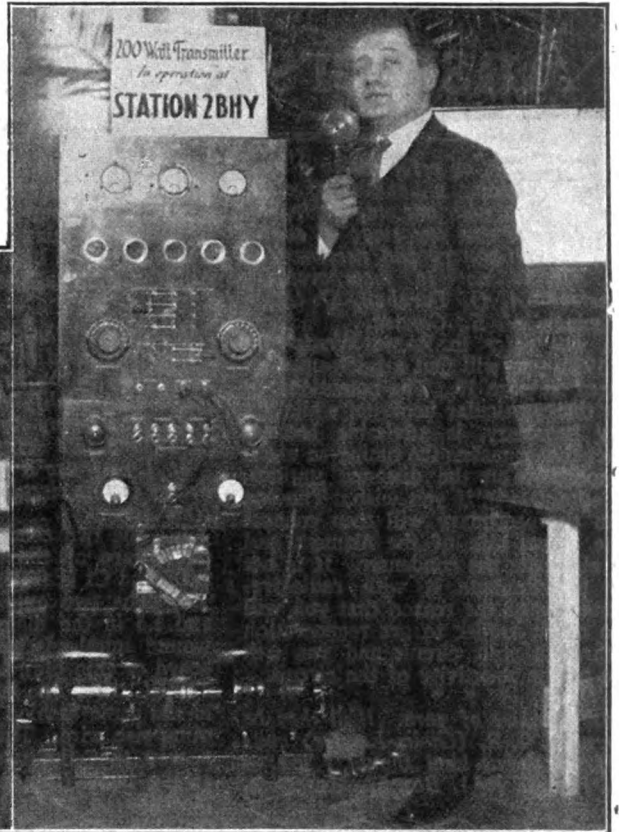


(C. Photonews)
Laurence M. Cockaday and his new room was one of the club features. He is on "the

Third Annual Convention, New York City Radio World Readers



(C. Photonews)
Transmitter of 2AGC, station of R. Neusch, New York City. It is of the 100 watt type, and has been heard in Switzerland during the recent tests.



(C. Photonews)
200 watt transmitter of Station 2BHY, owned by Chas. M. Srobroff, New York City. This was one of the club exhibits.

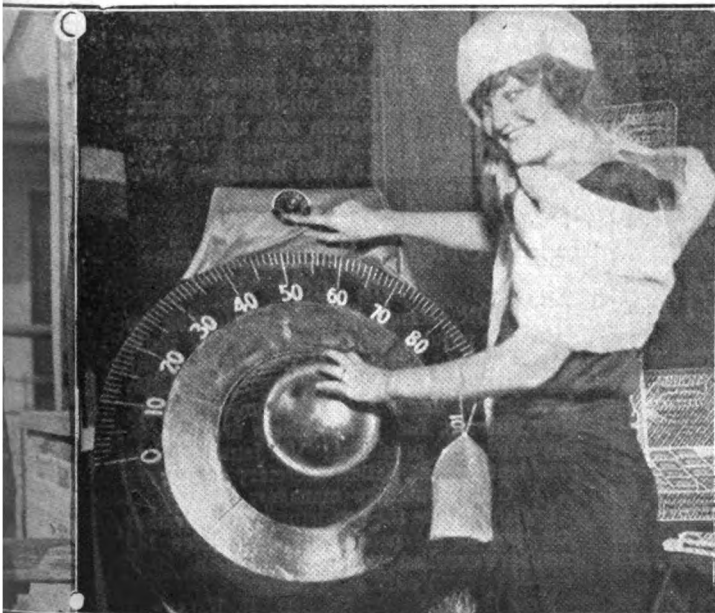
beauty, singing inside the monstrous Adams-Morgan Paragon set, which by the way was one of the features of the show. Mr. George Clark, of the Radio Corporation, next gave a humorous talk which caused the assemblage to roar with laughter. Numerous other men spoke and told stories, among whom were Kenneth B. Warner, wearing his two gallon plug hat; "Paragon" Paul Godley and Wm. F. Crosby.

This convention proved conclusively that more than ever is the interest in amateur radio increasing. In fact, it is growing to such an extent that it is simply impossible to estimate how things will stand next year at this time. The interest is not alone confined to the younger people, but the older ones are taking up the interest from a transmitting point and delight in telling

how fast they can "clean their hooks of all messages."

Some of the big features of the show were the transmitter of A. H. Grebe & Co. It was a 500-watt transmitter of the latest type and was specially licensed for three days, a provisional license being granted and the set inspected before the opening of the convention. Another of the big features was the immense set designed after the famous Paragon, and magnified several times. It was so large that it resembled an immense casket, decorated like a set. It sure did look handsome. Even if it would nearly fill a room, many an amateur would give his boots to own it.

On the whole the entire affair was an immense success, and the banquet was everything that was promised. The folks just had one "good old-fashioned time."



(C. Fotograms)
Mrs. Dorothy Decker, who "pounds brass" at Station 2UA, trying to operate the granddaddy of all Na-ald dials.



(C. Fotograms)
Miss Vaughn De Leath, the original radio girl, listening in on the new De Forest D10 reflex, while enjoying a few minutes rest.

Answers to Readers

KINDLY publish, or refer me to a back number containing a hook-up of a regenerative receiver with one stage of radio-frequency detector and one stage of audio-frequency, one A battery and necessary B batteries. It is not to incorporate a potentiometer?—A. O. Turnbull, 57 Union Street, Sydney, N. S., Canada.

If you will refer to RADIO WORLD for Feb. 24, 1923, you will find a hook-up such as you need on page 19. The potentiometer shown in that particular hook-up, while not absolutely necessary, is advisable because of the fact that it makes the tuning so much easier, especially on the distance stations. You can eliminate it, if you wish. The one lead from the secondary will then connect on to the minus side of the filament and that will eliminate the condenser. It is not advisable to eliminate it with radio-frequency, because of the reason that you will find it so much harder to get regeneration started through your circuit and you will lose a lot of the selectivity of the circuit.

I enclose samples of yarn. Will they be O. K. to wind G.-R. (Giblin-Remler) coils with? If not, what kind should I use?—Frank L. Pantell, R. 1, Box 57, Muscatine, Iowa.

The samples of yarn are a bit too thick. Preferably 4-ply yarn of the same type will do.

I enclose circuit that I have tried out. I could only get a loud hum when I used it. Can you tell me what is the trouble and how to remedy it?—E. J. Devereaux, Bakersfield, Cal.

The diagram you enclose has two errors. The first is that the antenna is connected in the wrong place. It should be attached to one end of the inductance instead of to the plate of the tube. The second error is that you have left off the ground connection. It should go to the other end of the inductance, preferably with a slider attached to enable you to get variation of inductance to tune the circuit. The circuit will work if you do this.

I am using the set constructed as explained by Ortherus Gordon in RADIO WORLD for Jan. 20, 1923. All that I can get is code and whistling. Can you tell me what is wrong? My antenna is 60 feet long and 36 feet high.—John Sambenini, 11924 Lafayette Avenue, Chicago, Ill.

The fact that you are getting code loud and clear is an indication that the set is working. You simply do not know how to tune it. We advise that you put a condenser in your antenna circuit, with which to tune your primary circuit. Do not burn your bulb too high. This will cause your tube to oscillate too violently and you will get the carrier wave of the station, but the voice will be so muffled that you will not be able to understand it. Reduce the B current. You may have a tube that does not use a lot of B battery and you may be forcing your tube.

You published a hook-up by John Kent in RADIO WORLD for Jan. 27, 1923. Will this set work with WD-11 tubes as detector and amplifier, or will it be necessary to use the U. V. 201 for amplification? Can I use U. V. 201 tubes as amplifiers for this circuit?—Edward G. Steffen, 10855 Divine Avenue, Detroit, Mich.

Yes, this circuit will work with WD-11 as amplifiers. It is not advisable to use the

U. V. 201 tubes as amplifiers with this circuit as it would necessitate your using both dry cells and storage cells for the filament current. As this circuit was devised to get away from the bother of using the storage cell, the advantage would be lost.

1. What is the value of condensers in the circuit published in RADIO WORLD for Feb. 3, 1923, page 14, by Fred J. Rumford, entitled "A New Amplifying Receiver"?

2. How many turns of wire on the coils L₁, L₂ and L₃? How are they mounted?

3. Can I use a three-plate variable condenser in this circuit?—R. W. Nass, Sussex, New Jersey.

1. The two condensers C and C₁ in this circuit are of the following values: C is .0005 and C₁ is .0005.

2. The two outside coils, shown as L₁ and L₃ in the diagram, are pancake coils, wound spiral-wise on a piece of stiff cardboard or thin fibre and are 50 turns of No. 22 SSC wire. The inner coil (L₂) is wound in the same fashion and is 75 turns of the same size wire. They are mounted in such a way that the two outside ones can be swung book fashion, and the inner one is mounted so as to be able to swing vertically up and down between them.

3. A three-plate condenser can be used by shunting it across the condenser you use in the secondary, thus making the secondary condenser a vernier.

Kindly give me some information as to a receiver that will permit me to receive from 2,500 to 3,500 miles?—O. H. Orr, Foley, Ala.

We refer you to RADIO WORLD for Jan. 10, 1923, where Mr. Thompson has given some very good reflex circuits. It is possible to do wonderful work with these circuits, but it is impossible to guarantee the range of any receiver to such distances, as much depends on the transmitting station and also on the manipulation of the receiver.

Will 45 volts on the plate of the tube (WD-11) be sufficient in connection with the Flewelling circuit? The set in question is to be used on an indoor loop.—F. N. Cash, 39 Union Street, Norwich, Conn.

In this circuit you can get better results if 45 or even 60 volts are used as a plate voltage. The WD-11 will stand 60 volts without breaking down, so it is perfectly safe.

1. I am using a Westinghouse R. C. receiver with the Power loud speaker. Is this radio-frequency? If not how can I add it to my set?

2. Can I connect a condenser in the antenna circuit, and if so will I get any better results?

3. How would the transformers (radio-frequency) be connected?—J. Frank Douhiitt.

1. You are not using radio-frequency. It can be added if you wish to entirely dismantle your present set. This is not advisable as the sets in question have been calculated for the best work, and it would entail endless work for yourself to add radio-frequency. We advise building a set such as shown in "Answers to Readers" in RADIO WORLD for Feb. 24, 1923. This set is the regenerative circuit, with both radio and audio-frequency.

2. A condenser can be connected in the antenna circuit but we fail to see where any

additional results can be gained by this unless your antenna is too long to allow you to receive short waves. In this case the condenser will allow you to get the lower wave stations.

3. They are connected much the same as the audio-frequency, with the possible exception that an extra tap may be taken off the secondary side which is done in some cases where reflex circuits are used.

Can you give me an efficient hook-up for the following apparatus: 1. A. K. variometer, 43-plate condenser, tube (WD-11), rheostat, grid leak and condenser, A batteries, B batteries and phones? I have a set now with these parts but cannot get out-of-town stations.—G. V. Heath, 2116 P Street, N.W., Washington, D. C.

We refer you to the diagram published in RADIO WORLD for March 10, 1923, in answer to a question on page 18, by Mr. Hausing. The seven-plate condenser in this circuit is not absolutely necessary, being merely a refinement that will tend to give finer control of the regenerative qualities of the receiver. It can be dispensed with if necessary. The rotor of the vario-coupler is used in this circuit as a tickler to produce regeneration and is shown by the coil on the right.

I have built the receiver shown in RADIO WORLD for Jan. 20, 1923, and described by Mr. Ortherus Gordon. Although I have followed the instructions to the letter I cannot get anything. One peculiar thing is observed. I cannot light my tube when the grid condenser is in the circuit, but when I remove the condenser and connect the wires, I can light the filament. Will you kindly explain this?—Elijah Collins, N. Y. Mills, Oneida County, N. Y.

You evidently have made some mistake. This circuit has been tried and proved a remarkable success. The fact that you cannot light your filament without removing your condenser proves that you have not hooked up the set right. We suggest that you re-wire the set, following the diagram exactly, and using a socket made for the WD-11 tube instead of the regular socket with an adapter such as you are using.

I have detector and two-stage set. I cannot get anything on the first stage, and cannot hold anything on the second stage. If I attach the ground wire I cannot even hear anything, but when the ground is left off I get everything from New York to Mexico and from Canada to the Gulf, but I cannot hold it. I hear it but it fades out no sooner than I have it in good.—Chester B. Gulley, Box 336, Salt Creek, Wyo.

Not having a diagram of your circuit it is impossible to find out what is the matter with it. Send in a diagram with all the parts used marked and we will correct it for you. Address RADIO WORLD, 1493 Broadway, New York City.

New Orleans Radio Association, Inc.

EDITOR, RADIO WORLD: Referring to your request for the name of our radio club, I beg to advise that the name of our organization is the New Orleans Radio Association, Inc., 2322 Melpomene street, New Orleans, La. The officers are: W. S. Oppenheimer, president; V. Jensen, vice-president; H. E. Faller, secretary-treasurer; L. J. Gallo, publicity manager.

I wish to take the opportunity of advising you that at the present time we have 135 members enrolled in our organization.

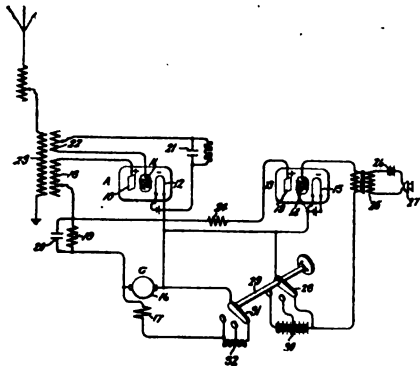
Yours very truly,
New Orleans, H. E. FALLER,
March 10, 1923. Secretary-Treasurer.

Latest Radio Patents

Apparatus for Producing a Succession of Electric Waves

No. 1,445,929; Patented Feb. 29, 1923. Patentee: Walter R. G. Baker, Schenectady, N. Y.

THIS invention relates to the production of electric waves and more particularly to methods and apparatus for producing a succession of waves which may be modified



Baker's Apparatus for Producing a Succession of Electric Waves.

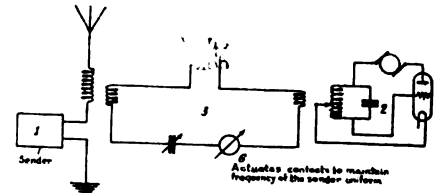
in accordance with impulses produced, for example, at a controlling or signalling station.

Apparatus of this character usually consists of a source of electric power, means for converting the energy of said source into current of an oscillatory character and a transmitter for suitably modifying the character of the oscillations.

An amplifier for the initial signalling impulses is often used, and this, as well as the oscillator, may consist of a vacuum discharge device which comprises an anode, cathode and discharge controlling grid. A suitable source of current is connected between the anode and cathode, and the current from this source is modified by changing the potential of the grid in accordance with the impulses which it is desired to transmit. It is proposed to provide a single source of current for the oscillator and amplifier. When, however, an attempt is made to change the potential of this source to change the output of the oscillator, as for example when it is desired to increase the distance over which messages are to be sent, it is found that amplifier which is likewise influenced by the changed potential will not operate as effectively unless a corresponding change is made in the normal potential applied to the grid. My present invention provides for the simultaneous changing of the potential of the common source above referred to and of the potential applied to the amplifier grid.

1 designates an undamped working sender of any well known type, 2 is a cathode tube auxiliary sender, and 3 is a tuned or untuned circuit coupled with 1 and 2 in which the measuring instrument 6 is provided. It makes no difference whether the measuring or instrument circuit 3 is periodic or aperiodic. It is even possible to actuate the auxiliary sender without the use of such circuit.

The momentary deviation from the frequency within the phase range may be acoustically determined, a very loose coupling being used. The use of a loose coupling makes possible the employment of



Schaffer's Indicator for Deviation of Sender from a Desired Frequency.

a mechanically operating measuring instrument provided with a scale gaged in a static manner in order to make possible the direct reading of the wave deviations.

In order to make possible the reading of both positive and negative variations in the wave of the working sender, the instrument 6 is preferably so adjusted that it gives the same indication irrespective whether one or both senders actuate the instrument circuit.

An increase in the reading of the instrument indicates an increase in the wave length, and a shortening in the movement of the instrument a shortening of the wave length.

The sensitiveness of the measuring arrangement may be increased or decreased within the desired limits by increasing or decreasing the looseness of the coupling.

In order to make possible the use of the arrangement for the purpose of automatically correcting variations in the wave frequencies within predetermined limits, the indicating instrument itself or in its stead a relay arrangement is used for the purpose of actuating certain contacts provided for this purpose.

Wave Meter with Cathode Tube

No. 1,446,425; Patented Feb. 29, 1923. Patentee: August Leib, Berlin, Germany.

WAVE meters provided with a cathode tube are well known and it has heretofore been proposed to provide such meters with a back-coupling whereby the wave meter operates as a sender, and the tunings are determined by means of the telephone in a receiver at maximum receiving tone strength. Under certain circumstances this arrangement has the draw-back that the wave meter, which operates without damp-

tween the anode or plate circuit and the oscillating circuit.

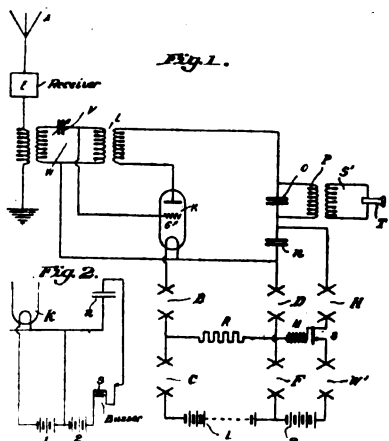
The arrangement may be particularly simplified if the magnets of the buzzer are wound with suitable thin wire and the interrupter connected in the anode circuit in such a manner that it is operated by the anode current as a self-interrupter.

Indicator for Deviation of Sender from a Desired Frequency

No. 1,446,433; Patented Feb. 29, 1923. Patentee: Walter Schaffer, Berlin, Germany

IF two senders operate jointly at the same frequency on an oscillating circuit, a phase displacement of 180° occurs between them. The weaker of the two senders is usually forced into or held in a 180° phase displacement by the more powerful sender. If the wave individual to the weaker sender is now slightly detuned with respect to the more powerful sender, the frequency of the oscillating wave does not vary but apparently only the phase displacement of the two senders with respect to each other is changed. Consequently, a measuring instrument provided in a circuit coupled with the two senders will register the variation. If, on the other hand, there is a variation in the wave of the more powerful sender, that is, the working sender, then this will have a corresponding effect on the auxiliary sender, the phase displacement being varied at the same time. The resulting variation in the current may then be used as a measure for the changes occurring in the wave, and the change in the output of the circuit may be used for correcting the occurring frequency variation.

My invention makes use of these occurrences for automatically indicating or correcting the deviation of a sender from the wave of the desired frequency. The illustration herewith is a diagrammatic representation of a circuit arrangement embodying the invention, and the reference numeral



Leib's Wave Meter with Cathode Tube.

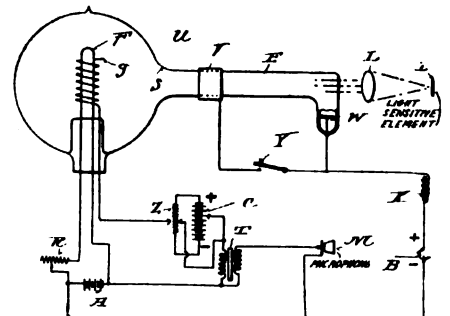
ing, that is, so as to produce a continuous wave, does not give a tone but must be made audible in the receiver by means of a second superimposed sender or by other suitable tone producing means.

The invention consists in transforming a normal oscillating circuit, which is back-coupled to an audion tube, into a sounding sender by very simple means. The means employed consists in an electromagnetic buzzer which is connected in the circuit be-

Light-Controlling Means

No. 1,446,247; Patented Feb. 29, 1923. Patentee: Lee De Forest, New York City.

THIS invention relates to means for controlling light by and in accordance with sound waves or other type of signals.



De Forest's Means for Controlling Light.

The object of the invention is to provide means which are simple and highly efficient for obtaining exceedingly large light fluctuations by and in accordance with sound waves or other type of signals.

A further object of the invention is to provide a device which may act as a source of light, and which is extremely sensitive to sound waves, or, in other words, the light from which will vary greatly in accordance with relatively small current variations in the circuits connected therewith.

New Records of The DX Nite Owls

Gets Unusual Results

From Norman T. Shideler, Bloomington, Ind.

I HAVE been experimenting with wireless for more than two years, and in that time have made a number of receiving sets which have worked satisfactorily; but in the last few weeks I have constructed a set which gives unusual results, and which I think will be of interest to other radio fans.

My set consists of a 23-plate condenser, a home-made vario-coupler coil, a 5-plate variable condenser, a WD-11 tube, and the other things which are necessary in all tube sets. My coil is $4\frac{3}{8}$ inches in diameter and is wound with 109 turns of No. 26 D CC wire. The first 25 turns are untapped, then a tap is taken off at every twelfth turn, making eight taps in all. The tickler coil is wound with 50 turns of the same wire, and on a three-inch tube. My hook-up, using the above instruments, is shown in the diagram, together with the layout of the panel.

The 23-plate variable condenser is used in the aerial circuit. The 5-plate condenser may be used either as shown in the drawing or across the tickler (shown by the dotted line). It works well in either place. In using this condenser I am able to get finer adjustment, and it also seems to add to the regeneration. I also use a phone condenser, but it is not absolutely necessary, as the tube does not require so much current when the condenser is used. The amount of B battery current needed depends

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

speaker. The set has a wave length of from 200 to 1,000 meters. I hope that this may be of use to some of the radio fans.

Uses an Humble Crystal Set

From Bill Keating, Minneapolis, Minn.

HERE'S another little DX record for a humble crystal set. On a night not long ago I picked up the following long-distance stations, which I heard clearly: WOC, Davenport, Ia., 275 miles; WHAS, Louisville, Ky., 600 miles; WCX, Detroit, Mich., 550 miles; WGY, Schenectady, N. Y., 1,000 miles; KDKA, East Pittsburgh, Pa.; 800 miles; WDAF, Kansas City, Mo., 475 miles; KSD, St. Louis, Mo., 500 miles; WLW, Cincinnati, O., 600 miles, and, last, but far from least, WOAL, San Antonio, Texas, 1,200 miles, which, I believe, is a record for distance with a crystal. The

Has Heard 150 Stations

From Leon A. Mears, Minneapolis, Minn.

I SEEM to have had exceedingly good results on my three-circuit set, using two steps of amplification. Most of my material is Atwater-Kent or Michigan, and I assembled the set.

I have heard 150 stations and a mileage of 15,170 miles in one evening. The stations heard on this evening were: CFAC, KDKA, KFAF, KFDL, KSD, KYW, WCAE, WCAS, WCX, WDAF, WFAF, WFAA, WGM, WGY, WHA, WHAZ, WSZ, WLAG, WLW, WMC, WOC, WSB, WWS.

The farthest stations received are: PWX, Cuba; KWH, Los Angeles; KGI, Berkeley, Cal.; KUO and KDN, San Francisco. All the stations come in clear.

On a One-Tube Set

From William Hansen, Astoria, Long Island

I WOULD like to submit my receiving record for a one-tube set, using a 43-plate variable condenser, vario-coupler and two variometers and Brandes phones. The following stations were received loud and clear:

WHAS, WHAI, WJZ, WFAF, WOR, WHN, KDKA, WBAN, WGY, KSD, NOF, WAAE, WBS, WAAM, WDAP, WJT, WMAC, WBAX, WSB, WOC, WGM, WBAY, WWJ, WGI, WHK, WIP, WRP, WJAX, WEAP, WJAS, KYW.

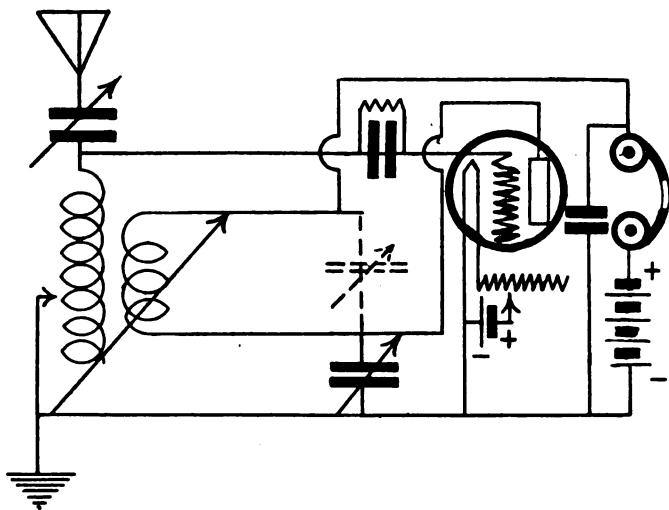


Fig. 1. Hook-up used by Mr. Shideler

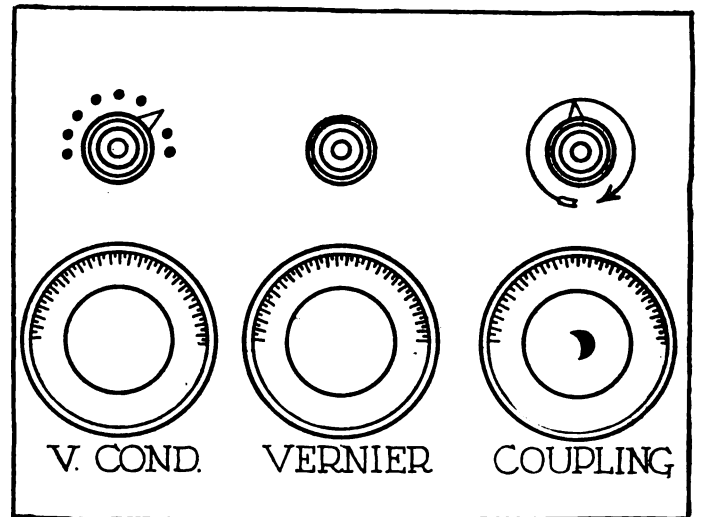


Fig. 2. Layout of Apparatus, as arranged by Mr. Shideler

entirely on the tube. I have found that it varies from $13\frac{1}{2}$ to 25 volts.

I have had unusual results with this set. Following are the stations I have heard: KDKA, KHJ, KSD, KYW, PWX, WAAC, WAAF, WAAP, WBAP, WBZ, WCAE, WCX, WDAP, WFAF, WFAA, WDAF, WDAJ, WFAV, WGI, WGM, WGY, WHK, WHAZ, WIP, WJAF, WHAS, WHB, WJAP, WJAX, WLAG, WLAL, WLW, WMAF, WMAK, WMAQ, WMAT, WMC, WOC, WOR, WOS, WPA, WQAA, WRAO, WSB, WSY, WWJ, WDAV, WMAC, WLK, WBT, WGF, WCK, WGR, WHAB, AVZ, WOAN, NAA, CFCA, CJCG.

Under ordinary conditions I can pick up any of the above stations. The larger stations, such as WWJ, WGY and KDKA, come in so loud that I can use a loud

other stations I get regularly, but that is the only time I have got San Antonio. They came in very distinctly.

The above stations were picked up while I was testing one of my sets, and the remarkable part about it is that they were all tuned in within less than ninety minutes between the hours of 7:30 and 9.

Several other fans using sets like mine have had equally good results.

California Records

From Norman West, Lawndale, Cal.

WITH a detector tube only I think I have some records as far as they go: WBAP, Fort Worth, Texas; WOC, KYW, KSD, WOE, WEAB, WNAC, WQAA, WDAF, KGU, WSY, KFC, WOS, WBAV, WOR, SPG, 9CXP, 8MK.

WDAT, KOP, WBT, WLK, WOS, WOO, WGR, WMAT, WFI, WMAW, IRI, ILL.

I have also received about 50 amateurs. I don't think my record is bad for a home-made set.

Looks Good to Us

From Nite Hawk, Oshkosh, Wis.

I READ about your new game of radio golf in the Feb. 3 issue. Here is my score, done with a Grebe CR-9. Starting at 7 p. m. I heard 21 stations till I stopped at 9 p. m. The total distance covered was 11,800 miles, or an hourly average of a little more than 5,900 miles. I did not stay up to hear the far western stations, such as KHJ, KYG, KDYS, and KDZR, which I usually hear. This is some DX record, is it not? All the stations were more than 200 miles away.

(Continued on page 21)

DX Nite Owls

(Continued from page 20)

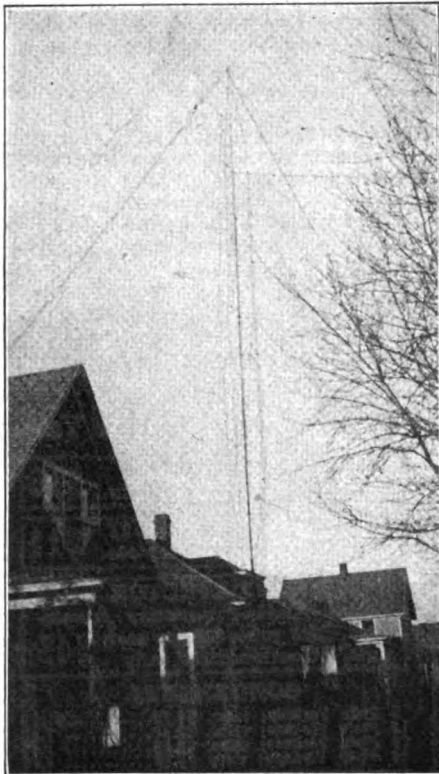
A High Aerial Is a Help

From L. Cochran, Colorado Springs, Col.

HAVING been an interested reader of your DX records as published in RADIO WORLD I submit one from Colorado Springs—"the city of sunshine, at the foot of Pike's Peak."

Using a standard hook-up, detector and two step, honeycomb coils, aerial 150 feet long, of an average height of a little over 50 feet, the following stations have been received since last September:

AS6, 6XB, 6XY, DN4, DD5, KDC, KDKA, KDN, KDPT, KDYL, KDYS, KDZQ, KFAD, KFAF, KFAN, KFAV,



One of Mr. Cochran's 73-Foot Poles.

KFBB, KFBC, KFBK, KFCL, KFBV, KFC, KFCK, KFDB, KFI, KGG, KHD, KHJ, KJS, KLZ, KMJ, KNJ, KOA, KCB, KOP, KFDL, KPO, KOY, KSD, KUO, KUS, KUY, KWH, KXD, KYJ, KYW, KZN.

WAAB, WAAC, WAAH, WAAK, WAAL, WAAP, WAAQ, WAAW, WAAZ, WBAP, WBF, WBL, WBZ, WCAL, WCAV, WCAZ, WCK, WCM, WCX, WDAF, WDAH, WDAJ, WDAO, WDAV, WDAW, WDAY, WDV, WEAB, WEAF, WEAH, WDAZ, WEAY, WEY, WFAA, WFAC, WFAR, WFAS, WFAT, WFAV, WFO, WGAB, WGF, WGY, WHA, WHAS, WHAZ, WHB, WIAR, WIAS, WJAD, WJAM, WJAN, WKA, WKAL, WKN, WKY, WLAG, WLAI, WLAL, WLW, WMAB, WMAD, WMAH, WMAJ, WMAT, WMAV, WMH, WNAD, WMC, WOOA, WOAI, WOC, WOH, WOI, WOK, WOQ, WOR, WOS, WPA, WPAC, WPAM, WPE, WQAO, WRM, WRR, WSB, WOAZ, WSY, WWJ.

CFC, CFCN, CHBC, CHCA, CHCQ, CJCG, CKCK.

This list comprises 144 stations located in 35 different states and four provinces of Canada, and figures a total of 110,000 miles. All the states represented are west of the Mississippi River with the exception of Nevada.

On a recent night I distinctly listened to

the test programs broadcast from KHJ, Los Angeles, and WOR, Newark, N. J. This test was started by KHJ at 11 o'clock p. m., Pacific Time, and was answered thirty minutes later by WOR at Newark. This was at 12 midnight here, and even at that hour several stations could be heard—for instance, the Drake Hotel, Chicago. The Kansas City "night hawks" were on just a few minutes before KHJ started, and Stamford, Texas, was on during the test.

This record is not the best one in Colorado Springs, as several of the fans have records that include Havana, Cuba, a station I have never been able to pick up.

I am enclosing a picture of one of my aerial poles. This pole is 73 feet to the top, and is made from old iron pipe, put up by one man without other help than block and tackle. The pipe was telescoped before raising, so that, at the time it was erected by the eave of the house, it was only 24 feet in length; then the inner or first joint was hoisted by a "gin pole," bolted to the second joint, and so on, like lengthening a telescope.

The radio engineers have reported that Colorado Springs is handicapped in reception owing to a high magnetic field which practically surrounds the location, and we find that reception varies, especially from the north and east; but from the south the stations seem to come in pretty regularly.

Determining Longitude by Radio

From E. D. Ball, Spartanburg, S. C.

NOT long ago I determined my longitude by use of the time signal from Arlington via Pittsburgh. This may be of interest to some of the radio fans.

The star Pegasi was used. The star's time of transit was computed in local time. The mean time watch was used to get the standard time of the star's transit. The correction to watch was taken by the wireless time signal via Pittsburgh from Arlington at 10 P. M.

The watch face reading of star's transit was..... 10 h. 3 m. 22 s.
The correction to watch was 10 seconds fast... -10 s.

The standard eastern time of transit was.... 10 h. 3 m. 12 s.
The computed local time was 9 h. 35 m. 41 s.

The difference is the longitude from 75th meridian 27 m. 31 s.

Five hours added gives the longitude west from Greenwich, which is 5 hours, 27 minutes, 31 seconds west.

This checks less than a second of the same taken by Western Union wire. Having a small astronomical observatory enabled me to do this, in connection with my wireless set.

Weather Sometimes Interferes

From John R. Knott, Iowa City, Iowa

I HAVE been a radio fan for almost one year now, and sure do like to experiment. I am using a WD-11 tube. The greatest distance I ever heard over was Los Angeles, 2,000 miles away. I get WOC, WHB, KDKA, WGF, and many others. If the weather is just right I can get WGY fine. WHAA, a local station, is a very hard station to tune out. I can usually tune them out unless the weather is exceptionally bad. I obtain best results on the 12-volt tap of my "B" battery. As I do not have a 6-volt tube I do not know how 12 volts would work on one.

(Continued on page 24)



This Combination Completes any RADIO RECEIVING SET



To own a good receiving set without Magnavox equipment, is like having your house properly wired and then using only small, feeble candle-power lamps in the sockets!

Whether placed in the average living room or large dance hall, Magnavox Radio floods the desired area with clear, resonant music or speech—its volume perfectly controlled from the Magnavox Power Amplifier constructed specially for it.

Combination R-3 Reproducer and 2 stage Power Amplifier (as illustrated).

R-2 Magnavox Reproducer with 18-inch horn: the utmost in amplifying power, for store demonstration, large audiences, dance halls, etc.

R-3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc.

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer. 2 stage 3 stage

Magnavox Products can be had of good dealers everywhere.

The Magnavox Co., Oakland, California

New York: 370 Seventh Avenue

Write for booklet illustrating and describing the

MAGNAVOX Radio The Power Amplifier and Reproducer Supreme

Advertising Rates: Display, \$5.00 per inch, \$150.00 per page.

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word.

Telephone Bryant 4796

New Radio Firms

(The new firms and corporations mentioned in these columns can be reached directly or by communicating with the attorneys, whose addresses are given when ever possible.)

Domestic Supply Company, Dept. 23, The Broadway Market, 19th street and Broadway, Oakland, Cal., household goods and electrical appliances and supplies.

Electric Novelty Shop, 4th and Market streets, Logansport, Ind. H. Levy, proprietor.

American Electric Sales Co., 632 Baronne street, New Orleans, La.

Nicholas Bros., 123 South Winter street, Adrian, Mich., are adding radio supplies to their business.

Kinley Radio Co., 33 Elmhurst avenue, Detroit, Mich.

United Electric Stores Corp, New Market, N. J. Samuel Eisemann and others.

Seattle Lighting Fixture Co., 617 Fourth avenue, Seattle, Wash., is adding radio supplies to the business.

D. X. Radio Corp., New York City, \$5,000; W. and M. Scadron, H. Jaolons. (Attorney, L. Scadron, 149 Broadway.)

Burrows Magnetic Equipment Corp., develop patents, \$90,000; C. O. Assmus, T. Irving Potter, East Orange, N. J.; Harrison H. Pierce, New York. (Julian Walker, Wilmington, Del.)

Municipal Products & Electric Co., Buffalo, N. Y., \$15,000; A. A. Aaron, C. Dautch, H. A. Kulowski. (Attorneys, Aaron & Dautch, Buffalo.)

Elliott Electric Supply Co., New York City, increased capital from \$5,000 to \$100,000.

Will-Fred Electric Manufacturing Corp., Queens, \$20,000; W. O. and B. A. Feldman, E. F. Calnea. (Attorneys, Mann & Buxbaum, 886 Broadway, Brooklyn, N. Y.)

Merrick Electric Co., Queens, \$10,000; T. L. McKeown, E. E. Breiling. (Attorney, T. Breiling, Hollis, Long Island.)

Super Radio Corp., Wilmington, Del., supplies, \$1,000,000. (Corporation Service Co.)

Marks Radio & Electric Co., New York City, \$5,000; L. Marks, B. Wertheim. (Attorney, H. C. Adams, 220 Broadway.)

Long Island Electric Service Corp., Queens, make wireless apparatus, \$9,000; B. Lapoint, J. V. Miller, W. W. Caulfield. (Attorney, W. E. Kennedy, 47 Cedar St., New York City.)

Radio Exchange, New York City, \$6,000; L. Feldman, B. Gleichman, F. Golding. (Attorney, M. L. Kane, 50 Court St., Brooklyn, N. Y.)

O'Connell Electric Co., Rochester, N. Y., increase of capital from \$10,000 to \$50,000.

Maceur Electrical Supply & Radio Co., Manhattan, \$5,000; W. Hurza, J. McQueen. (Attorney, H. Schapiro, 261 Broadway, New York.)

How Radio Helps Shorthand Students

EVERY day brings to light another use for radio broadcasting. It is now revealed that students of shorthand and typewriting are picking up addresses out of the ether to increase their speed at the typewriter or in writing shorthand symbols of the speaker's words. Those who have had to rely upon the patience of a member of the family or a friend to read to them while they dashed down the dots, dashes and curves can appreciate the advantage of radio dictation.

Radio Stocks

(Quotations as of March 7, 1923, furnished by Frank T. Stanton & Co., 35 Broad Street, New York City, Specialists in Wireless Securities.)

Stock	Bid	Asked
Am. Marconi Stamped...	5c	7c
Am. Marconi Unstamped	5	7
American Tel. & Tel...	124½	125
Canadian Marconi.....	2½	3¼
De Forest Radio.....	7	10
English Marconi com....	11	15
English Marconi pfd....	11½	15½
Federal Tel. Calif.....	6	6½
General Electric.....	185	186
Hennessey Radio Pub...	9	11
Manhattan Elec. Supply.	55½	56
Marconi Int. Marine....	9	10
Mackay Co. com.....	116	117
Radio Corp. com.....	4	4¼
Radio Corp. pfd.....	3½	3¾
Spanish Marconi.....	1	3
Western Union.....	115	116
Westinghouse E. & M...	64½	64¾

Satirizes International Radio

A FACETIOUS correspondent writes this letter to the *New York Times*:

"The attention of American reformers should be directed to the wave of moral turpitude into which the English have either drifted or plunged during the last week. Children in the British Isles are being kept up until 3 A. M., London time, to hear bedtime stories by radio, after which their elders begin orgies of song and dance that continue without cessation until 7:50 A. M. Beyond the probable deleterious effects on the English, it is difficult to estimate the number of cases of shattered nerves sustained by American radio amateurs in trying to hear the London revelry on this fantastic schedule."

Wireless Shares Boom

Following the announcement by Premier Bonar Law that licenses will be issued to the Marconi's Wireless Telegraph Company, Ltd. (English Marconi), to operate a large central station by which they can keep in constant communication with the world, similar to the Radio Corporation's station on Long Island, shares of all the companies have been in great demand. Radio Corporation common sold on March 6, from \$3½ to \$4¼, the preferred up to \$3¾, English Marconi to \$16 and Canadian Marconi \$3¼. As this demand broadens out, De Forest and other companies will come in for higher prices.

Coming Events

PERMANENT RADIO FAIR FOR BUYERS. Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits. Atlantic City, N. J., June 16 to September 8, 1923.

ILLINOIS STATE ELECTRIC ASSOCIATION. Chicago, March 16 and 17; R. V. Prather, secretary. Mine Workers' Building, Springfield, Ohio.

A Tip on the Flewelling Circuit

Many people have constructed the famous Flewelling Circuit, and have attempted to put a couple of steps of audio frequency amplification on it and have found that it was impossible, or that the control was so hard that they gave it up as a bad idea.

Now, if they had put a variable grid leak across the primary of first audio frequency transformer and varied that, much the same as the one in the grid circuit, they would have found that the signals cleared up and came in with a bang. A grid leak variable from one-half to five megohms will suit the purpose, and will help a lot.

WILLARD 8-17-23
WILLARD RADIO COMPANY
Dept. R.W.
291 Broadway New York

REINARTZ CIRCUIT
Every part complete. **\$10**

FLEWELLING CIRCUIT
Every part complete. **\$11**

TUNING & DETECTOR UNIT
2-Step Audio-Frequency Amplifier. List price \$35 for each unit. Combination only.. **\$45**

CONDENSERS

3 Plate Variable; value, \$1.75.....	\$1.65
13 Plate Variable; value, \$2.50.....	1.20
23 Plate Variable; value, \$3.50.....	1.85
43 Plate Variable; value \$4.50.....	1.95
13 Plate VERNIER; value, \$5.50.....	\$3.75
23 Plate VERNIER; value, \$6.00.....	4.00
43 Plate VERNIER; value, \$6.50.....	4.25

V. T. SOCKETS—Nickel brass sleeve, composition base; value, \$1.80; special at \$0.50

Ball Bearing Inductance switch; value, 75c; special at30

FILAMENT RHEOSTAT—Condensite base; value, \$1.10; special at70

FILAMENT RHEOSTAT with 2½" dial; value, \$1.50; special at85

Potentiometer with knob; value \$1.75; special at 1.00

Potentiometer with 2½" dial; value, \$2.15; special at 1.15

BEST QUALITY JACKS. Single circuit; value, 65c; special at30
Double circuit; value, 90c; special at43

VARIOCOUPLER—Caloron condensite and Litz Wire wound secondary; value, \$4.50; special 3.25

THREE-INCH DIALS—Unbreakable—best resisting composition—high finish; special80

TWO-INCH DIALS—Same design—for rheostat and potentiometer; special23

EXTRA SPECIAL—Telephone 3000 Ohms Headsets; \$9.00 value; reduced to 3.50

RAYMOND VERNIER RHEOSTATS—Value, \$1.50; special95

REINARTZ COILS—Value, \$2.50 1.75

ALUMINUM LOUD-SPEAKING HORN—Nickel Plated; List \$8.00 3.75

AUDIO-FREQUENCY TRANSFORMER—For use with W.D.-11 Tubes; List \$4.50. 2.75

Every article advertised above is guaranteed both by the manufacturer and by us—Mail orders filled immediately—transportation PREPAID on all orders of \$5.00 or over east of the Mississippi River. All others include postage.

Relative Advantages of Single Circuit and Double Circuit Tuners

PRIOR to the introduction of radio broadcasting, the ordinary type of radio receiver used by the amateur was of the double-circuit or three-circuit type. Because the radio amateurs were well versed in the use of these instruments it was not difficult for them to use these tuners and they took pride in their skill of operation. However, when broadcasting was initiated, the need for a simple tuner device that could be used by the layman was considered necessary and a single-circuit tuner was developed. On account of the simplicity of this new tuner and in view of the great number of broadcasting stations operating at the present time, confusion resulted concerning the efficiency of this tuner. Interference of two broadcasting stations is the cause of trouble in the use of the single circuit tuner.

The interference sometimes encountered in radio broadcasting reception is primarily a problem of broadcasting transmission. It will be eliminated by the enactment of suitable government legislation that will enable wave-lengths other than 360 and 400 meters to be assigned to broadcasting stations. No receiving tuner, whether it be of the single or double circuit type, will prevent two broadcasting transmitting stations operating identically on the same wave length from setting up interference in the receiving set, unless the signals of one station are of sufficient intensity to drown out those of the other station. Two broadcasting stations operating on nearly the same wave lengths will produce an audible note or "whistle" in a receiving apparatus, which no tuner of either the single or double circuit type will eliminate. The cure for this problem is the assignment of wave lengths to the transmitting stations of sufficient separation so as not to produce an audible note.

The single circuit tuner will enable the listener to differentiate between two local broadcasting stations by erecting an antenna not over 15 feet high and 15 to 20 feet in length. It has been conclusively demonstrated that a low antenna is more selective than a high antenna. The selectivity on a given antenna can be increased by an additional series condenser between antenna and tuner.

Selectivity in regenerative receiving sets is primarily a function of the amount of regeneration. Two local broadcasting stations on different wave lengths will often interfere with one another on either the single or double circuit receiver, but this is due to the overwhelming power of the transmitter which causes the apparatus to function by shock excitation and respond even when not accurately tuned to the transmitter. It has been demonstrated beyond all cavil that interference set up by two local stations can be eliminated on the single circuit receiver by an antenna, as described above.

The ordinary regenerative set with the double circuit tuner gives from 20 to 50 per cent reduction in signal audibility over the single circuit with the same number of tubes and the same general circuit. In other words, stronger signals will be obtained, in long distance reception, from a single circuit set than from a double circuit set.

The Advantages of Two Antennas

For those who have interest in long distance reception, as well as local reception and who experience difficulty in obtaining the necessary with the low antenna owing to it being shielded by buildings, etc., it is sometimes advisable to erect two single wire aerials, one for long distance reception—which may be of any wave length up to 150 feet, and the other for local reception—which is the small one previously described. The small antenna enables one to differentiate between local signals, while the larger antenna can be used for long distance work after the local stations have discontinued.

Many users of broadcasting sets are now

installing two antennae—a long one for long distance reception after the local stations have closed down, and a small one, or an indoor aerial, for local reception. The indoor aerial may consist of 10 to 25 feet of lamp cord concealed behind the picture moulding, or a piece of No. 28 wire stretched across the corners of the room. Listeners located up to 15 or 20 miles from a broadcasting station can often obtain all the signal audibility necessary for local work by concealing the antenna under the carpet of the living room or the library of the home.

The foregoing are technical points which will stand the closest analysis. Speaking purely from the commercial phases of the matter, the single circuit tuner is, without qualification, the most suitable for the novice, that is, for the user unskilled in the art; for generally, the multiplicity of knobs involved in the operation of the double circuit tuner places them beyond the stage of practicability for the non-technical public. Single circuit tuners were designed primarily with the idea of providing simplified operation, and as such, they enable the novice to obtain results which can only be secured from the double circuit tuner when the user possesses an intimate knowledge of the technicalities of the art.

Comparing collectively the advantages of the two types of tuners, it is clear that the single circuit tuner is by far the more useful to the average member of the family, as it enables him with a minimum number of adjustments to pick up far distant or local broadcasting stations. Usually the distant station can be found on the single circuit tuner several minutes before it can be located on a double circuit tuner, to say nothing of the increased audibility which the single circuit set provides.

For long distance reception, it is preferable in every case to install an outdoor antenna in a free open space keeping the lead-in away from the building and bringing it as directly to the receiving apparatus as possible. The antenna is preferably kept at the maximum distance from the trolley car lines, power lines, trees, buildings, etc., whereupon a marked increase in selectivity and in signal strength will be obtained.

FREE CATALOGUE

Make D X Records With D X Supplies

This Catalogue should be called "Recipes for Long Distance." It was written to help amateurs pull in the most distant stations.

D-X-Radio Company Specializes

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 This adapter is constructed of molded composition. It eliminates metallic and distorted sounds. Guaranteed to be satisfactory or money refunded.
 If your dealer cannot supply you send us \$2.00 and we will mail one by parcel post prepaid.
Industrial Sales Engineering Co.
 671 Broad Street, Newark, N. J.
 Phone, Market 9023

DX Nite Owls

(Continued from page 21)

A War Veteran Reports

From Albert R. Champlin, 12 Maple Ave., Westerly, R. I.

AS I have not seen any records listed from Rhode Island lately I thought you might desire to publish my late tests. I am a commercial operator, having served through the World War as a radio man, and had some interesting experiences. I have a detector and one-stage, using 50 feet of phosphor bronze wire strung around the baseboard of my room. I have received the following stations remarkably clear: WGY, KDKA, WEA, WNAC, WBZ, WGI, WWJ, 1,000 miles; WOT, WHAI, 1,200 miles; KYW, 1,000 miles; WOR, WAAM, WJZ, WIP, WHAG, WJAR.

Besides I have copied several CWS and amateur sparks. On 600 meters sparks have been copied as far south as NAT, New Orleans. I think this is good for inside antenna.

Receives on Detector Only

From Lang Spell, Bonifay, Fla.

I HAVE been reading RADIO WORLD for quite a while, and thought I would send my DX work in. I am using the single-circuit hook-up which was published

in RADIO WORLD of January 27 and find it a fine one.

The greatest distance I received was about 2,200 miles—KGW, Portland, Ore. KHJ comes in regular. Others are: KFI, KFAF, WAAL, KYW, WDAP, WJAZ, WLK, WOI, WOC, WHAN, WHAS, WIAR, WBAM, WDAN, WWI, WCX, WWJ, WOS, WDAF, WHB, KSD, WJZ, WOR, WEA, WGY, WHAZ, WBT, WLW, WJAX, WBAJ, WKAK, WKY, WLAL, WFI, WIP, WOO, KDKA, WHAF, WMC, WMAM, WFAA, WDAH, WBAP, WHAB, WEAY, WKAL, WOAI, WJAD, WAAK, WSB, WGM, WDAJ, WHOA, and WSY. These I did not get: Auburn, Ala.; Greenville, S. C.; Knoxville, Tenn., and one in Cuba I couldn't get, call or town. This is my 1½ months' record, being a total of 65 stations in 25 states and Cuba. All these were received on detector only.

A Good Hour's Work

From Gene Ullsmyer, Rock Island, Ill.

I HAVE a record of 7,500 miles in one hour. This is only the second time I have attempted to time my mileage. I get all my stations regularly but one. That is Troy, N. Y. I have two friends who listened in who will answer for my mileage. I have a three-bulb set.

He Likes Nite Owls Records

From Maurice T. Dubel, Buffalo, N. Y.

HAVE been reading with interest the "DX Nite Owls" records in RADIO WORLD, particularly regarding crystal detection. Mr. Keating's record is particularly good. Here is my contribution, using a crystal set and no amplification: KDKA, KOP, NCP, WBAY, WBZ, WCK, WDAP, WIP, WJZ, WOR, WEA, WEAL, WBU, WGY, WHAS, WHAZ, WIAR, WJX, and WOC. Farthest air line distance, St. Louis, 760 miles.

If you want details of my set will be pleased to furnish same. Time, experimenting, patience, a good piece of galena and good results can be had. Had ten of the above out-of-town stations in one evening.

Rapid Fire Work

From J. G. Bradley, Justin, Tex.

I SEND herewith my DX record for a recent night. I speeded up the old flivver some.

Total time worked, three hours, fifteen minutes. Mileage, 19,330. Average, 5,944 M.P.H.

KFFQ, 6:45 p. m.; WGY, 6:50; WHA, 7:04; WMAK, 7:10; WMAU, 7:15; WHAS, 7:30; KDKA, 7:35; WHB, 8:00; WSB, 8:02; WMC, 8:10; KSD, 8:20; WOC, 8:30; WLK, 8:40.

Closed down until 9:45 p. m. WJD, 9:50; WMAQ, 10:00; WDAP, 10:07; WJAN, 10:10; KFI, 10:15; WLW, 10:22; WGF, 10:23; WOAI, 10:24; WLAL, 10:30; WCX, 10:43; KPO, 10:44. Signed off, 10:45 p. m.

I did not count eight stations closer in—three each at Waco and Dallas, and two at Fort Worth, Texas. Some of these were on the air all the time from 6 p. m. until 10:45 p. m.

A Home-Made Record

From William M. Jackson, Wilson, Okla.

I HAVE been reading the DX records in RADIO WORLD for some time and would like to submit mine. I have a three-circuit tuner, detector and two-stage ampuner, which I built myself. My aerial is a single wire, 115 feet long, 20 feet high on one end and 25 feet on the other. On a recent night I received the following stations:

WDAP, WDAF, WOC, KDKA, WBAP, WMC, WCX, WLW, WGY, WOS, KLZ, WFAA, WSY, KFAF, WOI, KSD, WLAG, WSB, KGW, KFDL and KFI.

This makes 21 stations in 15 states. My longest distance is KGW, Portland, Ore. I have got 26 states so far, but expect to get more.



WALCON

Radio Frequency Transformers

Brings in distant stations on a loop—perfect reproduction. No distortion. Awarded Certificate of Excellence by N. Y. Eva. Mail.

THE BEST YOU CAN BUY

WALCON Transformers are tested and guaranteed. Particularly adapted for use with W.D.-11 tubes. Four new hook-ups, including a new reflex circuit furnished without charge with each transformer.

Price, \$4.00. We pay postage.

Dealers and jobbers: Write for our attractive sales proposition, backed by national advertising.

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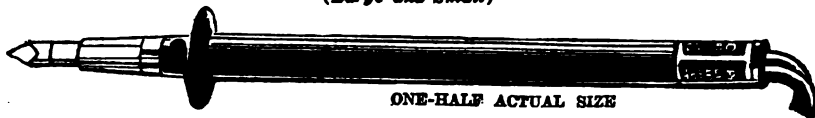
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THE POST SOLDERING IRON

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ONE-HALF ACTUAL SIZE

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 Add \$1.00 a Year to Foreign Postage, 50c for Canadian Postage.

Grain Prices Broadcast From Chicago Every Half Hour

THE latest method of broadcasting grain price quotations by radio from Chicago is an important service to the farmer, and is thus described by the New York Times:

It is 9:15 in the morning. The spacious trading floor of the Board of Trade is astir. Traders are changing from street coats to light jackets before entering the pits. Messengers are scurrying about, hands crammed with order blanks.

On the stroke of 9:30 a gong sounds. Overnight orders to buy and sell grain and produce are rapidly executed. Buyers, representing the consumer, seek the lowest price. Sellers, representing the producer, seek the highest price. The figure at which these two forces meet represents world values.

Over at one side of the trading floor is a man in a glass cage. He is in direct communication with a powerful radio-sending station. The opening prices are registered. Without the delay of a second these are transmitted to the radio-sender at the station on top of a large Chicago hotel.

Far out in the grain belt, hundreds of miles from the sending station, is Jed Smith, a farmer. He wants to know whether the time is opportune to ship his grain. He steps to his little radio-receiving set, tunes in to the 360-meter wave length, and what he hears runs about as follows:

"WDAP speaking. . . . Opening prices on the Chicago Board of Trade. . . . May wheat . . . one twenty-three and a quarter. . . . July wheat . . . one fifteen and a half . . ."

Then follow other quotations on grains and provisions, with important market news comment. At half-hour periods from the opening of the market until the close at 1:15 the quotations are broadcast, and thus made available to a legion of farmers and distributors. It is a milestone in marketing progress.

Hardly had the radio become practical when its value in the dissemination of price quotation was recognized at the center of world grain trade. A test period of broadcasting was opened. In a short time hundreds of letters and telegrams came pouring into the Board of Trade from scores of cities, towns and villages commending the service. They came not only from farmers, but country elevators, shippers, banks, business houses and educational institutions that use the quotations in class work.

Advices showed that, in Illinois alone, almost 500 towns and villages were using the quotations. Hundreds of farmers not in easy communication with towns obtained small radio-receiving sets for home use. Reports from other states told a story of similar interest.

It was then that the Board of Trade determined upon a permanent, continuous broadcasting service, and recently the Board purchased outright the big radio-sending station WDAP, on the Drake Hotel.

"The imagination falters in measuring the full significance of radio," commented Henry A. Rumsey, Chairman of the Board of Trade Radio Committee. "Forces of no less promise have written strange history. In the grain and produce market alone wonders will be accomplished. It will not be long until the farmer in the field follows the course of his daily market as closely as the merchant on the trading floor. And that is precisely what the Board of Trade wants. It has spent a fortune in an effort to give the farmer first-hand information on the ever-shifting world supply and demand. The grain trade is determined to aid the farmer in this end and in every other manner commensurate with sound economics."

"It is our intention," said Robert McDougal, former president of the Board, speaking at the formal opening of the new

station, "to give the entire radio public the official prices and other valuable information in connection with all commodities handled through this channel, thus serving the public from the farmer to the consumer. We hope to broaden our acquaintance and to demonstrate our contention that the Chicago Board of Trade is an open book that 'he who runs may read.'"

"The complete ownership and operation of the station will bring to our association, as well as to the public, no financial return. But it will work to the mutual advantage of the members and their world-wide clientele. It is indeed a step forward in our endeavor to acquaint the public in the grain business and also with the operations of the world's greatest grain exchange and the largest international enterprise in the Middle West."

The extent of the territory covered by the radio grain market service has not as yet been fully determined. Those in charge say, however, that a comparatively small radio set is capable of receiving these reports in any state in the Union.

Two thousand five hundred price quotations on wheat, corn, oats, rye, barley, pork, lard and ribs are issued from the Chicago Board of Trade on every business day. As Chicago is the largest grain exchange in the world the quotations are of vital interest to every one concerned with the production or distribution of these commodities and to persons in scores of related industries.

The radio has placed at the disposal of the farmer all salient features of this machinery of crop information and marketing. It has virtually placed him on a footing with the most enlightened merchant in the world grain and provision markets. The magic is his. He merely stretches phantom fingers in the air and pulls it down.

Radiophone on Ford Truck

A Ford ton truck equipped with a radiophone was one of the novelties entertaining visitors at the Brooklyn, N. Y., Automobile Show. Stanley Payne of the Payne Motor Company, Brooklyn, is responsible for the idea. The installation had its trial on a trip from Brooklyn to the New York Ford headquarters, and worked without a hitch. On Fifth avenue several traffic officers detained the outfit a moment to enjoy programs.

KING SR. VARIOMETER

150 to 600 Meters
No outside connecting hardware used—reducing capacity losses. Rugged—Solid. Size 4 3/4" x 4 3/4" x 3".
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Vol. 1—No. 2 Just off the Press.

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Full and complete instructions for construction of

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And Many Other Tested Circuits

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S. NEWMAN & CO., Publishers
74 Dey St., Dept. W., New York City

Construction of New Type Transatlantic Receiving Sets

By M. B. SLEEPER

Fully Illustrated. Price 75 Cents

IN addition to the listening to ships and broadcasting stations on short wave lengths there is a peculiar fascination about listening to the high-power telegraph stations of England, France, Germany, Russia and Italy as well as those located in the Pacific Ocean and the Oriental Countries. It is much easier to do this than most people imagine. The sending is very slow, a feature of assistance to the beginner in telegraphy. Several types of receiving sets for this task are described. Detectors, amplifiers, oscillators, etc., for long distance reception are also described. Suggestions for the operation of relays by the signals and the reproduction of them on a phonograph are given. In addition there is some valuable data on home made wavemeters for testing and experimenting.

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Spring Grip Telephone Plug

The Bestone Plug is an entirely radical departure in design and construction, giving superior results.

A simple pressure of the buttons instantly connects or disconnects the receivers. It is not necessary to disassemble the Bestone Spring Grip Plug for any reason. Just insert the cord tips—no more work, worry, or possibility of a poor connection.

Eliminates the use of several plugs—enables you to use from one to three sets of telephone receivers, or to change from head phones to loud speaker. List.... **\$1.25**

is attained only by the use of mechanically and scientifically perfect parts.

Now, more than ever, when the market is flooded with inferior goods, one cannot be too careful in the selection of standard, trade-marked articles, and in purchasing from a reliable source.

It is our aim to supply the highest standard radio specialties, thus insuring perfect results and satisfaction.

Every article we sell is unconditionally guaranteed both by the manufacturer and this organization.

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WAVE LENGTH AND SAVE MONEY ON YOUR PURCHASES

Lowest Prices on Standard Radio Goods in the U. S. A.

FREE A HYDROMETER (Battery Tester) with each purchase of \$1.00 or over **FREE**

HAVE YOU ENTERED OUR ADVERTISING PRIZE CONTEST?

FIRST PRIZE—

\$250.00 Radio Set Free—Six Tube Radio-Audio Frequency Set

SECOND PRIZE—

\$150.00 Radio Set Free—Four Tube Set, Detector and 3 stages Amplification

THIRD PRIZE—

\$100.00 Radio Set Free—Three Tube Set, Detector and 2 stages Amplification

To advertise our business we will give the above prizes to the three persons sending us a list of five or more names of Radio fans and who compose the best slogan or phrase of words we can use for our advertising matter. We are interested in sending our catalogue and price lists to Radio fans.

If you are interested in Radio and in its future possibilities don't overlook this opportunity to get acquainted with us, secure low prices on your purchases and an opportunity to win one of the above prizes free of charge.

In the event of two or more persons submitting the slogan judged the best, second best, or third best, each will receive the full amount of the prize tied for. All entries must be received by us not later than *March 31, 1923.*

Our Peanut Tube Does the Work of WD-11

For Detector and Amplifying uses. Can be used on 1½ volt dry cells or regular 6 volt A Batteries. Fits standard V.T. socket. Uses about 1/10 ampere, on two 1½ volt dry batteries. Price of tube, \$2.50, includes adapter.

1½ VOLT TUBE (not WD-11, but for same use). For detector and amplifying uses. Used on 2 Dry Cell batteries (1½ volt)..... \$5.00

THIS WEEK'S SPECIALS

1,000 HEADSETS, \$6.00 Value..... \$2.99 each

Biggest Radio Bargain Ever Offered—Order Promptly

200 RADIOLEAN CRYSTAL SETS, \$12.50 Value..... \$6.50 each

Includes Receiving Set and All Antenna Equipment

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- U. S. Navy (Pilotron) used as a detector, amplifier and transmitting tube, all in one, type V. T. 14.....List \$5.00, now \$4.00
- U. V. 200 Detector..... 4.25
- U. V. 201 Amplifier..... 5.25
- U. V. 201A Amplifier..... 8.50
- WD-11 1½ Volt..... 6.50
- Cunningham Detector..... 4.25
- Cunningham Amplifier..... 5.25
- Myers Audion High-Mu..... 4.50

Vacuum Tubes Repaired. Broken and burned out tubes repaired. Mail them parcel post insured. Price, \$2.79 each, cash with your order. Tubes returned by Parcel Post, prepaid. We guarantee them to burn equal to new tubes.

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- 43 Plate " 6.50, " 5.00
- Freshman Grid Leak and Condenser for Flewelling Circuit " 1.00, " .75

TRANSFORMERS

- ThordasenList \$4.50, now \$3.00
- Atwater Kent " 5.00, " 3.75
- Acme " 5.00, " 3.75
- WD-11 " 5.00, " 3.75

BUSS BAR WIRE—6 two-foot lengths..... \$0.25

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- Brandes—2000 Ohm 5.50

- Dictograph \$5.00
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Space being limited, we are obliged to omit other money-saving items. Write for quotations or ask for our latest Price Sheet Catalog.

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OUR SPECIALS

\$7.70 43 Plate Vernier Condenser.....\$4.75
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VARIOMETERS\$3.00
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 Wave Length. Unconditionally Guaranteed.
VARIOCOUPERS, 14 taps, 14 sol-
 dered leads. Bakelite. Good for \$2.50
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Klesner Vernier Rheostats.....	1.50	.90
Klesner Vernier with Dial.....	1.50	1.30
6 Volt Detector Tube.....	4.00	2.25
6 Volt Amplifier Tube.....	4.50	2.75
Freshman Variable Grid Leak.....	1.00	.70

CASH OR MONEY ORDERS WITH ORDER.
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Established 1895

Complete Regenerative

**BULB SET
 \$12.45**

Outfit includes 1½ Volt Tube—Fischer Variocoupler—14 taps—4 stops—23 Plate Variable Condenser—2 Knobs and Dials—Rheostat—Socket—Grid Leak Condenser—Dry Cell—22½ Volt Plate Battery—8 Binding Posts—Also Drilled Panel—Easy to Assemble.

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Mahogany Finish Cabinet for this Set **\$2.45**

Wholesale and Retail. Mail orders filled same day, upon receipt of Money Order, including Postage.

123 Nassau St., N. Y. City

**Great Britain's Wireless Plans
 Announced by Premier**

REPLYING to a question in the House of Commons on March 5 Premier Bonar Law said:

"In view of the developments in the science of wireless telegraphy and the other circumstances which have arisen since the late government decided upon a policy of a state-operated wireless chain, it is not considered necessary any longer to exclude private enterprise from participation in wireless telegraphy within the Empire.

"The government has therefore decided to issue licenses for the construction of wireless stations in this country for communication with the dominions, colonies and foreign countries, subject to the conditions necessary to secure British control and for suitable arrangements for handling the traffic.

"At the same time the government has decided that it is necessary in the interests of national security that there should be a wireless station in this country capable of communicating with the dominions, and owned and operated by private enterprise. A station of this kind will therefore be erected as early as possible, and it will be available for commercial traffic as well as for service messages."

**Secretary Hoover Calls Another
 Radio Conference**

SECRETARY HOOVER, of the Department of Commerce, has called a radio conference for March 20 to clear the air of the present chaos, due to conflict from broadcasting stations all over the country. The conference call reads in part:

"The Department of Commerce has sent out invitations for a reassembly of the radio conference held a year ago, together with some additional members. The conference held last year was for the purpose of considering legislation necessary in order to reduce the amount of interference in radio broadcasting. The legislation having failed to pass Congress, it is felt desirable to investigate what administrative measures may properly be taken temporarily to lessen the amount of interference in broadcasting.

"Since the last conference the number of broadcasting stations has increased from 60 to 581, and it is estimated that somewhere between 1,500,000 and 2,500,000 receiving stations are now in use. The amount of interference has increased greatly and threatens to destroy the growth of the art."

**Radio Pioneer Injured in Army
 Plane Crash**

A HUGE Martin bomber airplane, belonging to the Army, and known as A-26, crashed in a vacant lot in East New York, N. Y., on March 4. Lieut. Stanley Smith was killed and Major Follette Bradley, the pilot, was seriously injured but probably will recover. Major Bradley is credited with having sent the first radio message from an airplane in November, 1912.

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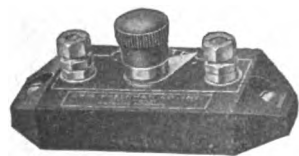
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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

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MAKING MONEY WITH YOUR SMALL CAMERA, 10c. coin. Wm. Kissel, Box 114, Adrian, Mich.

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DYNAMO BUILDING FOR AMATEURS—Or How to Construct a Fifty Watt Dynamo.—By Arthur J. Weed. A practical treatise showing in detail the construction of a small dynamo or motor, the entire machine work of which can be done on a small foot lathe. Dimensioned working drawings are given for each piece of machine work, and each operation is clearly described. This machine, when used as a dynamo, has an output of fifty watts; when used as a motor it will drive a small drill press or lathe. It can be used to drive a sewing machine on any and all ordinary work. The book is illustrated with more than sixty original engravings, showing the actual construction of the different parts. Price, \$1.00. **THE COLUMBIA PRINT**, 1493 Broadway, New York City.

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HOW TO BECOME A SUCCESSFUL ELECTRICIAN—By Prof. T. O'Connor Sloane. An interesting book from cover to cover. Telling in simplest language the surest and easiest way to become a successful electrician. The studies to be followed, methods of work, field of operation and the requirements of the successful electrician are pointed out and fully explained. 202 pages. Illustrated. Nineteenth revised edition. Cloth. Price, \$1.50. **The Columbia Print**, 1493 Broadway, New York City.

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LETTER TO THE EDITOR

Radio World's Assistance Demonstrated

EDITOR, RADIO WORLD: Many of your readers may be dismayed by the choice of so many different hooks-ups and the extravagant claims of their partisans. To these I want to call attention to the simple and efficient WD-11 set described in your issue of January 20, 1923, by Ortherus Gordon.

I studied this article carefully, bought the various items required, and, after one day's work, with a total expense of \$18.63, exclusive of phones and aerial, was bringing in stations over a thousand miles away. These include, in the East, Schenectady, Troy, Newark, and Charlotte, N. C.; in the South, Atlanta, Birmingham, New Orleans, Dallas and Fort Worth; in the West, Denver, Salt Lake City, Great Falls, Mont., and in the North, Minneapolis, Milwaukee and Chicago.

Since adding one step of audio amplification I have received very plainly over fifty distant stations. The significance of this is apparent when you consider that the almost constant operation of the two powerful local stations prevents listening in when the majority of concerts are being broadcast.

To Mr. Gordon's explicit instructions let me add the importance of a proper aerial. The labor of winding the two coils can be saved by buying them already prepared at a very slight expense. The simplicity of tuning this set and its selectivity are two important virtues.

March 1, 1923. E. STANLEY FIELD, JR.
821 E. 42d St., Kansas City, Mo.

New Technical Director for WGY

HARRY SADENWATER, one of the heroes of the air service of the United States Navy, has been placed in charge of the technical operation of the broadcasting stations of the General Electric Company, including WGY at Schenectady, N. Y., and the projected station at San Francisco, Cal.

Two years before he entered the ranks of the Radio Engineering Department of the General Electric Company Mr. Sadenwater was a lieutenant in the United States Navy, and was one of the few out of hundreds of volunteers selected for the hazardous flight of the NC flying boats, NC-1, NC-2 and NC-4, across the Atlantic, from Newfoundland to Portugal.

Lieutenant Sadenwater was radio officer on the NC-1, commanded by Lieutenant-Commander P. N. L. Bellinger. The NC-4, it will be recalled, was the only one of the three boats successfully to make the crossing. The NC-1, which carried Lieutenant Sadenwater, encountered heavy fog. Navigation was made so difficult that the big flying boat was brought down to float on the sea until the fog lifted. Instead of the calm sea expected the boat ran into rough water, and in a very short time the NC-1 was so badly rammed by the waves that it was impossible to ride off the water, and every minute added to the damage. Lieutenant Sadenwater sent out SOS calls until the batteries became exhausted. A Greek freighter finally sighted the NC-1, and picked up her crew, which was landed safely at Horta Fayal, in the Azores. Lieutenant Sadenwater, with other members of the crew, was made a Knight of the Military Order of the Tower and Sword by the president of Portugal.

Pacific Coast Radio Exposition

A RADIO and electrical exposition will be held at San Francisco from April 3 to 8 inclusive. A home-made-set contest for amateurs will be a feature of the show.

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 TELEPHONE, BRYANT 4796
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 FROM PUBLICATION OFFICE,
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 M. B. HENNESSY, Vice-President
 FRED S. CLARK, Secretary and Manager
 1493 BROADWAY, NEW YORK, N. Y.

Managing Editor: Stephen L. Coles
 Technical Editor: Robert L. Dougherty

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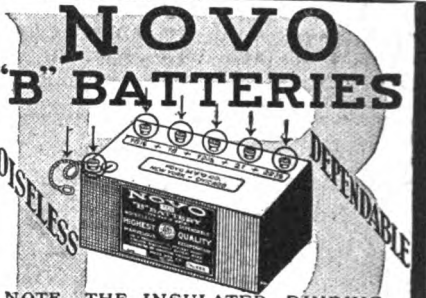
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Is "Amateur" a Misnomer?
 A VERY literal Englishman recently remarked to a man who was very much interested in radio, and had been for the past eight or ten years: "I really do not see why they call them 'amateurs.' From what I have noticed and heard, they seem to be as well equipped if not better than most of the operators on board the ships. Not only that, but I have had the opportunity to see them actually handle messages, and the remarkable precision and accuracy with which it was done actually astounded me."
 This is a very true conception of the American amateur. In nearly nine cases out of ten the average amateur, that is, the one who has owned a transmitter for the past five years or more, is more of a professional than the professional himself. In most cases amateurs have not the amount of money necessary to buy the expensive apparatus. So they are their own manufacturers and they turn out apparatus that works as well, sometimes better, than the commercial apparatus. This fact was recently brought out in the transatlantic tests. The distances covered on short waves with low power go to show that the amateurs have by means of a purely non-commercial association, that is merely for the benefit of the American amateur at large, developed into a force that is in many cases causing the various commercial enterprises to look to their laurels.

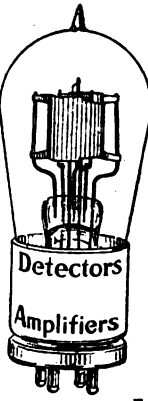
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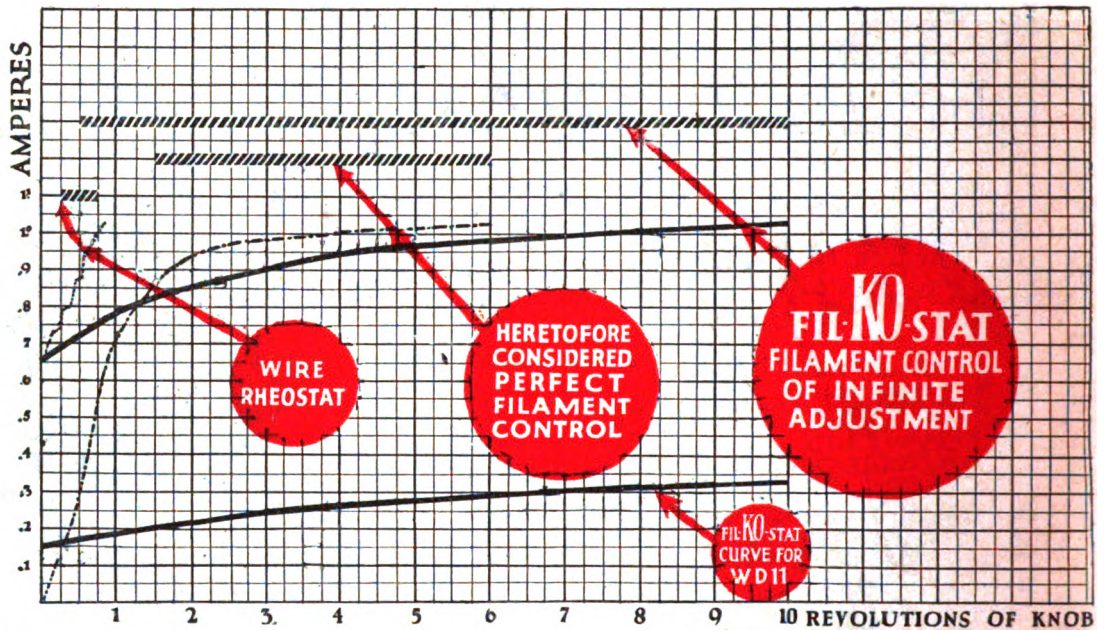
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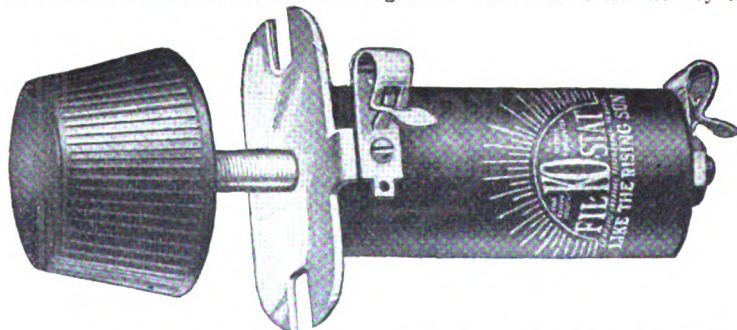
The lower curve on the graph above is eloquent testimony as to the Filkostat's adaptability to any dry cell tube. These tubes using only a fraction of an ampere demand an instrument that is so finely adjusted that this fractional current can be perfectly regulated. This the Filkostat accomplishes.

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- 7—Fine adjustment starts where tube BEGINS to function.
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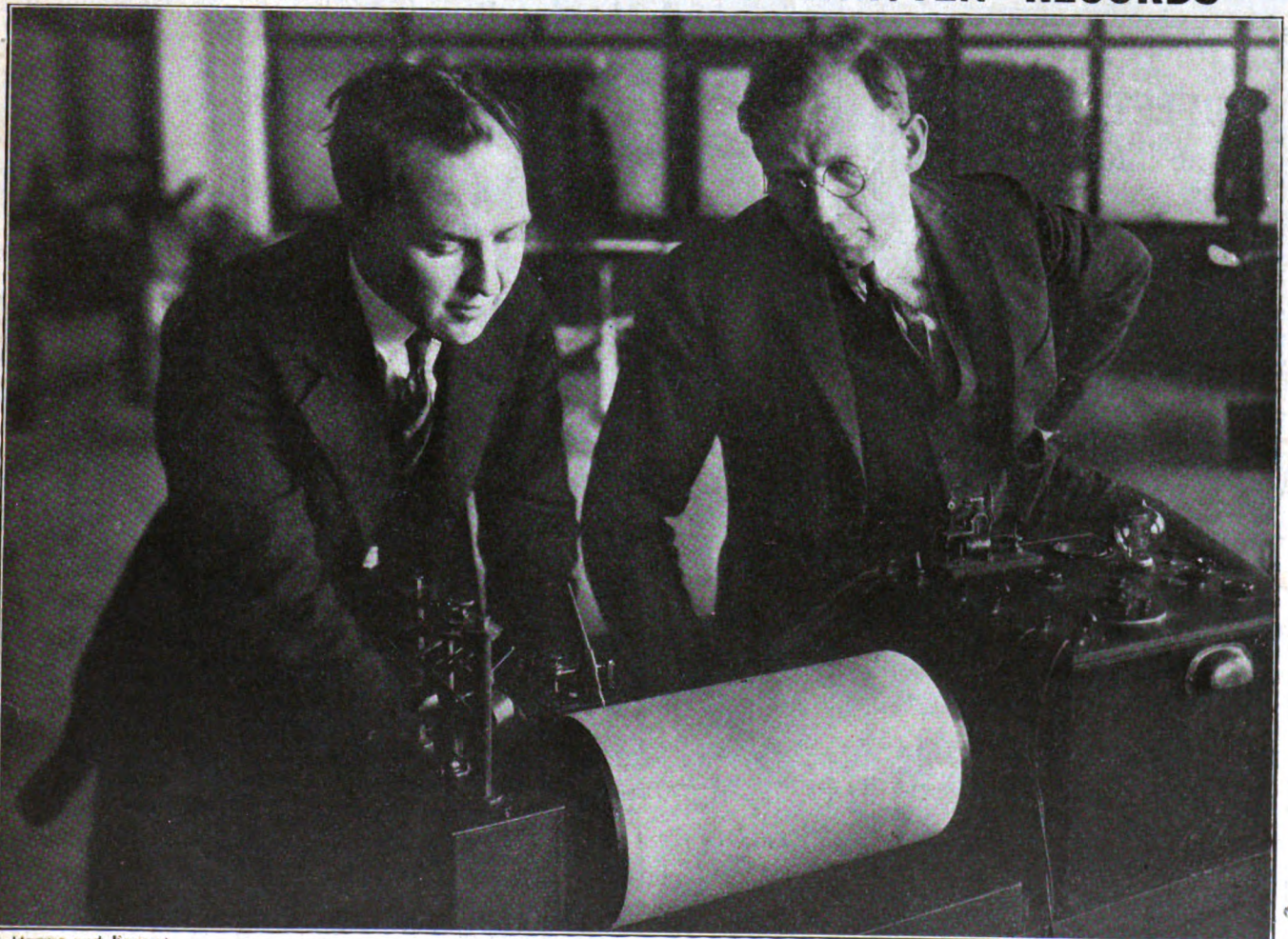
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and dashes of the message, and which preserves the record of the signals received. The record is taken down by an ordinary fountain pen which travels horizontally across the sheet, actuated by a very slow feed fine machine screw attachment, driven by a small motor. The signals themselves are amplified, and the output actuates a very sensitive relay which in turn works the mechanism which causes the pen to oscillate in irregular lines, which are transcribed at the leisure of the operator.

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[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

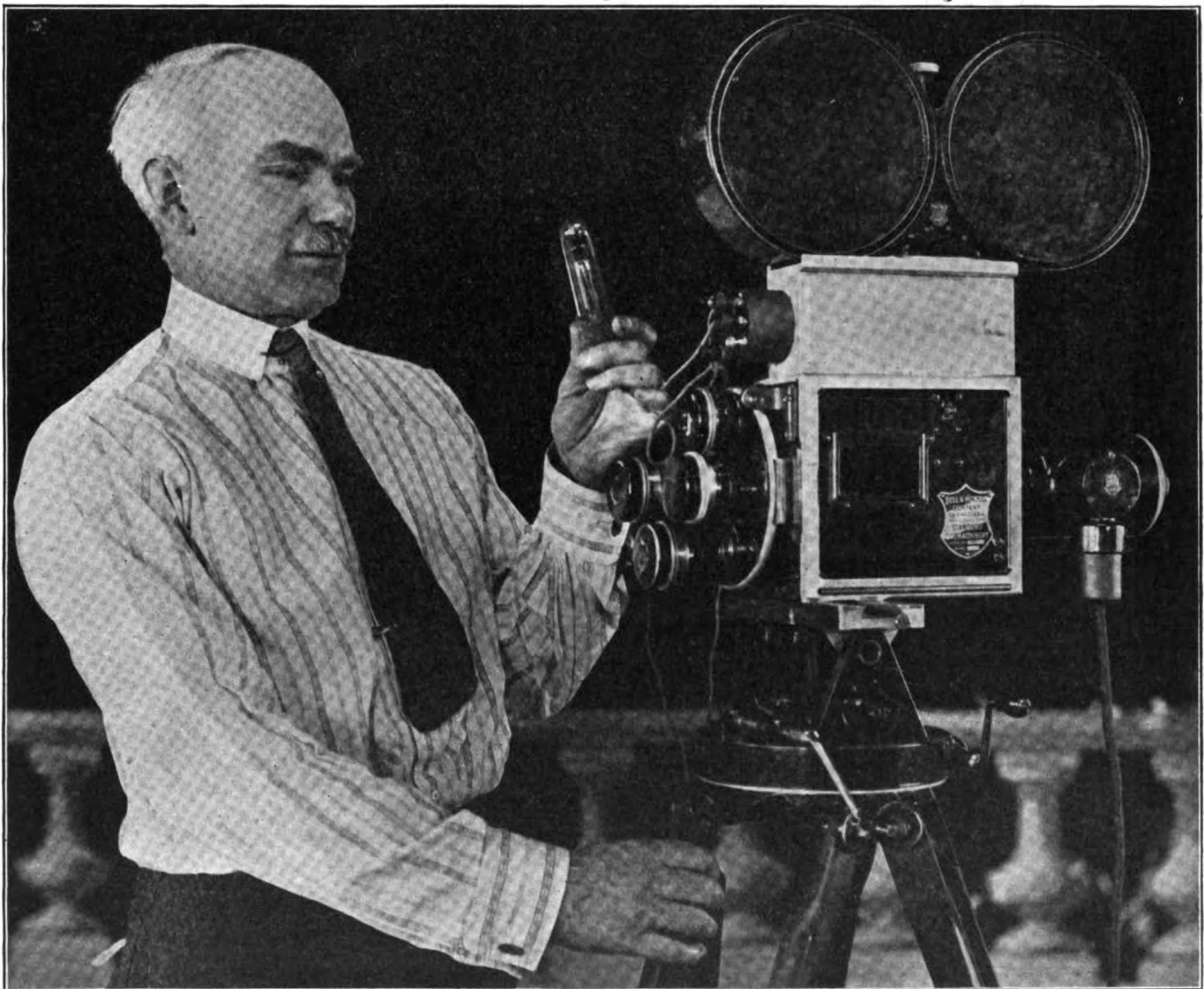
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Vol. II, No. 26. Whole No. 52

March 24, 1923

15c per copy, \$6.00 a year

Dr. Lee De Forest Demonstrates His Talking Picture Machine



Dr. Lee De Forest demonstrating his wonderful new invention which will make talking motion pictures possible. Dr. De Forest is holding the (C. Paul Thompson) "Photion" tube, which is the heart of the invention.

A vital step forward in the field of science was demonstrated on March 12, 1923, in Dr. Lee De Forest's studio, New York City, by Dr. De Forest himself. The device exhibited was a machine for photographing the human voice on the edge of a regular motion picture film while the picture itself is being taken.

Dr. De Forest has been working for the past three years on this invention, and has at last been able to call his experiments a success. The illustration herewith shows the inventor, who is also responsible for the present day audion and vacuum tube, with an ordinary motion picture camera, which he has adapted for use with his new device. He is holding what is

termed a photion tube, that is used to produce the voice on the film itself in a manner that at the present time cannot be made public.

By means of this device it will soon be possible to sit in your favorite moving picture theatre and instead of looking at the "pictures" you will also be enabled to hear the voices of the actors themselves. This idea is not new in itself, as many inventors have attempted to do the same thing for a number of years. Those of you whose memories are good will remember the attempt to synchronize motion pictures and talking machines at the old Eden Musee in New York some years ago that met with such a terrible failure.

Combining Radio Frequency and Regeneration

By C. White, Consulting Engineer

RADIO frequency amplification and regeneration have often been looked upon as two different ways of obtaining the same end and have seldom, if ever, been considered as a possible combination. The reason for this opinion has been due largely to the trouble experienced in keeping the tubes in the radio-frequency stages from oscillating. This tendency has existed even when no type of tickler or feed-back was employed. Poorly designed radio-frequency amplifying transformers, inductive reaction of the fields of the various radio stages due to a compact assembly with little or no intershielding, poorly insulated connecting wires, and incorrect style or make of vacuum tube have been blamed. But, the most potent reason, which was the feed-back of current through the common "A" and "B" batteries, was generally left unconsidered.

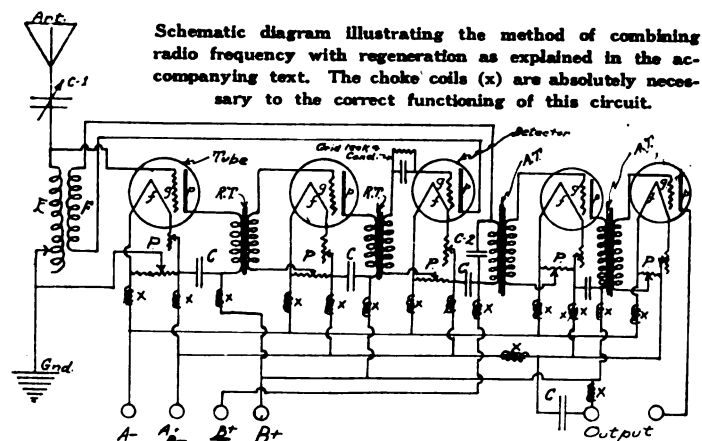
From my own laboratory experience it has been definitely proved that howling and other reactions that are far above the range of audibility are produced by this

the distant stations come in on a loud speaker that for a time we were almost certain that it was, a rather nearby broadcasting station.

To many looking for the first time at the diagram the cost of this set will appear to be excessive; but such is not the case, for it is possible by careful selection of the right apparatus and the right place to buy to complete this set at a total cost of about \$150.

For the amateur who wishes to extend the range of his present single circuit regenerative tuner, the schematic connections as shown in the illustration herewith will be an aid. It simply will be necessary for him to insert two radio-frequency amplifying transformers and two extra tubes before the detecting bulb and add the audio-frequency stages after the detector. Then he will have the combined advantages of two stages of radio-frequency, a regenerative detector, and two stages of audio-frequency amplification. Of course, he will have to place in the lead wires of his outfit the necessary choke coils marked X and the by-pass condensers designated by the letter C. Although the potentiometers are an added refinement still their use is fully justified since with them in the circuit it is possible to hold the grid of each tube to the correct negative potential and thus cut down all tendency of oscillation in the radio-frequency stages, thereby confining oscillation and regeneration to the detector tube alone, where it should be.

The constants and the types of apparatus for the various important parts of the circuit are as follows: The condenser C-1 is a 23 plate air variable, the unit E-F is an ordinary standard variocoupler employing E for the stator in the circuit and F for the rotor. All the units marked P are potentiometers having a resistance of about 250 ohms, the units marked X are choke coils that have an inductance of .1 henry, and the condensers lettered C have a capacity of .25 mfd. apiece. The transformers labeled R.T. are the radio-frequency transformers and those with A.T. on them are the audio-frequency amplifying transformers. A grid leak and grid leak condenser are recommended for use in the grid circuit of the detecting tube. The resistance and capacity of the same solely depends upon the particular tube used and easily can be found by trial, since the operation of the entire outfit does not critically depend upon it. The condenser C-2 is a fixed mica condenser of .002 mfd. capacity. The "B" battery terminal marked B+ is the positive terminal for the plate voltage applied to the detecting bulb, since it will be necessary to impress less plate potential on the detector than on the amplifiers. In order to keep the expense of operation as low as possible it is recommended that the new UV201-A Radiotrons or Cunningham's C301-A tubes be employed for all the stages and the detector. WD-11 tubes do not function satisfactorily with this type of circuit, and the ordinary tubes would require five amperes at five volts for operation whereas the type recommended would require only 1¼ amperes at five volts—just one-fourth as much power to light the filaments. Phone terminal jacks can be used on the audio-frequency stages but it is far better to adjust amplification by lowering the filaments of both tubes than to put out one tube and burn the other brightly.



frequent cause. Many receivers using a single tube as a detector without a tickler or feed-back and several stages of radio-frequency severely suffered in their range of reception efficiency due to the fact that at times for no apparent reason one or more of the tubes would start oscillating. At times, however, the inter-reaction was so severe that a constant hum or whistle could be heard in the phones. After placing choke coils and by-pass condensers in the battery lead wire circuits it was ascertained that practically all trouble due to oscillations was eliminated, that the reception efficiency was remarkably increased and the reliability or stability of operation was greatly enhanced. So stable and steady did the operation become when a potentiometer was placed across the filament of each tube in the set that it was decided to try out a tickler coil in the plate circuit of the detecting tube and see if the old tendency to oscillate when the filament was turned up a little too high returned.

It was found, however, that there was practically no difference between the outfit and an ordinary regenerative receiver in case of oscillation and stopping the same to adjust for maximum regeneration which is obtained when the detector is on the verge of jumping into oscillation. The receiver tuned-in very distant stations as easily as a good reliable single circuit regenerative tuner picking up local stations. So clear did

Boy Scouts Carry Radio With Them on Hikes

By David B. Rogers

WHEN the Boy Scouts go week-ending at Kanohwahke Lakes, N. J., in the Palisades Interstate Park where the Boy Scout Foundation of Greater New York conducts the largest all-the-year-round Scout camp in the world, they carry their radio with them. During the day it is useful for keeping in touch with headquarters, and at night it is called upon to prove its recreational value.

Several hundred Boy Scout troops in New York City now have sets, mostly of the portable type for field use, but in addition some of the troops maintain powerful tube sets at their headquarters. In many cases the sets have been designed and built by the boys themselves. Scout Robert S. Dunham of Troop 501, Manhattan, is responsible for one of the most efficient of these home-made sets. By an ingenious hook-up and panel plan, with jacks permitting the insertion of either head phones or microphone, he has concentrated his whole apparatus in a small rectangular box weighing less than ten pounds.

The Scouts were active in wireless work even previous to the recent radio boom. For a number of years now, a special radio award has been included on the list of Merit Badges given to Scouts acquiring specific knowledge of some sixty different vocational and avocational activities such as agriculture, signalling, plumbing, chemistry, printing, public health, craftsmanship, first-aid, business, civics, art, and electricity. And now the Radio Badge is worn with pride on many a khaki service sleeve.



Boy Scouts carry a portable radio set on their hikes and practice receiving and transmitting between different units.

Chronology of Speech Transmission by Wire and Wireless

In its annual report to stockholders for the year 1922, made public last week, the American Telephone and Telegraph Company publishes the following interesting chronological table of events in the transmission of speech:

- | | | | |
|------|--|------|--|
| 1875 | First words transmitted by telephone. | 1915 | First conversation by transcontinental line, 3,650 miles—Boston to San Francisco.
Speech transmitted for the first time by radio telephone from Arlington, Va., across the continent to San Francisco, over the Pacific to the Hawaiian Islands, and across the Atlantic to Paris. |
| 1876 | First complete sentence transmitted by telephone.
First conversation by overhead line, 2 miles—Boston to Cambridge. | 1920 | 11,795,747 Bell telephone stations owned and connected. |
| 1880 | 30,872 Bell telephone stations in the United States.
Conversation by overhead line, 45 miles—Boston to Providence. | 1921 | Conversation by deep sea cable, 115 miles—Key West, Fla., to Havana, Cuba.
First conversation between Havana, Cuba, and Catalina Island by submarine cable, overhead and underground lines and radio telephone—distance 5,500 miles.
Extension of Boston-Philadelphia cable to Pittsburgh—total distance 621 miles.
President Harding's inaugural address delivered by loud speaker to more than 100,000 people.
Armistice Day exercises at burial of unknown soldier delivered by means of loud speaker and long lines to more than 150,000 people in Arlington, Va., New York and San Francisco. |
| 1881 | Conversation by underground cable, $\frac{1}{4}$ mile. | 1922 | Ship-to-shore conversation by wire and wireless between Bell telephones in homes and offices and the S. S. America 400 miles at sea in the Atlantic. |
| 1884 | Conversation by overhead line (hard-drawn copper), 235 miles—Boston to New York. | 1923 | 14,050,565 Bell telephone stations owned and connected.
Successful demonstration of trans-oceanic radio telephony from a Bell telephone station in New York City to a group of scientists and journalists in New Southgate, England. |
| 1890 | 211,503 Bell telephone stations. | | |
| 1892 | Conversation by overhead line, 900 miles—New York to Chicago. | | |
| 1900 | 676,733 Bell telephone stations owned and connected. | | |
| 1902 | First conversation by long-distance underground cable, 10 miles—New York to Newark. | | |
| 1906 | Conversation by underground cable, 90 miles—New York to Philadelphia. | | |
| 1910 | 5,142,692 Bell telephone stations owned and connected. | | |
| 1911 | Conversation by overhead line, 2,100 miles—New York to Denver. | | |
| 1913 | Conversation by overhead line, 2,600 miles—New York to Salt Lake City.
Conversation by underground cable, 455 miles—Boston to Washington. | | |

A Simple Method of Winding Coils for the Flewelling Circuit

By Arthur S. Gordon

IF you are experimenting with the new Flewelling circuit as described in RADIO WORLD for Feb. 24, 1923, by Robert L. Dougherty, you will appreciate the simple method of winding honeycomb coils outlined in the following paragraphs. If you already know how to wind the coils, but are hesitating because of the difficulty encountered in mounting them, you will appreciate the novel and original idea suggested here, in

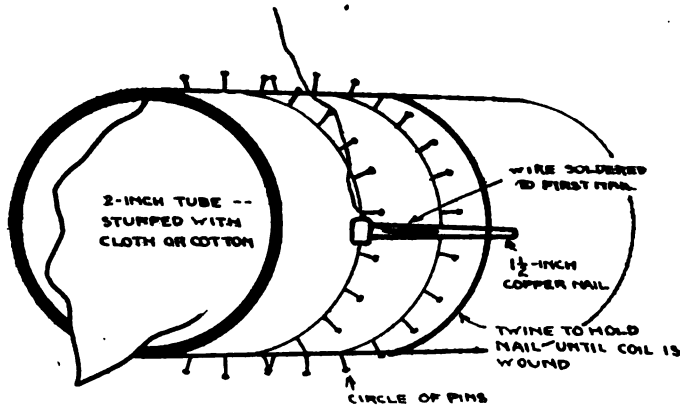


Fig. 1. Illustrating how the cardboard tube is prepared for the winding and how the end of the wire is soldered to a copper nail which is afterward employed as a contact for use with the adapter.

which two copper nails and two contact clips from a discarded B battery are made to serve the purpose of the most complicated adapter. At any rate, this article is offered at this time because of the increased interest in that hook-up which not only achieves super-regeneration with a single tube, but achieves it by the use of no more complicated a tuning device than the honeycomb coil.

Not only in the Flewelling circuit, however, does the honeycomb coil find its ideal application. Long before super-regeneration was thought of, single circuit amateurs were using DL coils because they were so easily

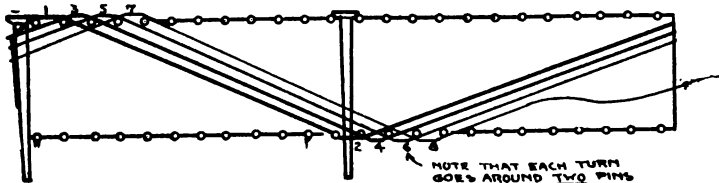


Fig. 2. Showing how the turns are carried around the coil. Note that they jump two pegs instead of one as is usually the case. The winding goes over the nails and holds them in place.

replaced with similar coils of a lesser or greater inductance. A set supplied with a complete row of honeycombs could jump instantly from 200 meters to 2,000 meters with no more effort than merely placing in the adapter that coil which possessed the required number of turns. This flexibility has given DL coils a deserved popularity in the past, and the new use for them in connection with the Flewelling super-circuit is bound to increase the number of amateurs who look with favor upon them. Possibly many of these enthusiasts will be meeting the honeycomb winding for the first time; and for this reason, as well as for those given above, the construction of a DL coil of any desired number of turns is described and illustrated here-with in detail.

A cardboard tube, two inches in diameter, is ideal

for the form about which to wind the coils. Wound on smaller tubes, the coils do not function well, while the use of larger cardboard forms increases the linear amount of wire without adding anything to the efficiency of the coils. The same statements apply to the width, which should be about one inch. Of course, there is a little margin on each side of these dimensions which makes no difference whatever.

Measure off and mark on the tube two pencil lines one inch apart. Leave a margin of one-half inch between the first line and the edge of the tube, because in this simplified method of winding where common pins are used as angle pegs, there must be extra cardboard on both sides of the line. Before placing the double row of pins around the form, however, as shown in Fig. 1, stuff the tube with cloth or cotton, making it, in effect, a cardboard pin cushion. This padding gives strength and steadiness to the pins and effectively takes the places of the wooden cylindrical block usually employed.

When the pins are in place about one-quarter inch apart, 25 pins once around, the form is ready for wind-

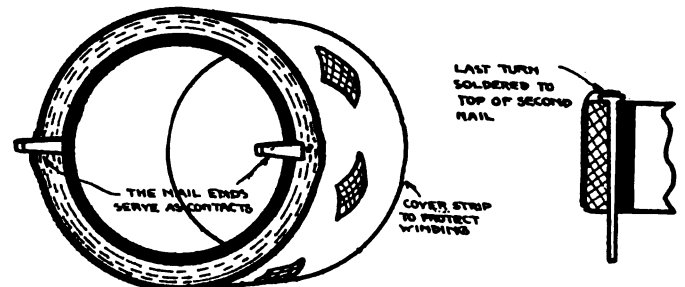


Fig. 3. The coil when finished. A cover of thin fibre is added for protecting the winding and also for appearance. The smaller sketch shows the method of attaching the winding to the nails.

ing. The right size of wire for coils of 50 and 75 turns is No. 22 or No. 24 SCC copper, although finer wire up to No. 30 may be, and is, used on coils of a greater number of turns. Before winding, solder the beginning of the wire along the upper half of a plain copper nail, which may be bought cheaply at any hardware store. Place this nail between any two pins with its lower part projecting beyond the second row of pegs, as shown in Fig. 1. A second and identical copper nail is placed in a like position on the other side of the coil, and both are, for the time being, held in place by a piece of twine. Later, of course, this twine is cut and thrown away, for every turn on the coil goes over these two copper nails and binds them as securely as though they were embedded in solid rock.

It will be noted in taking the next step that the turns go around two pins at a time instead of only one. It will be left to the amateur to discover the subsequent ease and neatness with which the turns fall in place. In detail, the winding is as follows: Take the wire from the first copper nail around the nearest two pins in the top row; then cross to the bottom row, at the same time making just one-half a turn with the tube. So around the two lower pins which imprison the second nail (see 2, Fig. 2) and then cross to the top row, this time also going around two pins, but including in

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Seven New Broadcasting Stations

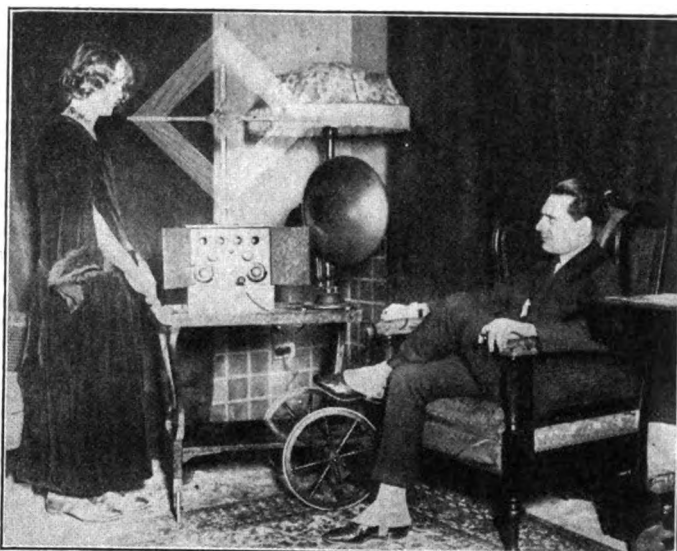
SEVEN new stations were licensed to broadcast on 360 meters during the week ending March 10, 1923. They are located as follows:

Call	Station	
KFHA	Colorado State Normal School, Gunnison, Col.	50 watts
KFDX	First Baptist Church, Shreveport, La.	200 watts
WQAZ	Greensboro Daily News, Greensboro, N. C.	300 watts
WOAQ	Portsmouth Kiwanis Club, Portsmouth, Va.	15 watts
WQAX	Radio Equipment Co., Peoria, Ill.	20 watts
KFFO	Smith, Dr. E. H., Hillsboro, Oregon.	5 watts
WRAP	Winter Park Elect. Const. Co., Winter Park, Florida.	20 watts

Radio for Safety and National Welfare

The use of radio for safety at sea and the welfare of the nation must be given first consideration in standardizing services, according to Admiral Ziegemeier, Chief of the Naval Communications Service. Discussing precedence of the several services recently, Admiral Ziegemeier pointed out the necessity of granting suitable wave lengths to the mobile stations, including ships and aircraft.

A "Tea Wagon" Radio Set



(C. Underwood and Underwood)
Miss Florence Kiersted entertains Mr. R. W. E. Decker with a "tea wagon" radio set at the recent New York convention.

ATTENDING the Second District Radio Convention recently held at the Hotel Pennsylvania, New York City, were many notables—in fact, so many that it would require columns of RADIO WORLD to describe them. However, out of all the chaos stepped a few to be meekly led before the "clicker" and snapped. It was therefore a fortunate moment when the photographer caught Mr. R. W. E. Decker, known on the "air" as ZVA, while seeking a few minutes rest from the excitement of the occasion. Mr. Decker is shown in the illustration listening to the "tea wagon set" demonstrated by Mrs. Florence Kiersted, of Brooklyn, N. Y.

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that number one that has already been used. In other words, although each turn goes around *two* pins, it only

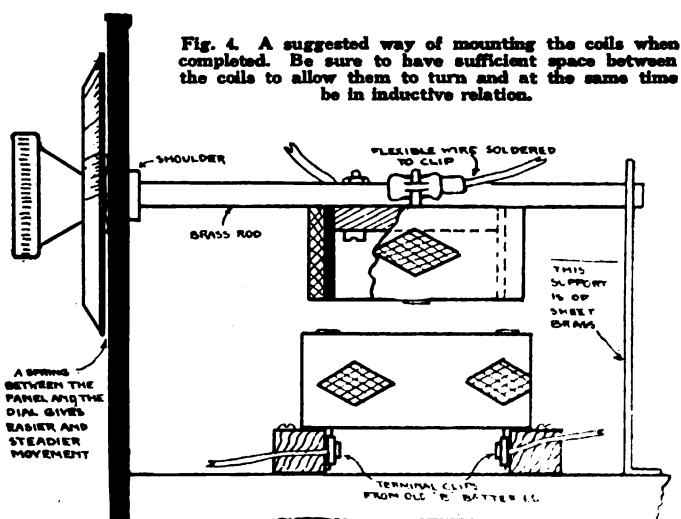


Fig. 4. A suggested way of mounting the coils when completed. Be sure to have sufficient space between the coils to allow them to turn and at the same time be in inductive relation.

goes in advance of itself *one* pin at a time. Fig. 2 illustrates this.

When one layer is on the tube, you have wound 25 complete turns. Two layers contain 50 turns, while three make a DL coil of 75 turns. Whichever size coil you make, the winding should stop at the second nail and the end of the wire should be soldered to the flat head of that nail. Now take out all the pins except two, those two being the pegs about which the last

half turn was taken. Soak the coil—also the working end of the tube—with hot paraffin. Wait until the paraffin is almost cold, then press it between the turns with your fingers. When this cementing process is finished, take out the last two pins, cut off the cardboard on both sides of the now completed coil, put on a cover strip to protect the winding, and you will have a coil which looks something like Fig. 3.

Now for the adapter. At some point during the preceding explanation, you have probably wondered what sort of an arrangement would take a coil with the ends of two copper nails protruding from it. Did you ever notice the terminal clips on a B battery? Or the clips that are on sale in even the smallest radio stores, the kind that bend over, press down and leave a little bridge of spring brass under which to slip the wire or cord tip? Well, these contact clips solve the problem and solve it ingeniously.

Looking at Fig. 4 you will find the stationary DL coil resting on two blocks of either wood or bakelite. The inner side of each of these blocks is one contact clip, so placed to receive the copper nail ends coming from the coil. The leads from the other instruments are, of course, soldered to the clips. That's novel enough and as simple as a device doing its work can be.

The movable coil is served in a little different manner. The method of mounting the coil on a circular block of wood, which is in turn bolted to a brass rod, is incidental. The real purpose of the upper half of Fig. 4 is to show how the contact clips are soldered to flexible wires which go to the other instruments of the set, and which are clamped on the nail-end contacts.

An Improved Radiotron Type Vacuum Tube

By J. L. Bernard

A NEW and improved radiotron type UV-201-A superior in many respects to the UV-201 tube and designed to supersede the latter recently has been announced by the Radio Corporation of America, of New York City, as the latest addition to their vacuum tube line.

While in outward appearance UV-201-A resembles UV-201, with the exception of a slight discoloring of the bulb, the new tube incorporates several distinctive features.

One of the outstanding features of the new tube is its special filament. Radiotrons UV-200 and 201 contain pure tungsten filaments which require about one ampere with a six volt battery source for the production of normal filament emission. The latest tube, however, contains a new and improved filament requiring only one-quarter of an ampere (.25) at five volts across the terminals of the filament and with this current the filament emission averages about five times that of the UV-201 tube. It is remarkable that with

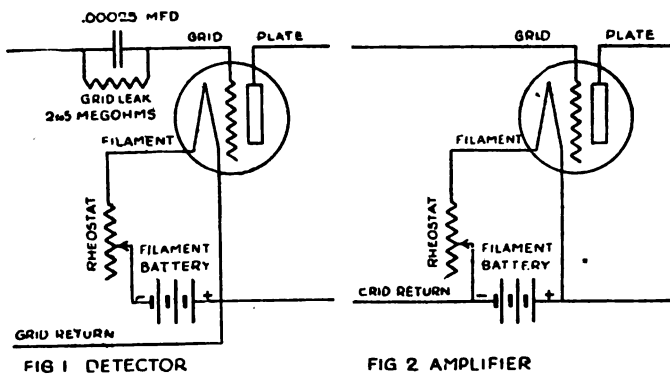
about five times that of the ordinary amplifying tube, make it an exceptional tube for power amplification such as that required for loud speaker operation. (2) The filament of one tube consumes one-quarter ampere and it may be operated from four dry cells in series thus eliminating the use of storage batteries. If more than one tube is used, it is recommended that a storage battery of from 20 to 40 ampere-hours be employed. If radiotrons—UV-201-A—are used instead of UV-201, the battery will last four times as long. (3) Having exceedingly high vacuum, the tube is exceptionally quiet in operation there being no inherent tube noises. High vacuum also assures uniform characteristics. (4) It is particularly adapted to radio-frequency amplification. (5) In its operation as a detector, radio-frequency or audio-frequency amplifier the results obtained are exceptionally independent of filament adjustment. Critical adjustments of grid leak or grid condenser are not required. (6) It can be used in any equipment which at present uses the ordinary tube and will give improved results. No adapter is necessary when the standard four-prong socket is used. (7) If the filament is supplied by a six-volt battery the resistance of the filament rheostat should be at least four ohms, preferably six ohms. (8) Filaments should always be operated at the lowest current consistent with satisfactory results. (9) The tubes should be mounted on cushioned bases when used for detection and audio-frequency amplification.

When the tube is used as a detector it is usually preferable to connect the grid return to the positive side of the filament exactly as shown in Fig. 1 herewith. A grid condenser of .00025 mfd. and a grid leak of two to five megohms are recommended. Critical adjustments of grid leak and condenser are not required. The best plate voltage for detection is approximately 40 volts.

When the UV-201-A radiotron is used as an amplifier it is important that the filament rheostat should be placed in the negative lead from the "A" battery and that the return lead from the grid circuit should be connected to the negative side of the "A" battery and not to the negative side of the filament. These connections should be made as shown in Fig. 2.

For the best results the negative grid bias voltage should be increased with increase in plate voltage. In general, the following grid bias voltages are suitable: 40 volt plate, 0.5 to 1.0; 60 volt plate, 1.0 to 3.0; 80 volt plate, 3.0 to 4.5; 100 volt plate, 4.5 to 6.0.

Negative biasing cells should always be placed in that portion of the grid circuit where it returns to the filament circuit rather than next to the grid terminal of the tube.



Diagrams Illustrating Method of Using Radiotron Tube as Detector or Amplifier.

this special filament, the electron emission is increased five-fold and not, as one might expect, at the expense of additional filament power. Furthermore, this high filament emission is not accomplished at excessively high operating temperatures. On the contrary, the filament, when burning at normal brilliancy, has a temperature materially less than that of the UV-201 tube.

Aside from its superior filament properties, the new tube is exhausted to an exceedingly low pressure. A high vacuum is recognized as representing one of the most important factors in the design of vacuum tube amplifiers and every effort has been made in the case of UV-201-A to completely expel the gases from the bulb. The successive stages in the exhaustion of the new tube are carried out with extreme care so as to insure satisfactory performance.

During this process of exhaustion a mirror-like film collects on the inside wall of the glass bulb which remains after the exhaustion is completed. The translucent film should not lead the owner to believe that the tube is defective. This slight discoloring does not interfere with the operation of the tube in any way.

High filament emission in a vacuum tube, when accompanied by exhaustion which is carried to the lowest pressures obtainable in production determines, in a large measure, the success of the tube as an amplifier of radio-frequency currents as well as low frequency energy. The practical significance of these features is:

- (1) Electron emission from the filament, averaging

What Most Appeals to You in RADIO WORLD?

Drop us a line and let us know what you like and what you don't like in our text pages. We are trying to keep our thumb close to the pulse of the radio public. Judging by the sales of this paper, we are succeeding. Let's hear from you. Address Editor, Radio World, 1493 Broadway, New York City.

Prize Winning Amateur Set at Radio Fair, New York

THE amateur constructor, in the making of his set, is taking more care and pains than was his wont in the old days. This has been proved conclusively in the many sets which have come forward at recent conventions and fairs where various amateurs exhibited their work.

It used to be that when a fan was making a set, any old thing he found lying around would serve the purpose as long as it worked, even half way. This has given way to the man who, with electric soldering iron, automatic drill, templates and the best of material, is making the most up-to-date circuits for his own use. His workmanship is excellent, frequently surpassing that of the professionally manufactured article in point of novelty and idea, if not in work alone. Of course the hand-made set must of necessity give way to the machine drilled and assembled set, but for work where care has been taken and ideas worked out in concrete form, the American amateur who makes his own set is without peer as a model maker.

An example of this fine type of workmanship is the set illustrated herewith, which was constructed by W. H. Spalding, of Brooklyn, N. Y., and which won first prize at the Amateur Set Contest of the Permanent Radio Fair, Hotel Imperial, New York City. The judges had many sets to test and look over. After due consideration the prize was awarded to Mr. Spalding for workmanship, novelty and actual working qualities. The set was entirely constructed by Mr. Spalding who used the three unit honeycomb circuit, embodying several new ideas in the construction of the set, such as the elimination of the jacks and plugs for the switch-

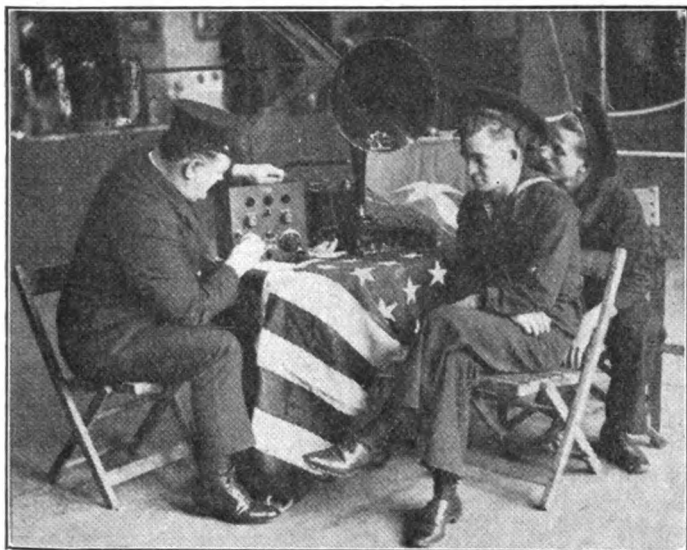
ing of the phones from the detector to the different stages of amplification. This was done by means of



(C. Photonews)

W. H. Spalding and the three tube receiver with which he won first prize at the Permanent Radio Fair, New York City. The set operates on the famous $1\frac{1}{2}$ volt cells. Transfer from detector to first stage and first stage to second is made by an ingenious arrangement of push switches, instead of the regulation plug and jack. The set is self-contained, having space for the batteries in the cabinet. It won on points of utility as well as workmanship, the interior being wired with utmost care.

two small push switches, and embodies several novel constructional details evolved by the builder in the course of his work.



(C. Kadel & Herbert)

Chief Petty Officer W. L. Whalen tuning in Pittsburgh at the Motor Boat Show, New York City, where the radio division attracted much attention. The set shown is a De Forest Reflex with Magnavox loud speaker.

Radio at the New York Motor-Boat Show

ONE of the most interesting exhibits at the recent Motor Boat Show, Grand Central Palace, New York City, was the radio booth. Here gathered all the "old salts" even if they only owned a row boat. Some of the radio sets, designed for use on small yachts, attracted much attention, but on the whole, the most attractive was the one incorporating the loud speaker through which music from the different broadcasters was heard. Of course, nobody who owns a yacht, catboat or small motorboat can be considered up-to-date these days, unless they incorporate a full-fledged radio receiving, and maybe transmitting, set on their craft. The delight of "sailing, sailing, over the bounding main," is not complete these days unless refreshing music from one of the larger broadcasters is to be heard. Think of the comfort of knowing that you are always in touch with land, no matter how sea-sick you are. Many amateur yachtsmen have also become enthusiastic radio fans and are building their own sets for use on their craft.

Broadcast Test Between London, England, and Newark, N. J.

REPORTS from British fans telling of the reception of American stations in England has influenced the British Broadcasting Corporation to arrange for a special program in an attempt to reach the United States. Tentative arrangements had been made between 2LO, which is the main station of the broadcasting chain controlled by the corporation and WJZ, the Radio

Corporation-Westinghouse station in Newark, N. J., for reception of the former's program early in April. As a new station is being erected by the Broadcasting Corporation which will be more powerful than the original one, the test has been postponed.

Station 2LO will conduct its tests with WJZ on 360 meters, which will enable fans equipped with broadcast receivers to tune in that wave to listen in. The Newark station will stand by during the test, and the co-operation of other local stations will be asked.

The Kenotron Rectifier for Obtaining High Voltages

By *B. R. Cummings*

Radio Engineer of General Electric Company

THE development of three-element vacuum tubes for use as generators of radio frequency power has been accompanied by the requirement for a power supply of high voltage direct current, which is applied between the plate and filament of the three-element tube. At lower powers the high voltage direct current is obtained from a direct current generator with a rotating armature. At higher voltages than are obtainable from such machines, however, it has been necessary to develop other means for obtaining this supply. The kenotron rectifier has been developed primarily for this purpose in connection with radio telephone and telegraph transmitters, although it is applicable to other uses where a high voltage direct current power supply is required.

The word "kenotron" was originated by the General Electric Company about 1913 as a name to cover all types of vacuum tubes. The word is derived from two Greek words, "keno" and "tron," the former meaning space or vacuum, and the latter meaning object or thing; the word kenotron, therefore, implies a vacuum device. As used at present, the term refers only to the two-element rectifying tube, the term "pliotron" being used for the three-element tube. The kenotron is similar appearance to the more familiar three-element vacuum tube, the underlying difference being in the omission of the third or control electrode, commonly known as the "grid." In one of its earliest forms it was known as the "Fleming valve," although that valve was built for handling comparatively small currents only, and was used almost entirely as a detector tube in radio receiving circuits.

The kenotron depends for its functioning upon its inherent unidirectional conductivity, which briefly may be described as follows: In common with the more familiar three-element tube, a filament in a highly evacuated vessel is heated to incandescence by the passage of direct or alternating current through it. Under these conditions the filament emits a great number of electrons, which are unit charges of negative electricity. If a potential difference is created between the filament and the second electrode, known as the "plate," and the plate is made positive with respect to the filament, the negative electrons will be attracted to the plate and will enter it, causing a flow of current between the filament and plate inside the tube and from the plate back to the filament in the circuit external to the tube.

The flow of current, therefore, is based fundamentally on two things. First, on the continuous emission of electrons by the filament; and, secondly, by the attraction of these electrons to the plate. It is apparent, therefore, that the current in such a device can flow in one direction only; for if the plate is made negative with respect to the filament, in an effort to cause a current flow in the opposite direction, the fact that no electrons are emitted by the plate will leave no medium for current flow in the space between the filament and the plate. Under these conditions, the result is an open circuit. As soon as the potential of the plate again becomes positive, however, current will again

flow through the tube. Therefore, if a kenotron tube of suitable capacity is placed in series with an alternating current supply, it will be found that current will flow in the circuit only during every other alternation, during which the current flows from the filament to the plate. For the alternations which would normally cause the flow of current in the opposite direction, the kenotron acts as an open circuit.

The output of such a rectifier will be a pulsating direct current, each successive alternation of the power supply, of the same polarity, producing a pulse of direct current. It is customary, therefore, where direct current of constant amplitude is required to add a so-called "filtering system" in the output circuit of the rectifier, which will smooth out the ripple.

For the production of high voltage direct current by means of a kenotron rectifier, it is customary to step-up the alternating current supply voltage, by means of a transformer, to a voltage somewhat higher than that actually required for the operation of the three-element pliotron in the radio transmitter proper, so as to allow sufficient additional voltage to compensate for the voltage drop through the kenotron tubes and the filter system. This high voltage alternating current is rectified by means of kenotron rectifiers, the circuits and the number of kenotrons used depending upon an economic consideration of the purposes for which the equipment will be utilized. It is possible, by means of a number of kenotrons, and by utilizing a multiplicity of phases, to obtain a direct current output from the kenotron rectifier which will have remaining in it only a small percentage of intermittent direct current.

Particularly in the radio telephone transmitter it is essential that the plate supply to the pliotron tubes be constant, and it is customary in such equipment to associate with the kenotron rectifier a filter system. Here again the extent to which the filtering is carried out is dependent upon economic conditions, and it is usually found that it is preferable to permit a very small ripple in the output rather than provide a filter system which would be sufficiently elaborate to remove this ripple entirely. Such filter systems usually consist of a combination of condensers and reactors of comparatively high capacity and inductance connected across, and in series with, the load. In some cases it is found that a "trap" circuit, consisting of a capacity and an inductance in parallel, tuned to the frequency of the ripple in the rectified output, can be effectively used to suppress the ripple.

The kenotron rectifiers built on this principle are applicable not only to radio equipment, but to any circuit in which a high voltage direct current is required. Such rectifiers have been built with capacities up to 30 kilowatts at 15,000 volts direct current, although much larger equipments can be developed. Such equipment is preferable in many respects to revolving machinery, even at voltages at which the latter can be built. The kenotron rectifier is noiseless in operation, has no moving parts and requires no maintenance other than the infrequent replacement of the rectifier tubes.

Capital Radiations

By *Washington R. Service*

WASHINGTON, D. C.—For the first time an army order directs an officer to report his arrival in this country by radio. Ordinarily an officer is advised to report by telegraph or in writing, but today radio has begun to usurp other means of communication and the order quoted is an indication of future practice. Major A. B. Hitchcock, of the 7th Infantry, who has been ordered to return from Alaska to the States, was the first officer ordered by radio to report to his new commanding officer for assignment.

* * *

An investigation to ascertain whether or not there is

will be undertaken and contracts and agreements will be examined to learn if exclusive rights or special privileges for transmission or reception have been made. No announcement has as yet been made by the Commission.

* * *

Radio will play an important part in the International Ice Patrol Service which will begin for the summer as soon as the Coast Guard cutter "Tampa" leaves Boston. The purpose of this service to which the cutters "Tampa" and "Modoc" have been assigned by the Coast Guard, is to locate dangerous ice near the

Radio Entertains the Bedridden



(C. Gilliams Service)

About the meanest fate in the world is lying in a hospital, unable to move, and depending upon people to bring a little sunshine into your life in the conventional manner with flowers and a little gossip of the outside world. That is as it used to be, but is not at the present time. An up-to-date case is that of William Snider, a telephone lineman, who recently suffered broken arms and legs in a fall from a particularly high telephone pole. His comrades, hearing of his plight, and knowing that he was an especially active man, understood that he would suffer from his forced inactivity. So they installed a radio set in his room.

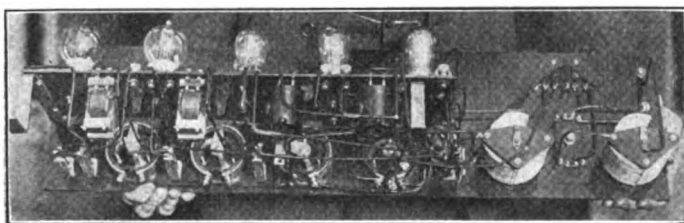
New Use for Phonograph Records



(C. International Newsreel)

One of the newest wrinkles in the way of home-made radio apparatus was recently shown by W. J. Simpson, of St. Paul, Minn. Having a lot of old phonograph records which had outlived their usefulness, he tried using them for mounting radio apparatus. This, of course, is not absolutely new, as many people have used defunct records for different parts of radio sets before. The novelty of the idea is that he made the entire set on the record, using it as a panel to mount his apparatus on. The illustration shows two sets made by Mr. Simpson. They are easy to work with, and are good insulators, being made of rubber composition. A neat cabinet for this type of apparatus can be made from a hatbox such as Mademoiselle, the Modiste, sends home to your wife. It can be painted black and no one will know the difference.

A Fire Escape Antenna



(C. Kadel and Herbert)

An unusual DX accomplishment accredited to A. S. Mawhinney, 891 Riverside Drive, New York City, recently was described in RADIO WORLD, and now the fans are given a chance to see the workings of this remarkable set. This set picked up California, using a wire attached to the fire escape as an antenna. The set illustrated, it will be noted, uses five tubes—the first two on the right as radio frequency amplifiers, the third tube as a detector, and the two V. T. 2s as audio frequency amplifiers. The work of this set is a marvel, as is also the work on it.

a radio trust will soon be launched by the Federal Trade Commission in compliance with the requirements of a House resolution. This resolution directing the Commission to investigate the status of the radio industry to ascertain whether anti-trust statutes were being violated, was received by the Commission last week. It is understood that a conference of the officials and probably a preliminary investigation will be held before formal action of any sort is taken or witnesses are called. A complete survey of the radio patent field

transatlantic steamship lane, patrol the section and broadcast warnings twice daily on 600 meters. The ship on patrol answers to the call KFOG and gives information upon request. Once each evening a radiogram is sent to the Hydrographic Office of the Navy in Washington defining the ice danger zone. This information is re-broadcast from naval radio stations at Arlington, Annapolis, Boston, New York and Norfolk every morning and evening because the ships' apparatus is not powerful enough to carry long distances.

Methods of Measuring Properties of Electron Tubes

A Convenient and Readily Determined Detection Factor

Various detection factors have been proposed* to express the merits of the electron tube as a detector. A factor to be useful should be readily determinable and simple of application in desired calculation. The audio-frequency output voltage (or current) produced by the rectification of a completely modulated radio-frequency input varies for most detector tubes over a limited voltage range approximately as the square of the input voltage. So for a load of given impedance in the plate circuit the ratio of the voltage across this load to the square of the input voltage will be nearly a constant over this limited range of voltages. This ratio forms a convenient detection factor, which may be readily determined with the tube under actual operating conditions. (This factor is used in calculations by L. M. Hull in the report mentioned above.)

The method of measurement can be understood by reference to Fig. 6. It consists of applying a completely modulated radio-frequency voltage to the input of the tube and measuring the audio-frequency output by comparison with a known audio-frequency voltage of the same frequency.

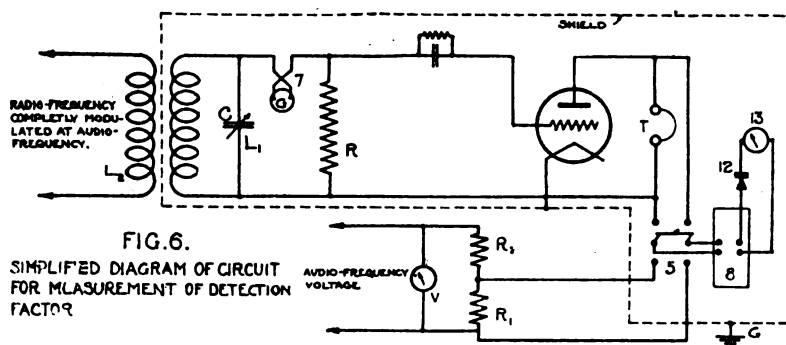


FIG. 6.
SIMPLIFIED DIAGRAM OF CIRCUIT
FOR MEASUREMENT OF DETECTION
FACTOR

- R_2 Radio-frequency link resistance.
- R_1 Decade resistance box, 0-1,000 ohms.
- R_2 Resistance box, 0-10,000 ohms.
- V. Hot-wire voltmeter, 0-30, 0-150 volts.

The tube and measuring apparatus are completely enclosed in a grounded screen wire cage, which shields the apparatus from the radio generator and from stray radio signals or disturbances, and is supplied with modulated radio-frequency and audio-frequency current from apparatus outside of the cage.

The modulated radio frequency is supplied by an electron-tube, radio-frequency generating set, enclosed in a metal-lined box and placed about 3 meters from the cage. The wave length of the generated radio frequency is variable over the range desired. The plate voltage is about 120 volts alternating current, supplied by a small 500-cycle motor generator, which also furnishes, through a step-down transformer, 30 volts to the leads 2.

The radio frequency, adjusted to the wave length at which measurements are to be made, is introduced into the cage by means of coils L_1 and L_2 , the coupling of which

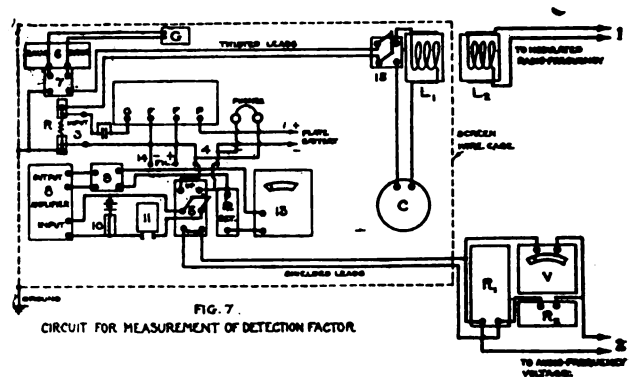


FIG. 7.
CIRCUIT FOR MEASUREMENT OF DETECTION
FACTOR

The complete circuit arrangement is shown in Fig. 7, in which the following legends are used:

1. Leads to radio-frequency supply.
2. Leads to audio-frequency supply.
3. Terminals connected to input of tube under test.
4. Terminals connected to input of tube under test.
5. DPDT switch.
6. Galvanometer shunt.
7. Vacuum thermoelement of low resistance.
8. 3-stage audio-frequency amplifier (resistance coupled).
9. Audio-frequency transformer.
10. Grid leak, 2 megohms and 2.5-volt battery in input circuit of amplifier.
11. Mica condenser, 0.02 microfarads capacity.
12. Crystal detector (carborundum). (These may be replaced by thermoelement and galvanometer.)
13. Milliammeter.
14. Filament battery terminals.
15. DPST switch.
- C. Variable condenser, maximum capacity, 0.005 microfarad.
- G. Sensitive galvanometer (low resistance).
- L_1 and L_2 radio-frequency coupling coils.

can be varied. The coil L_2 , outside the cage, has an inductance of about 140 microhenries, and, since it is in an untuned circuit, is used over the entire range of wave lengths. Two coils are used at L_1 in the tuned circuit, L_1 -C-15-7-R, inside the cage, to cover the range of wave lengths required—one the same size as L_2 , used from 600-1,500 meters, and a larger coil having an inductance of about 860 microhenries, used from 1,500-4,000 meters. This input circuit is tuned to the radio-frequency current in L_2 by varying the condenser C.

The input to the tube is the iR drop across the resistance R, due to the radio-frequency current flowing through R, and is varied by using different values of R and varying the current through R by changing C. This current is measured by the thermoelement 7 and galvanometer G, which are calibrated with the shunt 6. The resistances used at R are standard high-frequency link resistances,* varying from 0 to 30 ohms. They must be measured occasionally on a direct current bridge to check their resistance as they do not remain constant.

The grounded input terminal at 3 may be connected to either the negative or positive side of the filament. Short leads should be used in all connections to the tube.

The audio-frequency comparison voltage is supplied to the switch 5 through shielded leads by the voltage divider

*Stuart Ballantine, Proc. I. R. E., April, 1919. L. M. Hull, Radio Laboratory Report, Bureau of Standards, CR134d. John R. Carson, Proc. I. R. E., April, 1919. Hulbert & Brett, Phys. Rev., 16, 1920, p. 274 and p. 466. H. J. van der Bijl, "Thermionic Vacuum Tubes," p. 339.

*See Bureau of Standards Circular 74, p. 176.

(Continued on next page)

Prof. Hazeltine Demonstrates His New Neutrodyne Circuit

A DEMONSTRATION of the neutrodyne circuit designed by Professor Hazeltine, of Stevens Institute of Technology, was given last week at Columbia University, New York City. Its principles were fully explained by the inventor and by its builder. This receiver operates on an entirely new principle and because of that fact, it is incapable of oscillating. It is known as the "set that cannot cause interference through its re-radiating signals and oscillations."

The circuit utilizes two stages of tuned radio frequency, detector and two stages of audio frequency, but through the agency of an entirely new design of several of the component parts of the receiver, it may be said to be one of the revolutionary models of radio receivers. The signals received are of such volume that it is possible to receive them without either antenna or ground. As demonstrated at Columbia, the clearness of the received signals was on a par with crystal detection, no distortion or other extraneous noises being noticeable. The signals came in with perfect modulation, a feature of note in itself, as many of the regenerative circuits of today distort music and the voice to such an extent as to make them totally unrecognizable when they are amplified to any great extent.

This receiver marks one of the greatest advances made in the design of receiving apparatus so far, and will tend to revolutionize the designs of receiving apparatus. The circuit is licensed for manufacture to the Independent Radio Manufacturers, Incorporated, and will shortly be placed on the market.

As explained in RADIO WORLD for March 10, 1923, in which a descriptive article appeared with a illustration of the receiver, one of its great advantages is that it will tend to decrease the interference in receiving due to nearby receivers re-radiating signals and causing the receivers in the vicinity much trouble especially when faint signals are being received from far distant stations. The interference of one set employing the regenerative principle, with two or more steps of audio frequency and at least 100 volts on the plate can be felt for quite a distance, especially in the case of

a section of the country where there are a great many sensitive receivers located in a small congested area, such as the residential districts of New York, where there are often 50 to 100 tube receivers located within a space of a city block. Any one familiar with the difficulties of receiving DX signals in such a section, will realize the benefit of this type of receiver. It is often



(C. Kadel & Herbert)
 Demonstration at Columbia University, New York City, of the new neutrodyne circuit designed by Prof. Hazeltine (left) and built by J. D. R. Freed (right). The audience overflowed the room and many had to be turned away.

possible for a crystal detector to be set oscillating through the agency of a powerful regenerative set in the vicinity, through the heterodyne principle which uses a separate oscillator to enable a non-oscillating detector to receive undamped oscillations.

When the Hazeltine circuit, or neutrodyne receiver, comes into popular use all this will be eliminated, because of the fact that the receiver does not depend upon oscillations for its effective operation.

(Continued from preceding page)

at R_1 , R_2 , consisting of a resistance R_1 variable by one ohm steps from 0-1,000 ohms, to which are connected the leads into the cage, in series with resistance R_2 , variable from 0-10,000 ohms in 10 ohm steps. The voltmeter V and supply voltage from the 500-cycle generator are connected across R_1 , R_2 as indicated.

When either the audio-frequency output voltage of the tube under test or the comparison voltage obtained from the voltage divider is connected to the input of the voltage-indicating circuit by switch 5 it is amplified by the 3-stage audio-frequency amplifier 8 and transformer 9, causing an alternating current to flow in the circuits 9, 12, 13. This current is rectified by the crystal detector 12, and deflects the milliammeter 13.

With the frequency of the radio-frequency generating set adjusted to the desired value and switch 5 up resistance links are inserted at R, always opening 15 before removing a link at R, increasing R until a suitable deflection is obtained on the milliammeter 13.

The comparison voltage is now connected to the voltage-indicating circuit by throwing switch 5 down, and R_1 and R_2 are adjusted until approximately the same deflection on the milliammeter is obtained as previously. Switch 5 is thrown to the up position again and the tube input varied by varying C, it being equipped with a small variable condenser for fine adjustment until exactly the same deflection is obtained with switch 5 either up or down. The audio

output voltage e_t is now equal to the comparison voltage across R_1 , and, since the voltage E across R_1 and R_2 , measured by voltmeter V, is known, the tube output voltage—

$$e_t = E \frac{R_1}{R_1 + R_2}$$

The galvanometer being calibrated, the current i , flowing through R is obtained from the galvanometer deflection, and the radio input voltage—

$$e_t = i R$$

From the definition given above the detection factor

$$k = \frac{e_t}{e_t^2}$$

These measurements are repeated at different frequencies if desired.

This detection factor has the disadvantage that it must be specified with a given load in the plate circuit. However, for a comparison of several tubes this load may be kept constant, and a good factor for judging the tubes is given.

(This is the third and last of a series of three articles. The other two appeared in RADIO WORLD for March 10 and March 17, 1923.)

The Radio Primer

*For Thousands of Beginners Who
Are Coming Into Radio Circles*

Weekly A B C of Radio Facts and Principles Fully and Clearly Explained

By Lynn Brooks

WHAT is meant by "shielding a panel"?

By shielding a panel is meant to line the side with a metallic sheet, in order to eliminate the bothersome "body capacity effect" which is so noticeable when a regenerative circuit is employed. This body capacity is an annoyance because when tuning a set which is not shielded, the set actually can be thrown out of tune by removing the hands, placing the hands near any of the major controls and oftentimes by grasping the phone cords. This can be eliminated by shielding the panel.

* * *

How should a panel be "shielded"?

The method of shielding a panel is as follows: Take a sheet of heavy tin-foil, copper-foil, or thin sheet aluminum, and mark it for drilling the same as the panel. This is done easiest by first drilling the panel itself. Then using the panel as a template, drill the metallic sheet, being careful to drill all the holes in the shield itself larger than those of the panel. This is done to prevent any of the metallic parts of the instruments coming in contact with the shielding and shorting through the agency of the machine screws

with which the instruments are themselves fastened to the panel. Then either using a heavy shellac or small machine screws, fasten the shielding in its proper place on the rear of the panel, making a connection from the shielding to the ground. If tinfoil is used, it is best to allow a lug to remain on the sheet and then fasten this under the ground post. If you try to solder on tin foil you will be disappointed as it is almost impossible. If copper foil or aluminum is used they can be soldered.

* * *

What parts of the panel should be shielded?

In the shielding of a panel it is only necessary to shield the parts of the panel that house the tuning controls, such as the variometer, variocouplers or tuners. The detector and amplifying units do not have to be shielded. In some of the commercial sets the units are shielded separately. There is a separate shield for each variometer, tuner, condenser, or other tuning unit.

* * *

Is shielding necessary on all sets?

Shielding should be used on all sets employing regeneration. The straight audion does not need this so much, as the capacity effect is not so noticeable.

* * *

How can it be determined if shielding is necessary?

If when the set is tuned and the hand taken away from the controls, the signals fade appreciably or are lost altogether, that is an indication that the body capacity has been called into effect when tuning, and immediately when the hand has been taken away, it has disappeared. In this case, the panel of the tuning unit should be shielded, or if that is not advisable, a "long-armed control" should be employed.

RADIO WORLD'S ANNIVERSARY NUMBER NEXT WEEK

RADIO WORLD is hard at work on its Special Anniversary Number, dated March 31, published March 28.

This issue will celebrate the beginning of the third volume of RADIO WORLD, the great national illustrated weekly.

The red advertising form has gone to press. Last page of last black form closes March 23.

Regular advertising rates are in force as follows:

One page: One time—\$150.00.

Half, Quarter, Third and Two-thirds pages at proportionate rates.

One inch, one time—\$5.00. Per agate line, \$0.40.

On four consecutive issues, 10 per cent discount.

On thirteen consecutive issues, 15 per cent discount.

Cover and preferred position rates made known on application.

Write or send copy and order now and get the best possible publication value by being represented in the Special Anniversary Number of RADIO WORLD.

NOTICE TO READERS—Orders received indicate a great demand for this Anniversary Number. We have tried to provide for this in advance. If you want to be sure to get RADIO WORLD for March 31, leave an order with your newsdealer.

RADIO WORLD, 1493 Broadway, New York City.

Radiograms

The Navy Department will offer two engineering students from each of the country's leading universities the opportunity to cruise for two weeks on navy vessels. The plan will go into effect next summer to allow students to study the mechanics, electrical apparatus and radio equipment of warships.

* * *

Fire destroyed Shepard's department store in Providence, R. I., last week, with a loss of \$1,500,000. The store's radio was broadcasting a concert when the flames were discovered. After sending a message that the entertainment must stop because the store was afire the twenty entertainers escaped to the street.

* * *

Jackie Coogan, the seven-year-old motion picture star, addressed the radio audience of WGY, the Schenectady radio broadcasting station of the General Electric Company, on March 23. Jackie's voice was photographed by the pallophotophone a few weeks ago and this record was reproduced by radio. Jackie, now back in Los Angeles at work on a new picture, heard himself talk across the continent. As he explained: "I got quite a thrill from hearing myself talk to myself three thousand miles away from myself."

The extent of the great interest manifested in radio was indicated in St. Louis last week when a large advertisement appeared in the newspapers of a 54-apartment building just being completed, in which every apartment is supplied with complete radio equipment.

* * *

Columbia University has placed at the disposal of the American Institute of Electrical Engineers a scholarship in electrical engineering in the School of Mines, Engineering and Chemistry. Reappointment of the student is conditioned upon good standing. Francis Blossom, F. B. Jewett and Professor W. I. Slichter have been appointed as a committee to pass upon the fitness of applicants.

* * *

Through arrangements with the American Telephone and Telegraph Company radio station, WEA, Arthur Hammerstein, who is at Palm Beach, Fla., was the first theatrical producer to listen in on his own production. On Thursday evening, March 15, a special wire was installed at the Casino Theatre, New York City, where the producer's musical play, "Wildflower," is the attraction, and the entire performance was broadcast from overture to finale. Incidentally, it is said that this is the first time an entire production has been broadcast. During the intermissions of the piece a synopsis of the play was given so that the radio audience would receive the full benefit of the performance.

Radio and the Woman

By Crystal D. Tector

MY best friend and myself had a terrible argument the other day because of the fact that I went to the Third Annual Radio Convention and didn't call for her. I had told her that I intended going, and when I came home, of course a lot of my friends wanted to know how the show was. I was all properly enthused and of course she heard about it. Just because I hadn't told her that I was going, she went off in a huff and said she wouldn't go. Well, I have heard of silly people biting their noses off to spite their faces, but this is even worse. I would have pardoned my worst enemy to go to the show. And F. H. is sore at himself because he couldn't get tickets for the banquet.

* * *

I notice that a station is giving out information on household budgets and how to cook various little dishes that are not heard of much these days. I never knew how to make "Floating Island" until I heard the little lady tell how, and so I surprised F. H. that night by having it for supper. When he asked me what it was I replied: "Well, that's the newest radio development, called 'Hetrodyne Pudding,' and I really think that he believed me."

* * *

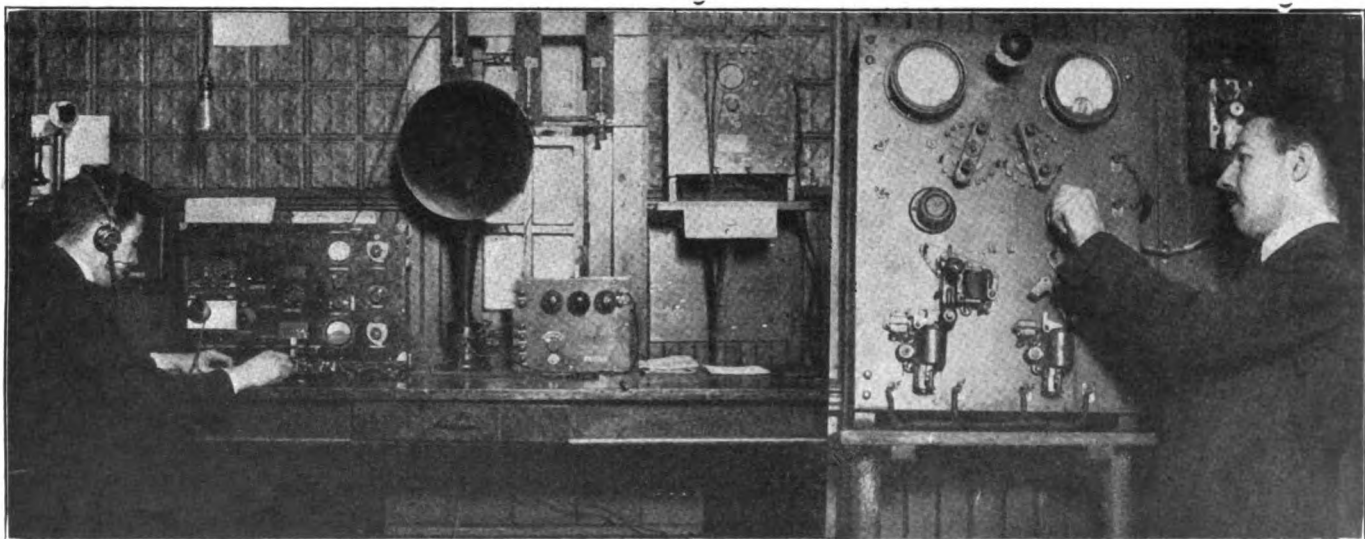
Friend Husband came home one evening all excited and wearing a big mysterious smile. Under his arm he carried the funniest looking long parcel, like the old fashioned French bread that you used to get when Old New York was young. I tried to make him tell me what it was, but all he would say was, "Wait a while, nosey; don't get impatient, or I won't show you." Well, the only thing that I could do was wait and you girls know how a husband can be mysterious when he wants to. Teasing won't do any good with F. H. 'cause he just assumes that legal air and freezes right into his shell. After dinner, he sneaked up into his room and I heard him hammering and puttering around and

I tried to get in but he had locked the door. I went down and started in to finish my novel, or listen in, I forget which now, because I was so full of curiosity that I really couldn't digest anything that I was doing or trying to do. After about an hour, I heard the upstairs door open and F. H. come sneaking softly down. I never moved, or tried to even peek. He passed the parlor door and went down stairs, and pretty soon I heard him slam the furnace door. When he finally returned upstairs, he was wearing a very disappointed look and he finally delivered a lecture to me on the subject of "If dumbbells like me didn't believe everything that people told them, then the wise men that sting them with radio sets in a cane—you don't even need an antenna—wouldn't be able to earn enough to make the price of a cup of weak tea," and so on. It was quiet evident that even a wise "radio man" like F. H. can be fooled by a slick salesman some time. The best way, I think, of providing against that is to have the thing demonstrated right there and investigate it before you even think of buying it, even if it does look good.

* * *

'Member last week I told you about my "home-made Flewelling?" Well, I think that we have had more fun and heard more different stations with that "funny looking contraption," as Brother-in-law Jack says, than with any set I have ever had before. I can have more fun playing with the different squeals and howls and then tuning them into WLW or one of those DX stations to the complete mystification of all my friends. It really is a most complete education to try to make a set by yourself and then succeed after numerous and grievous set-backs, such as burns, wrong connections and other things too numerous to mention, but always interesting to look back upon. I always remember my first attempt to make a dress and a cake, and I always will remember my successful attempt to make a Flewelling.

Radio Equipment in a New York City Armory



Interior of Station BG4, located at the 101st Signal Battalion Armory, Park Avenue and 34th Street, New York City, showing the airplane transmitter and receiver used, with the loud speaker, directly next to which is the power amplifier enabling the signals to be heard through a large room. The picture to the right shows the charging panel, which keeps the batteries at full charge at all times.

(C. Photonews)

Photographic Glimpses

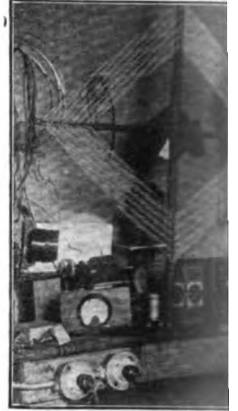
Captions by Roy



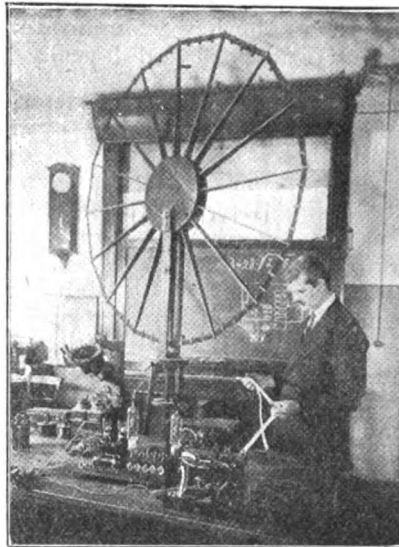
(C. Kadel and Herbert)
Gilda Gray, nationally known dancer and "Follies Star," on a visit to the recent Radio Exposition, finds the radio teapot the most interesting thing there because of the fact that it "let's one have music with one's tea." The set in question is built into a teapot and has a range of 1,000 miles. It utilizes a peanut tube for reception, with compact wound inductances, allowing the entire set to be mounted atop a silver tea pot, as seen in the picture.



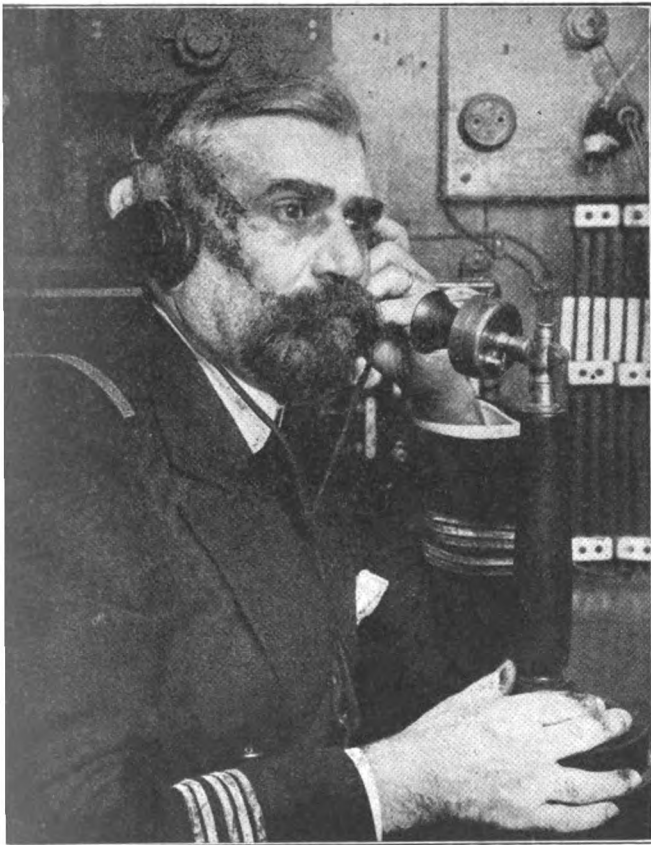
(C. Photonews, N. Y.)
A neat and compact receiver which attracted considerable attention at the Permanent Radio Fair, Hotel Imperial, New York City. It was mounted on the base of a regular socket. The tuning inductances, as can be seen, are spider-webs, and comprise the entire tuning unit of this unique receiver.



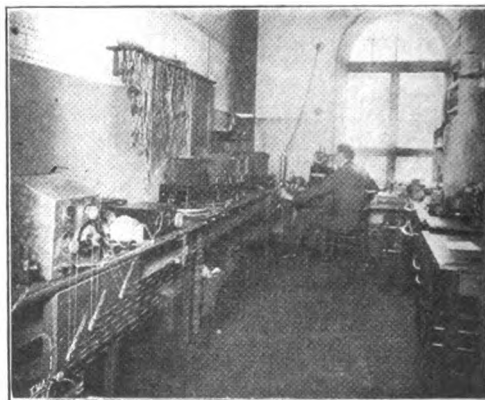
(C. Kadel and Herbert)
B. R. Mayo, 18-year-old his marvelous set, which for less than \$20.00, yet over 1,000 miles. It requires to receive signals. It works on distant stations, loop antenna



(C. Wide World Photos)
One corner of the Research Bureau of the Berlin National Departmental Wireless Telegraphic and Telephone Co., Berlin, Germany. This office is experimenting with the advisability of long distance reception and transmission on small loops. The signals received are automatically registered on a moving tape, as can be noted in the picture.



(N. P. & A. Photos)
The captain Maurras, of the S. S. Paris, talking to Captain Roch, of the S. S. France, more than 250 miles distant. This is one of the advantages of radio to captains of ships sailing the high seas. It allows them to converse with much less trouble than on land, because there is no danger of getting the numbers mixed up. The radio telephone has become so important to "those who roam the watery lanes" that its importance is only eclipsed by the machinery of the ship itself.



(C. Wide World Photos)
Unique method of control to eliminate any body capacity, used in the Research Bureau of the Berlin National Wireless Department. The receiving instruments are so super-sensitive that the control is accomplished at a distance by means of strings and pulleys.



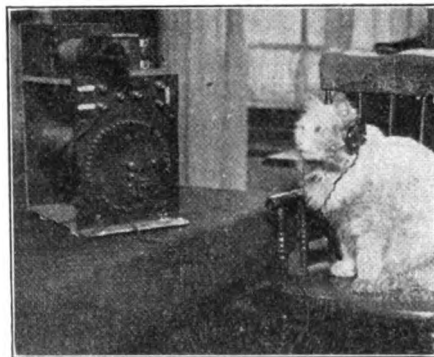
(C. Keystone View Co.)
The receiving antenna at which is one of the principal European signals handled in America. The antenna is nine miles long. Mr. E. Gineer, and the man responsible for throwing the ground switch

From the Realm of Radio

by L. Dougherty



(C. Kadel and Herbert)
When you hear J. E. K. announcing at WOR, you know it is a woman, but few of you West-erners have ever seen her, and that same ap-plies to a great number of the local Eastern fans, so an introduction is in order. Therefore, "Radio fans, meet Miss Jessie E. Koweing, one of the official broadcasters of Station WOR."



(C. Kadel and Herbert)
Some of you fans have often wondered who originated the term "cat whiskers." If you will look at the above picture you will see the originator and possessor of the finest cat whisk-ers in the land. All hail the "Radio Kink of the Cat Whiskers."



The speech by Secretary Herbert Hoover, arbiter of radio telegraphy and telephony, which recently broke all distance records of KHJ, the Los Angeles station. Mr. Hoover's speech from that station was heard 500 miles east of New York City, a distance of 3,500 miles, and was a distance record for this station. The picture shows Secretary Hoover speaking on that occasion.



(C. Kadel and Herbert)
A fair fan's idea that saves a lot of worry when she shuts off for the evening. Miss Margie O'Neil found that she sometimes went to her downy and forgot to turn the current off her Magnavox, with the result that the battery was run down the next morning. So she placed a small six volt lamp in parallel with the battery line, which warns her to "turn off."



(C. Harris and Ewing)
W. W. Tupper, of the Bureau of Lighthouses, and the receiving set he designed to make it possible for keepers of isolated lighthouses to keep in touch with the outside world. The set uses three spider web induc-tances to tune with and a WD-11 as a detector. As the Bureau has no appropriation to install the sets, blueprints and detailed instructions will be furnished by the Bureau to all keepers desiring them.

radio enthusiast, and can be made to sell which has a range of no outside antenna operate a loud speak- spite the fact that a is used.



overhead, Long Island, N. Y., stations for the reception of the Radio Corporation of 30 feet from the ground, but W. W. Alexander, Chief En- ble for this station, is shown hich protects the entire system area.

Answers to Readers

WILL you give me a hook-up for the Reinartz circuit using honeycomb coils, and also the proper size coils to use? 2. What is the correct spelling of the name? 3. What is the Welsh peanut tube No. W.T.-501, and how does it compare with the standard 6-volt tubes? Refer me to back issues if necessary for the diagrams as I have all the back numbers.—A. E. McCulloch, 649 East Buchtel avenue, Akron, Ohio.

1. While this circuit can be used with honeycomb coils, you will not have very great success with it. The feature of the entire set is the fact that the coil, which is a spider-web type, and the coupling are fixed, the tuning being accomplished by means of taps and condensers. We refer you to page 23 of RADIO WORLD for January 13, 1923, where you will find the hook-up with all constants, as well as a detailed description of how to wind and tap the coil, in answer to a query from Mr. C. W. Stewart.

2. The correct spelling of the word is "Reinartz." It is the name of the man who discovered the circuit.

3. This is a new, small tube, manufactured by W. Guild, 68 Glen Ridge avenue, Glen Ridge, N. J. We do not discuss in this department the relative merits of competitive types of apparatus such as this. We suggest that you write to the address given for descriptive literature.

I have seen advertised a new tube made by the General Electric Company, called the U.V. 201 A. Kindly let me have all the data on this tube.—A. J. Patterson, Westport, N. J.

We refer you to the article on the subject in this issue of RADIO WORLD.

I have constructed the set described by Mr. J. Rumpf in RADIO WORLD for March 3, 1923, and have been unsuccessful in getting any results out of it except a loud, buzzing sound. What may be my trouble?—W. A. Cale, 56 Beaver street, New York City.

You mention in your letter the fact that you have your honeycomb coils mounted one above the other. This is wrong. They should be mounted in a vertical position at right angles to one another, exactly as shown in the diagram, so that they will form two sides of a rectangle. They should be mounted about three inches apart. The wiring for this set should be as short as possible. Do not wire with straight-line bus-bar wire, but use heavy cord wire that can be run in straight "bee" lines. Use correct capacities as marked in the drawing, and do not have the variometer in inductive relation to either of the coils. By that we mean do not mount it near them. A grid leak is not necessary with this set, and should not be used. The honeycomb coils should not be mounted in such a fashion as to be movable, but made stationary. Make sure that you have a hard tube, as a detector will not function well with this set. If it does function at all it will give little better results than you have already obtained.

In relation to circuit No. 2, published on page 4 of RADIO WORLD for February 3, 1923, will you kindly advise me how this could be hooked up as a single-circuit

regenerative set, what apparatus is used and where placed?—Roy McShaffrey, Star Theater, Monessen, Pa.

It is not advisable, but it can be done in the following manner if you wish, although the results you will get are questionable: Instead of using the loop, hook the leads from the single-circuit coupler to the leads where the loop is now connected with the variable condenser across the leads. Make the antenna lead tap off so as to go to the grid of the first tube, and the other end of the circuit (the one going to the ground) go to the other lead, where the other side of the loop is connected. Then connect the rotor of the coupler in the plate circuit of the third tube (detector) in the same manner as you would connect it were you using a single-circuit regenerative. This is for your information, and, although it might prove to be an interesting experiment, it is doubtful if it would work. The circuit as it stands is capable of oscillating, due to the back-coupling of the circuit through the tubes and transformers. We advise first hooking up the circuit as it stands. If you care to use a regular variocoupler, with antenna and ground, connect the rotor in place of the loop the same as in a regular circuit.

1. In the article appearing on page 11 of RADIO WORLD for March 3, 1923, Mr. Rumpf states that it is not advisable to use an outdoor aerial. But as I have a 60-foot outdoor aerial, will it be possible for me to use it? 2. Kindly advise me if I could construct the two honeycomb coils—namely, L. 1500 and 1250—and how to do it.—P. G. Pedicord, Premier Service Co., 120 No. Market street, Wichita, Kan.

1. The reason for this statement is that the set is so super-sensitive that a great deal of outside interference, such as static and re-radiated signals, would make reception extremely hard. The loop is the ideal medium for this set, and should be used, although, as an experiment, you might try the antenna and ground, connecting them in the place marked for them.

2. It is so much easier and cheaper to buy these coils that it would not pay you to make them. They have 1250 and 1500 turns apiece, and it would probably cost you more to construct them yourself than the market price. You must also take into consideration that the manufactured article is usually perfect, whereas you would have to take a chance on your construction being O. K. The building of small coils which do not require over 75 or 100 turns is a different matter. Details for the construction of such coils are given in this issue by Ortherus Gordon under the heading "How to Make the Honeycombs for Your Flewelling."

Is there any postage or tax imposed on radio apparatus coming from Great Britain?—John Docherty, 179 East 110th street, New York City.

There is the regular duty, plus a special tax on electrical goods manufactured outside the United States, which is imposed on all goods of this sort. Apply to the Collector of the Port of New York, Custom House, New York City, for values and assessments on these as they change with the value of import and salable value of goods.

Radio to Prevent Mine Disasters

HERBERT E. METCALF, a radio engineer, has predicted that disasters in mines may be averted, mining camps put in touch with the outside world of business and entertainment, and the expense of communication lessened by the installation of radio telephony. Mr. Metcalf gives an affirmative answer to the question, "Can radio be used underground?" Mr. Metcalf is quoted as saying:

"Radio waves do penetrate the ground and do travel through the earth much the same way as they travel above the ground. There are, however, certain limitations which tend to absorb the power of the transmitting set when sending underground; but, due to the increase in efficiency and sensitiveness of receiving sets, it may be stated with authority that no difficulties are encountered in sending messages from the surface to the bottom of the deepest mine unless perhaps the receiving set in the mine is surrounded by a high metallic content iron ore. The above remarks apply principally to receiving below from a sending set above. The reverse—sending from below to be received above—is a little more difficult, especially in metallic ore mines."

Secretary Hoover Will Appeal Radio License Case

AN appeal will be taken by Secretary of Commerce Hoover from the recent decision of the District of Columbia Supreme Court ordering Mr. Hoover to issue a radio license to the Intercity Radio Company of New York, according to an announcement by the Department of Commerce. Secretary Hoover, empowered by legislation to regulate radio communication, refused a license to the Intercity Company on the ground that it interfered with naval and other radio communication around New York City. The company took the matter to the court and obtained a favorable decision.

Colby Academy Radio Club

EDITOR, RADIO WORLD: The officers of the Colby Academy Radio Club are as follows: Thomas O. Parker, Faculty Advisor; Vermal C. Buchlin, President; Raymond Knight, Chief Operator; R. W. Ringrose, Secretary.

Membership in the club is open to the whole student body. The apparatus is bought by the Science Division. Radio concerts are given twice a week to the students in the chapel. The radio room is open daily from 5 to 6 p. m.

Yours truly,
VERMAL C. BUCHLIN,

March 15, 1923.
New London, N. H. President.

Sewickley, Pa., "Y" Radio Club

EDITOR, RADIO WORLD: The names of the officers of the Sewickley "Y" Radio Club are: Instructor, W. S. Fraser; President, John Kinsvatter; Secretary, Robert Ritchey; Property Man, Edwin Hingst.

Yours truly,
ROBERT RITCHEY,
March 20, 1923. Secretary.

Growing Into Big Figures

SECRETARY HOOVER, of the Department of Commerce, recently estimated that there were at present somewhere between 1,500,000 and 2,500,000 radio-receiving stations now in use in the United States.

Latest Radio Patents

Radio Receiving Apparatus

No. 1,446,899; Patented Feb. 27, 1923. Patentee: Lloyd Espenschied, Hollis, N. Y.

THIS invention relates generally to systems for transmitting energy, and particularly to the protection of such systems against disturbance. Its object is to provide a method of, and apparatus for, eliminating or minimizing the effects of disturbances in such systems, whether in power circuits or signaling systems, and in either wire or wireless systems of communication. The invention finds one very important application in the radio transmission of intelligence as a protection

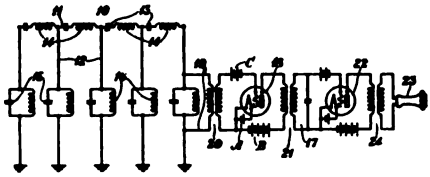


Diagram of Receiving Circuit as improved by Lloyd Espenschied and explained in the following text.

against the electrical disturbances commonly known as "static"; and the invention will be here described as applied to such a system, but, as will clearly appear hereinafter, the invention is of much broader applicability.

In radio signaling systems the usual antenna is sharply tuned to increase its responsiveness to waves of the particular fre-

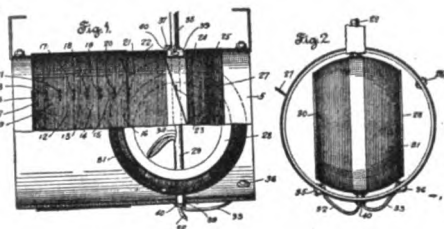
quency to be received and to reduce the liability of interference from signals of other frequencies. The effect of static disturbances upon an antenna thus sharply tuned seems to be analogous to that of a blow upon a tuning fork; that is, the energy of the impact is converted largely into oscillations of the frequency to which the device is tuned. In a wireless receiving system this means that the disturbance will appear in the receiver to the confusion of the signals it is desired to observe. In other words, the receiving systems, instead of excluding the static disturbances by reason of existing differences between them and the signaling impulses, or instead of accentuating or producing differences between them, tends to effectually extinguish the differences that do exist, so that the disturbance is in a sense manufactured by the system for its own receiver. Like phenomena may occur in almost any energy transmission system where some or all of the transmitting medium has a natural period or is capable of responding sympathetically to foreign disturbances.

This invention proposes to avoid such disturbances by changing or diverting the disturbing energy into a plurality of frequencies other than that of the energy to be transmitted or into a band of frequencies of considerable extent so that, even though the frequency being transmitted falls within its scope, only a small proportion of the disturbance reaches the translating or indicating devices of the system.

Variable Inductance

No. 1,445,898; Patented Feb. 26, 1923. Patentee: Marvin C. M. Lane, Roselle Park, N. J.

THE special objects of the present invention are to combine in a simple, compact structure all the functions of a variometer, variocoupler and variable inductance, which will be capable of a fine degree of tuning throughout a comparatively wide range, including the longer as well as the usual short wave lengths. In the accomplishment of



Schematic drawing illustrating the new Variocoupler as patented by Mr. C. M. Lane.

these objects the inventor uses a single tubular core upon which there is placed a bank-wound coil provided with taps and as a continuation of that a straight wound coil within which is journaled a rotor so positioned that it can be turned to carry its windings partly beneath the bank-wound coil.

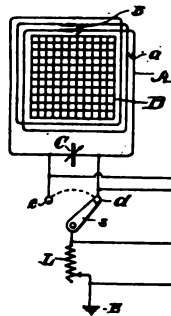
Radio Method and Apparatus

No. 1,447,165; Patented Feb. 27, 1923. Patentee: Frederick A. Kolster, Washington, D. C.

MY invention relates to apparatus for transmitting or receiving electro-radiant energy or electro-magnetic waves for the transmission of intelligence, as for

telegraphy or telephony, or for signaling in general, or for any other purpose.

My invention resides in apparatus of the character referred to comprising a closed circuit whose distributed capacity and inductance are preferably very small or substantially nil—the closed circuit—and particularly the inductance or coil therein, operating as a capacity area connected through tuning apparatus, as variable in-



Composite method of transmitting and receiving as applied to apparatus by F. A. Kolster.

ductance, with the earth or any counterpoise capacity.

Receiving apparatus embodying my invention is an absolute direction finder or a true radio compass whereby the location of a source of radiant energy may be determined. Such receiving apparatus serves also as an excellent interference preventer; that is, for permitting reception of signals from a desired station to the exclusion of signals from other stations differently located with respect to the receiving station, and to the exclusion of atmospheric or natural electrical effects.

Transmitting apparatus embodying my invention has the property of transmitting energy of greater intensity.

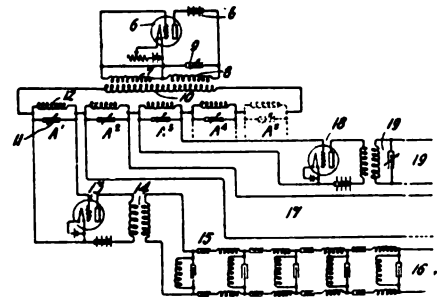
Generator and the Generation of Multiple Frequencies

No. 1,446,752; Patented Feb. 27, 1923. Patentee: Burton W. Kendall, New York, N. Y.

THIS invention relates to a method and means for the generation of multiple frequencies, and has for an object to provide a means for producing currents of a frequency or frequencies higher than a given basic frequency. The higher frequency currents may be used for any suitable purpose, such as sources of carrier waves for multiplex signaling.

The higher frequency currents are obtained by distorting the wave form of the fundamental frequency and by selecting the overtones or multiple frequencies present in the distorted wave.

The distortion may be effected by means of an electric discharge device, which has the following characteristics that give rise to a distortion: First, equal increments in



Mr. B. W. Kendall's method of producing multiple frequency for the transmission of high frequency currents.

the voltage applied to the device do not produce proportional changes in its output current. This gives rise to a distortion, as the input voltage is not faithfully reproduced in the output circuit. This characteristic belongs to all audions which have not been provided with special means to change this characteristic. Secondly, a further and greater distortion is obtained, according to the present invention, by considerably overloading the audion. This is done by applying to its input terminals an alternating potential such that the maximum value carries the operation of the tube beyond that portion of its characteristic which is substantially linear, thus substantially distorting the wave form of the applied alternating potential as repeated by the tube. This applied alternating potential may be such that the maximum positive value will exceed that necessary to cause the tube to become saturated and the maximum negative value will exceed that negative value required to reduce the output current substantially to zero, or one of these conditions may exist alone to the substantial exclusion of the other. The number of electrons which can be given off by a thermionic cathode at a certain temperature has a limiting or saturation value, and the corresponding point on the characteristic curve of the electron discharge device may be termed the saturation point of the cathode for that temperature. Accordingly the cathode will limit the space current which can flow in the thermionic device, and variations in the internal impedance in the circuit of the space current are not followed by proportionate changes in the value of space current. Thus the wave form of the output current will be considerably distorted. Thirdly, in some cases a further distortion may be obtained in the suppression of the alternate half waves by passing the distorted wave through a unilaterally conducting device, such as a thermionic rectifier. A particular electric discharge device may have one, two or even three of the distorting characteristics just described.

New Records of The DX Nite Owls

Paste These in Your Hat

From W. H. Howe, Route 6, Phoenix, Arizona

I AM enclosing herewith a list of stations that I have heard, and which I know will be of interest to the DX Nite Owls.

The greatest distance covered is 2,200 miles, from WGY, Schenectady, N. Y. Early Sunday morning, March 4, this station was coming QSA on one stage of audio, and on two stages they nearly knocked the phones off my head. WDAP, Chicago, was also very strong at the same time.

The set is home-made, being a two-circuit detector with two stages of audio frequency and one stage of radio frequency, which is tuned with an ordinary variometer. A 400-ohm potentiometer is used; 27 volts on the detector, 110 volts on the plates of the amplifiers, and 4½ volts on the grids of the audio amplifiers. Aerial is inverted L type, 65 feet long and 25 feet high.

The following stations have been heard here:

Call	Location	Distance
AGI	San Francisco, Cal.	650
DN4	Denver, Colo.	600
KDN	San Francisco, Cal.	650
KDPT	San Diego, Cal.	300
KDYL	Salt Lake, Utah	500
KDYM	San Diego, Cal.	300
KDYS	Great Falls, Mont.	1,025
KDYW	Phoenix, Ariz.	8
KFAB	Portland, Ore.	1,025
KFAD	Phoenix, Ariz.	8
KFAF	Denver, Colo.	600
KFBK	Sacramento, Cal.	675
KFCB	Phoenix, Ariz.	8
KFCI	Los Angeles, Cal.	350
KFDB	San Francisco, Cal.	650
KFDL	Denver, Colo.	600
KFGH	Stanford University, Cal.	625
KFHJ	Santa Barbara, Cal.	450
KFI	Los Angeles, Cal.	350
KFV	Yakima, Wash.	1,050
KGG	Portland, Ore.	1,025
KGO	Pasadena, Cal.	350
KGW	Portland, Ore.	1,025
KHJ	Los Angeles, Cal.	350
KJS	Los Angeles, Cal.	350
KLP	Los Altos, Cal.	625
KLS	Oakland, Cal.	650
KLX	Oakland, Cal.	650
KLZ	Denver, Colo.	600
KMJ	Fresno, Cal.	500
KNJ	Roswell, N. M.	425
KOB	State College, N. M.	300
KOG	Los Angeles, Cal.	350
KPO	San Francisco, Cal.	650
KQW	San Jose, Cal.	625
KRE	Berkeley, Cal.	650
KSD	St. Louis, Mo.	1,300
KUO	San Francisco, Cal.	650
KUS	Los Angeles, Cal.	350
KUY	El Monte, Cal.	325
KWG	Stockton, Cal.	585
KWH	Los Angeles, Cal.	350
KYJ	Los Angeles, Cal.	350
KYW	Chicago, Ill.	1,600
KZN	Salt Lake, Utah	500
WAAP	Wichita, Kan.	900
WBAP	Fort Worth, Texas	825
WBL	Anthony, Kan.	800
WDAF	Kansas City, Mo.	1,050
WDAH	El Paso, Texas	300
WDAP	Chicago, Ill.	1,600
WDAV	Muskogee, Okla.	925
WFAA	Dallas, Texas	850
WGY	Schenectady, N. Y.	2,200
WHB	Kansas City, Mo.	1,050
WKY	Oklahoma City, Okla.	825
WMAB	Oklahoma City, Okla.	825
WOC	Davenport, Ia.	1,300
WOAI	San Antonio, Texas	825
WPA	Fort Worth, Texas	825
WWJ	Detroit, Mich.	1,800
9ZAF	Denver, Colo.	600

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

Send a Stamp for This Hook-Up

From Ben E. Noble, Box 156, Pacific, Mo.

I AM a regular reader of your fine magazine, and I have got some helpful hints from every issue. I am submitting my record since January 15, 1923. I did not think so much of it until I noticed so many others, and I believe I have something to be proud of. I am using a one-stage WD-11 tube set I made myself, vario-coupler, 23-plate condenser with vernier adjustment in series with aerial, Jenkink rheostat on detector tube and Freshman grid leak.

The number of stations I have heard is 115, covering 37 states on the Pacific Coast and Atlantic Coast; also five provinces in Canada; Gulf Coast and San Antonio, on the border. My greatest distances are:

WLAJ, Fairbanks, Alaska; PWX, Havana, Cuba; KFD, Los Angeles, Cal.; KGW, Portland, Ore.; KDYL, Salt Lake City, Utah; KDYS, Great Falls, Mont.; KWJ, Roswell, New Mexico; WOAI, San Antonio, Texas; WOR, Newark, N. J.; WHAZ, Troy, N. Y.; CKCK, Regina, Canada; CFCA, Toronto, Canada; CKAC, Montreal, Canada; CFCB, Vancouver, B. C.; CJCG, Winnipeg, Man.; WNAQ, Charleston, S. C.; WFAH, Port Arthur, Texas; WAAB, New Orleans, La.; WKAH, Palm Beach, Fla.; WJAP, Duluth, Minn.; KFAF, Denver, Colo.; WBZ, Springfield, Mass.; WDAL, Jacksonville, Fla.

I have heard a few distant stations while our local station, KSD, twenty-five miles away, is transmitting. I have no trouble at all tuning them out for the eastern stations, and on one occasion I had PWX, Havana, Cuba, only eight degrees from the post, and could not hear the post. Any one wanting this hook-up of my set may have same by sending a stamped envelope. I did not think anything of my log until I noticed what others were doing.

DX News From New Brunswick, Canada

From Neal Coleman, St. John, N. B., Canada.

AFTER having seen many records in RADIO WORLD I wish to submit my list of stations. My set consists of a vario-coupler, a variable condenser and two stages of amplification. I have an aerial 90 feet long with a lead-in of 40 feet, single wire. My stations are:

WGY, WJZ, WOR, WNAC, WGI, WIP, WOO, WWJ, WEAJ, WSB, WMAQ, WMAK, WHAZ, WHAS, WDAS, WCAE, WHA, WHK, WFI, WNAT, CHCX, PWX, WOAA, WEA, WCAU, CKAC, CFCF, WHAM, WBAY, WGR, WOC, KOP, KDKA, KSD, WBZ, WBT, WBAP, WDAP, and about twenty more stations. I have had my set for five months.

A New Sailor Nite Owl

From R. W. Higgins, U. S. Naval Training Station, Newport, R. I.

I HAVE something for the good of the order. I have no hook-up of my own, but an \$18 regenerative set, using WD-11 tube with adapter and lighting circuit for aerial. Here is my record night for you to slant at: WEAN, WJAX, WGY, WBZ, WJZ, WEAJ, WGAS, WBAK, WOC. How is that for the electric-light aerial? Chicago and Davenport clear as a bell.

Can Equal the Record

From Roger H. Burrill, Campello, Mass.

AFTER seeing your DX night owl department I think that I can equal the record of anyone who has the kind of set that I have. My set is of the single circuit regenerative type. My aerial is one hundred and fifty feet long. The ground is attached to a water pipe. The set I have is a one-tube WD-11 with 43 volts on the plate. These are a few of the stations that I hear regularly: PWX, WSB, WHAS, WGY, WGI, WNAC, WLW, WFCF, CFCA, KDKA, WOC, KYW, WEAJ, WOO, WOR, WJZ, WIP, WBZ, WHAM, WEAJ, WRW, WFI, NAA, etc.

Doing Away with Taps

From J. White, Brooklyn, N. Y.

SEVERAL days ago the windings on the rotor of my vario-coupler came loose, and I began experimenting with my set, and at last hit on a substitute for my vario-coupler. By setting the two coils of the stator in series and disconnecting the rotor so that it acted like the rotor of a vario-coupler I had a good substitute. By placing the aerial and ground on the stator and the usual secondary connections on the rotor I obtained good results. I received KDKA, WGY, WJZ, WOR, WEAJ, WAAM, WBAN and WQA in one hour on last Sunday night.

I had a regenerative receiver employing one vario-coupler, one variometer and one vario-condenser (21-plate), using a WD-11. Of course the results were not so loud, but it is a good substitute for the amateur who wishes to do away with taps.

Good Record for Single Tube

From Perkins Bonneyan, 637 Poplar Ave., Fresno, Cal.

I HAVE written before, but if this is printed I will promise to forever hold my peace. I wish to present a list of DX stations which I heard on a recent night, using a single UV-200 detector tube only: PWX, Havana, 2,425 miles; WCAE, Pittsburgh, 2,150; WSB, Atlanta, 2,025; WGM, Atlanta, 2,025; WWJ, Detroit, 2,000; KYW, Chicago, 1,775; KSD, St. Louis, 1,625; WOC, Davenport, 1,600; WHB, Kansas City, 1,400; WDAF, Kansas City, 1,400; WBAP, Fort Worth, 1,300; CFCN, Calgary, 1,100.

How is that for a nice little record, Mr. Editor? No doubt it has been beaten by fans using two, three or more tubes. But who has done better on a single tube? As I have not as yet seen any that beats this I claim the record for single-tube, single-night reception. If you have beaten this, Mr. Fan, let's hear from you.

(Continued on page 26)

Electric Ferry "Poughkeepsie" Is Revolutionary Type of Craft

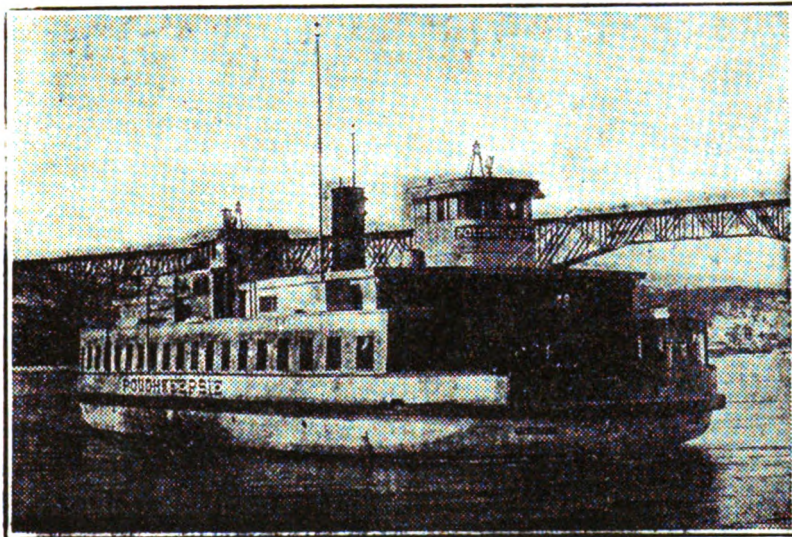
THE most unique boat in the world is now plying the Hudson River between Poughkeepsie and Highland. She is the ferry boat "Poughkeepsie," and she is not only electrically propelled, but she is controlled like an automobile, she has a lower operating cost that any other vessel of her size and power afloat, and she is also specially designed for breaking through ice. Because of this unusual combination of novel features, she has probably attracted more attention than any vessel since the "Monitor."

The United States Navy was the first to appreciate the advantages of electricity for ship propulsion and it took a long step in advance of other naval powers by equipping all of our recent battleships with electrical propelling machinery. Electric drive is also in successful use on several pleasure yachts and on certain other craft of a more or less

understood. This facility of control is of great importance to a vessel that must constantly enter slips and thread its way through crowded traffic.

No less important, however, is the "Poughkeepsie" high fuel economy. Because her engines are of the internal combustion type, they can develop their full power on less than one-third the amount of fuel required by the most efficient type of steam engine. This means that her operating cost is extremely low and makes this type of drive very desirable in all classes of vessels in which it can be used.

A feature of the "Poughkeepsie" that will be especially appreciated by motorists crossing the river next summer is that because of the compactness of her Diesel-electric machinery it can all be contained within the hull with no superstructure on the main deck. Hence this deck is perfectly clear and



Electric Ferry Boat "Poughkeepsie" Is Controlled from the Pilot House

experimental character but the "Poughkeepsie" is one of the very first commercial vessels to be electrically operated. She is, therefore, a pioneer; and in the opinion of many marine engineers she marks the beginning of the electrification of our river and harbor vessels, and perhaps our merchant marine as well.

An electrically-operated ship differs from an electrically-operated locomotive in that she cannot get her electric power by wire or third rail, but must generate it herself. The "Poughkeepsie's" generating plant consists of two Winton engines of the so-called Diesel type; that is to say, they resemble automobile engines but use heavy oil instead of gasoline for fuel. Each engine is rated at 125 horsepower and drives a 90-kilowatt Westinghouse electric generator. These generating units operate continuously at constant speed and in one direction only when the boat is in use. They do not control the speed or movement of the boat, but merely furnish electricity for two 100-horsepower Westinghouse motors which are geared to the propellers.

The control of the propeller motors is centered in a small handle mounted behind the wheel in each pilot house. By moving this handle, the pilot himself starts the propellers, changes their speed, stops or reverses them. He therefore operates the boat just as a chauffeur does an automobile, without losing time signalling to the engineer or running the possibility of being mis-

can accommodate four lines of automobiles, instead of the usual two lines only. In fact, though the "Poughkeepsie" is barely half the size of a Staten Island ferry boat, she can actually carry more cars. This large capacity is expected to eliminate waiting at Poughkeepsie and Highland during the coming touring season.

The "Poughkeepsie" has to be an ice-breaker if she is to operate continuously during the winter, since the ice is often over two feet thick at this point. To look at her, she seems broad, shoal, and of very light draught. This is not the case, however, for under her visible hull is a second one, known as the "hullfin," which carries the propellers. When the "Poughkeepsie" runs into ice, she does not wedge into it as a boat with an ordinary keel would do, but her broad end rides over it, crushes it, and then pushes it aside. Her propellers, being beneath the main hull on the hullfin, are always deep in the water and are uninjured by the ice.

Victor Erects New Building

The new building recently erected by the Victor Talking Machine Company at Camden, N. J., will be used for the manufacture of phonograph records and not for making radio equipment. Vacuum tubes are now used by the Victor company in recording the voice.

The Power Amplifier for your Magnavox Radio

THE Magnavox, in reproducing with extreme sensitiveness every signal supplied to it from the receiver, must necessarily reproduce any extraneous sounds which may originate in the receiver or power amplifier itself.

Therefore, to obtain all the wonderful results of your Magnavox Reproducer, use it with the Magnavox Power Amplifier.



R-2 Magnavox Radio with 18-inch horn



THIS instrument is intended for those who wish the utmost in amplifying power: for large audiences, dance halls, etc., but requires only .6 of an ampere for the field.

R-3 Magnavox Radio with 14-inch horn

SAME in principle and construction throughout as Type R-2. Is ideal for use in homes, offices, amateur stations, etc.

Requires one ampere field current from your filament battery.



Magnavox Power Amplifier—Model C

CAN be used with any "B" Battery voltage which the power tube may require for best amplification.

2-Stage and 3-Stage

The facilities and experience back of each piece of equipment bearing the Magnavox trade mark are unrivalled anywhere in the world.

Magnavox products may be had of good dealers everywhere.

Write to us for illustrated booklet

The Magnavox Company
Oakland, California

New York Office: 370 Seventh Ave.

Advertising Rates: Display, \$5.00 per inch, \$150.00 per page.

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word.

Telephone Bryant 4796

New Radio Firms

(The new firms and corporations mentioned in these columns can be reached directly or by communicating with the attorneys, whose addresses are given when ever possible.)

De Forest Phono Film Corp., Dover, Del., patents, \$4,750,000. (U. S. Corporation Co.)
 Marvel Electric Supply Co., New York City, \$5,000; D. E. and M. Greenbaum, A. L. Popper. (Attorney, M. Popper, 99 Nassau St.)
 Wallace Electric Co., Rochester, N. Y., to issue 500 shares preferred stock, \$100 each; 300 common, no par value.
 Radio Construction Co., Wilmington, Del., radio, \$750,000. (Corporation Trust Co. of America.)
 Tristan Sales Corp., New York City, make wireless apparatus, \$100,000; G. M. Jost, C. W. Hanes, A. Klein. (Attorney, I. Cohn, 1540 Broadway.)
 Woodlawn Electrical Appliance Co., Wilmington, Del., \$100,000. (American Guaranty & Trust Co.)

Backus, Minn., Telephone Subscribers Get Free Radio Concerts

RADIO reception has been greatly simplified in Backus, Minn. If the Backus resident is a telephone subscriber he simply takes his telephone receiver from the hook and music, drama, sermon or lecture pour out. He has no need to worry about run-down batteries, weak tubes, the intricacies of hook-up or the length or height of his antenna. Miss Anna Ozier, chief operator for the Backus Telephone Company, recently wrote WGY, the radio broadcasting station of the General Electric Company, Schenectady, N. Y., as follows:

"We have a receiving station here and by putting the horn close to the transmitter and connecting up the farm lines, I have a system now by which the subscribers on our farm lines who have never had an opportunity of getting concerts direct from the air have passed many of these winter evenings enjoying themselves by turn and turn about at the telephone.

"I know of several cases where three or four people have listened in on the same receiver at once. In one case I was surprised by being recompensed by a lady who was so much pleased by the concert and the part she though I took in it, that she brought me a dozen eggs. As she said, it was her way of saying 'thank you.'"

Radio Stocks

(Quotations as of March 14, 1923, furnished by Frank T. Stanton & Co., 35 Broad Street, New York, Specialists in Wireless Securities.)

Stock	Bid	Asked
American Marconi, Stamped..	5*	15*
American Marconi, Unstamped.	5*	7*
American Tel. & Tel.....	125½	125½
Canadian Marconi	2¾	3
De Forest Radio.....	7	10
Dubilier Condenser	9	9¾
English Marconi com.....	11	15
English Marconi pfd.....	11½	15½
Federal Tel. Cal.....	5½	6
General Electric	188½	189
Hennessy Radio Pub.....	9	11
Mackay Co. com.....	111	115
Manhattan Elec. Supply.....	55	57
Marconi Int. Marine.....	7	10
Radio Corporation com.....	4¾	4¾
Radio Corporation pfd.....	3¾	3½
Spanish Marconi	1	3
Western Union	115	116
Westinghouse E. & M.....	65	65½

*Cents per share.

Naval Communications Service Has a Big Year

GOVERNMENT messages totalling 15,763,308 words were handled by the Naval Communications Service during 1922, according to a statement made public last week by Acting Secretary Roosevelt. Of this total, 10,000,000 were for the Navy, the remainder being official business for the various Government departments. The House of Representatives is at the bottom of the list with 505 words, with the White House next to last with 1,258.

Coming Events

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits. Atlantic City, N. J., June 16 to September 8, 1923.

RADIO AND ELECTRICAL EXPOSITION, including amateur home-made set contest, San Francisco, Cal., April 3 to 8, inclusive.

Crosley Celebrates Second Anniversary

THE Crosley Manufacturing Company, Cincinnati, Ohio, home of the broadcasting station WLW, celebrated its second anniversary last week. This celebration, however, applied to the radio division. Two years ago, on Washington's Birthday, Powel Crosley 3d wanted his dad, Powel Crosley, Jr., president of the company, to purchase a radio-receiving set for him. His classmates had one, and, boy-like, he, too, wanted one.

When Mr. Crosley went to the Precision Equipment Company to buy the radio set he found the prices were very high. With the idea in mind that there must be thousands who would want a set he called in an engineer, and together they designed a cheap radio set. The first of these receivers was ready March 21, 1921. The Crosley socket with its design for mounting upon a panel, the variable condenser with its book-type action, and other distinctive apparatus now well known in the Crosley line, came as a result of a little boy wanting a radio set.

It is interesting to note that, within two years from the time Powel Crosley, Jr., went to the Precision Equipment Company to inquire the cost of a radio-receiving set, he purchased the company.

The Crosley Manufacturing Company has one large factory, where an extensive line of radio apparatus is manufactured; another makes the cabinets, while a third establishment is the printing plant. A little informative newspaper is issued, called the "Crosley Radio Weekly," which gives programs of the Crosley station.

The Delta Dry-Cell Tube

The Delta Midget Tube Company, 241 Market street, Newark, N. J., have brought out a new dry-cell tube taking three volts and using an amperage of .15. It is said to be equal to doing the work of the W-D 11 tube. This firm also manufactures sockets and adapters for their tube. The entire line of products, both because of the present shortage of tubes and the inherent quality of the line, is proving very popular.

These Cheerful Workers Make "Signal" Radio Equipment



A Group of Employees Outside the Factory of the Signal Electric Manufacturing Company, Menominee, Mich.

Advantages of the Hazeltine Neutrodyne Circuit

THE most remarkable feature of the neutrodyne circuit, invented by Professor L. A. Hazeltine, of Stevens Institute of Technology, Hoboken, N. J., which was illustrated and briefly described in RADIO WORLD for March 10, 1923, is that great distances, hitherto unobtainable, are secured with clear and undistorted reception.

The neutrodyne circuit is non-regenerative. Therefore the familiar whistles and squeals which attend the "tuning in" of a regenerative set are entirely absent. Experts who have tried the few sets available at this early date report picking up stations clear across the continent; and, what is most remarkable, the quality of the music and speech is practically like the clear tones received on a short-range crystal detector set.

To the initiated radio enthusiast the neutrodyne set looks unlike any heretofore constructed. There are no variometers, no variocouplers and no ticklers. Tuning is effected by three variable condensers, two of which are set at the same definite settings for definite wave lengths, and antenna tuning is accomplished entirely by a single dial operating a variable condenser.

Other features are the use of new types of jacks for automatic filament control and the devices called "neutroformers," to which the high amplification is due.

The invention, from a technical standpoint, comprises means for neutralizing the effect of the inherent capacity between the grid and plate circuits of a vacuum tube, thus enabling any degree of high frequency amplification to be obtained without regeneration or feed back, and without the distortion which attends regeneration.

The term "neutrodyne" is used advisedly, "neutro" meaning equal and "dyne" meaning a force. An electrostatic force is applied to the grid of each high frequency amplifier tube, which force is equal and opposed to the effect of the "grid-plate" capacity of the tube. Thus undesired effects of the inherent tube capacity are

neutralized or balanced out. In technical circles it is expected that this invention will entirely revolutionize radio-receiver design.

One of the pleasing features of the neutrodyne circuit is its great selectivity. It is possible for the "listener-in" to make a log or station record, in which the settings of the dials are recorded for various stations. Once this log is made any large station in the United States with a transcontinental sending range is picked up by merely setting the dials at these positions. Unless a sending station changes its wave length the record of dial settings is permanent and never varies for that particular installation.

The patents of the inventor have been exclusively licensed to a group of manufacturers united in a trade organization known as the Independent Radio Manufacturers, Inc., 165 Broadway, New York City. Among this group are three who will manufacture the Hazeltine apparatus under sub-licenses. They are Freed-Eiseman Radio Corporation, New York City; F. A. D. Andrea, New York City, and the Garod Corporation, Newark, N. J.

The anniversary number of RADIO WORLD, to be dated March 31, 1923, will contain an extended description, with several illustrations, of the Hazeltine neutrodyne circuit.

Princeton University Radio Club Sets a Mark

THE Princeton University Radio Club, Princeton, N. J., has established what is claimed to be a record for the number of messages handled in a month by an amateur station. From the 15th of one month to the 15th of the next the Undergraduate Club passed the 1,000 mark. The record of the club is 1,226 radio messages in a month, and in the four months of the existence of the club the amateurs have handled more than 4,000 messages. The club, which was started last November, has been licensed by the Government to carry on experimental work. It has twenty-five members, seven of whom are licensed operators, and they operate the station on a twenty-four-hour basis.

"WINDSOR CASTLE" PHONES



\$5.90

"Windsor Castle" Phones are made in the United States for the Canadian trade. Hence the British flag on the label.

Marvelous 3000-Ohm Instrument

It is your opportunity to get into the big D-X Class. Toronto, Canada, hears WEAFF, as well as WOC and other distant stations nightly with these Phones. Look for the full name on the Cap. And be sure you are getting the Special

IMPREGNATED BLUE DIAPHRAGM

This BLUE DIAPHRAGM is IMPREGNATED with a Special Chemical for Stability. Insist on it and the name "Windsor Castle."

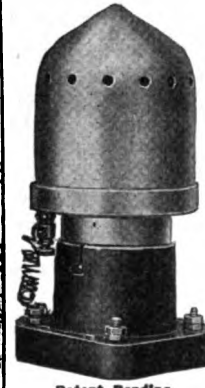
Send us a Money Order and our Mail Department will do the rest quickly and efficiently. We pay Postage east of Mississippi. Checks or Stamps not accepted.

Send for Free Catalogue Dept. 84D.

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123 Liberty Street New York City

SIX REASONS WHY A



"Vac-Shield"

- 1—Non-Magnetic.
- 2—Prevents Inter-stage Coupling.
- 3—Stops Howling.
- 4—Prolongs Life of Filaments.
- 5—Tunes in DX.
- 6—Protects Tubes. Attached in a Minute. Order today.

Patent Pending
Will ship immediately by mail postpaid on receipt of \$1.00.

ORANGE RESEARCH LAB.
41 North 16th Street East Orange, N. J.

150-3000 Meters, with free diagram.....	\$4.00
Heavy Comb Coil—D. L. No. 30.....	1.50
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6-Way Phase Converter.....	.75
45 Volt B Batteries.....	1.75
22½ Volt B Batteries.....	.75
Acme Transformers.....	3.25
Special W.D.-11 Transformer.....	2.00
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Small Type Variometer.....	1.75
Coupler.....	1.25

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123 E. 23rd ST. NEW YORK CITY
Cash with Order—Wholesale, Retail

CRYSTAL-TUBE FOR CRYSTAL SETS
Now ready for distribution. It gives clearer tone and protects your crystals. 25c (Silver). Our descriptive circular sent free on receipt of your address. (Discount to dealers.)
VACUUM ELECTRIC WORKS, Toledo, Ohio



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FIRST FOR PRICE, QUALITY, AND SERVICE

11 years at the same cost

All standard merchandise guaranteed. Prices going up. Take advantage of present low rate. Our guarantee provides you satisfaction, or your money back, we will repay transportation charges if not satisfied.

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\$45.00 Magnavox, new type \$39.50	Baldwin Superhone..... \$9.50	Dayton Fan..... \$7.50
55.00 Western Electric..... 50.00	Baldwin unit..... 5.20	180 Degree Silk Wound..... 2.35
20.00 Amplitone..... 15.00	Brandee..... 5.00	VARIOMETERS
20.00 Diatograph..... 15.00	Federal..... 5.40	Dayton Fan..... \$9.50
TRANSFORMERS	Borwick..... 3.75	Arrow..... 2.00
U. V. 712..... \$5.35	Hardek 3000 ohm Special..... 4.25	Scaris Bakelite..... 7.50
U. V. 714..... 5.45	Aurh..... 5.75	RHEOSTATS
Acme..... 8.75	POTENTIOMETERS	Outler-Hammer Vernier..... \$1.25
Dayton..... 4.75	Federal, 200 ohms..... \$1.25	Outler-Hammer Non Vernier..... .85
Bestone..... 6.35	Radio Corporation, 250 ohms 3.00	Safetyrite..... .65
CONDENSERS, BAKELITE	"B" Bat., Eveready, 22½ V., Large..... 2.00	"B" Bat., Eveready, 45 V., Large..... 2.75
11 plate, Radio Store..... \$1.15	"B" Bat., Eveready, 45 V., Large..... 2.75	OIL MOUNTINGS
25 plate, Radio Store..... 4.75	8 Coll DeForest..... \$9.95	8 Coll Orava..... 4.00
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83 plate, Vernier..... 4.80	2" Dial..... \$.23	3" Dial..... .30
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(Complete with Tubes, "B" Battery, "A" Battery, Phone, Aerial, etc.)		
BATTERIES		
Storage, Eveready, 50 Amp..... \$14.00		
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Sunbeam Multirange Variocoupler, 150 to 3000 Meters, Complete with Solid Bakelite Variometer Mounted..... \$11.95		

Select your set and write us for prices. We'll do the rest.

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Farm Lighting Plants at Bargain Prices.

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High dielectric resistance.
 6"x24" \$1.00
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 Manufacturers' special sizes collected.
 Agents wanted.
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400 Radio Dealers, covering U. S. by States, per M. \$7.50
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 7 Mfrs. who make and assemble complete Radio Sets, per list \$4.00
 900 Radio Amateurs and Managers of Radio Stations, per M. \$7.50
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Greatest land offer of the day. Radio Farms directly adjoining World's Greatest Radio Station of The Radio Corporation of America at Miller's Place, North Shore of Long Island, in famous fruit and truck garden section. These fertile farm plots, 60 to 100 feet above sea level, perfect for strawberries, fruit and vegetables. Only one and a quarter miles from a delightful beach; superb boating, bathing, fishing. Unsurpassed for summer bungalow camp sites. New State concrete highway crossing property direct to 59th Street, New York. Best of easy terms. Titles guaranteed. Write for Radio Farm Facts.

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Flewelling Circuit

No ground, no aerial. Portable; can be carried in your car, train or camp. Will get long distance on a loop.

Simple to operate; can be worked with W. D. 11 Tube. We sell the complete parts to make up this wonderful set for \$20.25. Includes the following:

- 1 Spec. Bakel. Variocoupler..... \$2.90
- 1 .0005 finest Vernier condenser..... 4.35
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- 3 .005 Condensers (mica Dubliers)..... 2.25
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- 8 Binding Posts..... .40
- 1 Genuine Bakelite Panel, 7"x18"..... 2.25
- Finest make 7x18 Cabinet..... 3.75

WE SELL:

- 45 V. "B" Batteries (each)..... \$1.95
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 NEW YORK CITY

RADIO WORLD

TELEPHONE, BRYANT 4706
 PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF HAMS WEEK)
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Beacon Fires, Radio, and Cable Will Aid Arctic Explorer

ROALD AMUNDSEN, the famous arctic explorer, plans to hop off in an airplane from Wainwright, Alaska, next June and fly over the North Pole and land at Spitzbergen, Norway—if he's lucky. An elaborate system of communication will be established to report the time Amundsen starts his flight. Wainwright is 400 miles from the nearest radio station, at Noorvik, on the Kobuk River, Alaska. The Chamber of Commerce at Nome, Alaska, has planned a chain of signal fires made of drift wood and coal, and each tended by two Eskimos. These bonfires will be built 15 miles apart. When Amundsen starts the first fire will be lit, and when its smoke is seen the natives will light the second fire, and so on down the line.

The news of the start thus received at Noorvik will be broadcast by radio, picked up by other radio stations and relayed by telegraph and cable to Spitzbergen. Here will be in waiting a number of fast scout planes, ready to rush to Amundsen's assistance if he gets into trouble toward the end of his flight.

Renews Subscription to the "Best Radio Paper"

Editor RADIO WORLD:
 I am renewing my subscription to RADIO WORLD as it is the best radio paper in my opinion and I have tried them all. Enclosed please find check for six dollars for one yearly renewal beginning with date stated on bill.

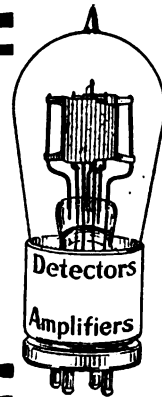
Yours truly,
 M. J. FOX, JR.
 150 W. 86th St. New York, March 10, 1923.

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"The Little Wonder"

FOR BOYS AND GIRLS

CRYSTAL SETS

Unassembled-Net **\$3.50**

Catches distinctly everything broadcast within 30 miles. We also manufacture the "Little Wonder" assembled set at \$5.00.

GUARANTEED TESTED CRYSTALS

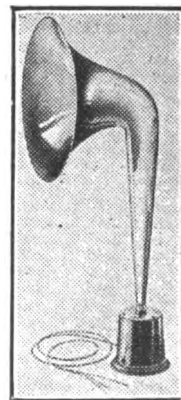
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Enjoy Perfect Radio Entertainment

Written Guarantee of Satisfaction or Money Back.

Type D. H. No. 1020, \$35 F. O. B. New York

Dealers write for special trade proposition.

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 23 Washington St. New York

Shall WHN Remain Silent on Certain Nights?

EDITOR, RADIO WORLD: As you are probably aware, Station WHN, Ridge-wood, Long Island, N. Y., has been asking, on the air, for the past few nights for letters from the radio audience as to whether they want WHN to be silent on certain nights for the purpose of allowing the "DX fans" a chance to listen in to long-distance stations, or whether they want the late evening programs (10:30 to 12 p. m.) to continue.

I know of numerous DX fans who, on account of not being able to tune out WHN, don't listen to him at all.

I would suggest agitation as to having a rule passed to compel all eastern stations to close down at, say, 10:30 every night. Also, how about allotting a different wave length (not 360 or 400) to those stations which, on account of having late hours allotted to them, have no alternative in the matter but to interfere with us DX fans on account of their late hours?

Personally I have nothing against Station WHN as I think their programs are very good considering the fact that they are a low-powered station; and, as far as I have heard, they don't advertise themselves in any way. They evidently must be under a heavy expense, and it is all done to please the radio listeners, with no hope of return.

In conclusion, would like to say that all DX fans, I am sure, will appreciate anything you may be able to do in this matter.

March 10, 1923. H. D. STRULLER.
111 Broadway, New York City.

Prize Essay Contests on Radio Subjects

THE management of the American Home and City Beautiful Association Exposition, to be held on the Million-Dollar Pier, Atlantic City, N. J., this summer, has completed arrangements for conducting a nationwide essay contest on the following subjects: "The Best Way to Educate the Public on Radio"; "Why Radio Should Be in Every Home, and How It Can Be Done"; "Who Shall Carry On and Pay for Future Broadcasting?" and "The Complete Radio Set as the Logical Installation."

The following men, prominently identified with the radio industry, have been invited to be represented on the Board of Judges for awarding prizes to winning contestants: Dr. Lee De Forest, De Forest Company, Newark, N. J.; Paul Godley, Adams-Morgan Company, Upper Montclair, N. J.; A. H. Grebe, The Grebe Company, Jamaica, L. I.; General J. G. Harbord, David Sarnoff and P. Boucheron, Radio Corporation of America, New York City; M. P. Rice, General Electric Company, Schenectady, N. Y.; Dr. W. H. Easton, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; Paul Findley, Western Electric Company, New York City; Major-General George O. Squier, Chief Signal Officer, U. S. A.; Dr. A. N. Goldsmith, Director of Research, City College of New York; Roland Burke Hennessy, Editor, RADIO WORLD, New York City; H. Gernsback, Editor, *Radio News*; Major J. Andrew White, Editor, *Wireless Age*; Kendall Banning, Editor, *Popular Radio*; Henry M. Shaw, President, Radio Trade Association; Lawrence A. Nixon, Editor, *Radio Dealer*, Secretary, Radio Trade Association, and Jack Binns, Editor, New York Tribune Radio Section.

Those who compose the Board of Judges also have been appointed as the Radio Committee for the Radio Exhibit. The above committee will also direct the essay contest and award prizes to winners in a contest in which only radio fans or those who listen to broadcasting are eligible to submit essays on the subject.

Prize Winners at the Permanent Radio Fair, New York City

THE winners in the prize contests for amateurs at the Permanent Radio Fair, New York City, have been announced as follows:

For the smallest one-tube, portable set—First prize: R. S. M. Long-Distance Receiving Set, manufactured by the Boston Scale and Machine Co.—Won by Fred W. Proctor, Hotel Ambassador, New York City. Second prize: Eagle Radio Portabloop—Won by Milton Brownshield, 1922 Wallace avenue, Bronx, New York City.

For self-contained home-made, three-tube, dry-cell receiving set—First prize: Paragon RD-5 and A-2 amplifier, manufactured by Adams-Morgan Co.—Won by W. H. Spalding, 27 Monroe place, Brooklyn, N. Y. Second prize: two-step amplifier, manufactured by Acme Apparatus Co.—Won by Carson Borthney, 168 West 4th street, New York City.

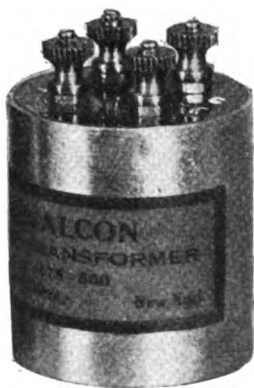
The prizes are on exhibition in the Broadway window of the Hotel Imperial, New York City. The Permanent Radio Fair has had several requests to hold another contest, and would like to hear from radio fans as to just what kind of contest they would like to have.

Navy Dirigible to Make Polar Flights

DURING the coming summer, when the ZD-1, a navy dirigible now under construction, is placed in commission, she will be sent on a flight around the world and on trips to the North and South poles. Rear-Admiral William A. Moffett, Chief of the Naval Bureau of Aeronautics, announced on March 6 in an address broadcast from WJZ by way of the Waldorf-Astoria, New York City.

Short-Circuited His Purse

"That doctor is a regular human dynamo." "Yes, and when I came in contact with him I myself was highly charged."—*Science and Invention.*



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RADIO DESK
The Place for Your Radio Set and Equipment

Closed compartments for Batteries, Head Sets, Tools, Extra Parts and other Appliances.

Useful and ornamental in any home with a receiving set. In oak and mahogany finish.

Send for Illustrated Literature.

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LIBERTYVILLE, ILLINOIS

\$25 A DAY
Selling Shirts

Large shirt manufacturer wants agents to sell complete line of shirts, pajamas, and night shirts direct to wearer. Advertised brand—exclusive patterns—easy to sell. No experience or capital required. Entirely new proposition. Write for free samples. Madison Shirt Co., 603 Broadway, N.Y.C.

BUILD YOUR OWN SET
THE
RADIO
CONSTRUCTOR

PRICE 25c MAILED

This new edition of THE RADIO CONSTRUCTOR (just off the press) illustrates and fully describes the most popular and efficient hook-ups. Full and complete instructions for construction of

Flewelling Reinartz
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And Many Other Tested Circuits

This is the book you have been waiting for. Get it today from your dealer, or it will be mailed you postpaid on receipt of only 25c.

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WALCON
Radio Frequency Transformers

Brings in distant stations on a loop—perfect reproduction. No distortion. Awarded Certificate of Excellence by N. Y. Eva. Mail.

THE BEST YOU CAN BUY

WALCON Transformers are tested and guaranteed. Particularly adapted for use with W.D.-11 tubes.

Four new hook-ups, including a new reflex circuit furnished without charge with each transformer.

Price, \$4.00. We pay postage.

Dealers and jobbers: Write for our attractive sales proposition, backed by national advertising.

Manufactured by
THE RADIO CENTRE, 2 West Broadway, N. Y.

FILL OUT AND MAIL NOW

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RADIO WORLD

RADIO WORLD 1493 Broadway, New York City

Please send me RADIO WORLD for months, for which please find enclosed \$.....

SUBSCRIPTION RATES:

Single Copy	\$.15	.....
Three Months	1.50	.....
Six Months	3.00	.....
One Year, 52 Issues.....	6.00	.....
Add \$1.00 a Year to Foreign Postage, 50c for Canadian Postage.		.....

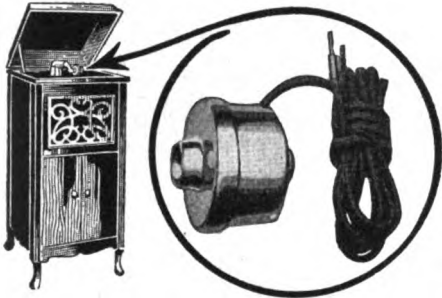
DX Nite Owls

(Continued from page 20)

Proud of His Record

From Jack Allison, New York City.

ON a recent night I heard the following list of stations: WGY, WAAM, WIP, WSB, WDAP, KDKA, WOC, PWX, WOO, WWJ, WJAX, WDAF and WAAN. I think that I have made a good night's DX work. I am using a honeycomb coil set with one stage of audio amplification,



RADIO LOUD SPEAKER FOR PHONOGRAPHS

The MORRISON Loud Speaking Unit, for use on phonographs, takes the place of awkward headphones. Possesses a tone value 100% true—an achievement never before attained in a loud speaker.

Attaches in Place of Reproducer

Slips on tone-arm of phonograph in place of reproducer, or can be used with horn. Adapted to any bulb set with one or more stages of amplification. Adjustable from soft to loud tone. Cannot possibly rattle or loosen through excessive amplification. A popular-priced Loud Speaker, that compares with most expensive instruments on the market. Thousands in use, giving perfect satisfaction. Handsomely nickel plated, complete with 5 ft. cord, \$18—at your dealer's or direct. Sent O. O. D., if desired. Fully guaranteed. Money back if not satisfied. (When ordering, specify make of phonograph).

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A Money-Back Guarantee Goes With Everything We Sell

WE SELL ONLY STANDARD PARTS AT LOWEST PRICES

Atwater-Kent Variometers\$6.75
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Raven Molded Variometer 4.00
Raven Molded Variocoupler 4.00
Westinghouse Dry Cell Tube 6.50
U. V. 200 Tubes	..... 4.00
U. V. 201 Tubes	..... 5.75
Cunningham 301 Tubes	..... 5.75
A. B. C. 23 Pl. Condenser	..... 1.90
A. B. C. 43 Pl. Condenser	..... 2.30
A. B. C. 23 Pl. Vernier Condenser	..... 3.75
A. B. C. 43 Pl. Vernier Condenser	..... 4.00
Acme Audio Transformer	..... 4.00
Baldwin Type C Phones (double)	..... 8.75
Baldwin Type C (single)	..... 4.50
Stromberg-Carlson Phones	..... 6.00
Radio-Receptor Phones 3.50
Federal Phones 5.00
Brandes Phones 6.00
Bradleystats 1.70

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115 West 23rd Street New York

two 43-plate condensers, and, although I have not heard as many as some of the other fans, I am very proud of my home-made set.

Another New One Due to Crystal Not Re-radiation

From Leo Schecter, 1935 Sample Ave., St. Louis, Mo.

I WROTE to you some time ago about my reception with a 1-slide crystal set. Since then I have received a new station, WLB, Minneapolis, Minn., and am receiving other stations much louder. I think the reason for this is because I am using crystals sold by the Rusonite Company, advertised in RADIO WORLD. I have come to think that my tuning-coil is not the reason for my reception, because I have just built a 2-slider and have heard WCX and WOC in one night on it. The reason for my wonderful reception must be in my phones, which are 509 w. Western Electrics, and my aerial, which is a 2-wire, 85 ft. long and 36 ft. high. Many people have told me that my reception is due to re-radiation, but two authorities, Mr. Flewelling and Dr. Greenleaf W. Pickard, famous radio inventor, both say that re-radiation is impossible. I will be glad to give the details of my 2-slider tuning coil to anyone who writes for them.

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Watch This Column EACH WEEK It Will Pay You

HEAD SETS	
List Price	Our Price
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7.50 Stromberg Carlson	4.75
6.00 Frost 3000 Ohms	4.25
6.00 Royaltone	3.75
5.50 Murdoch Type 57	4.10
12.00 Western Electric 509W	9.50
6.00 Baldwin Type C Master	8.50
6.00 Baldwin Type C, Single	4.00

LOUD SPEAKERS	
List Price	Our Price
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55.00 Western Electric	50.00
12.00 Westavox (New Type)	31.50
40.00 Calophone	30.00
20.00 Dictograph	15.00
15.00 Britannia	12.50

AUDIO TRANSFORMERS	
List Price	Our Price
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7.00 Radio Corp. U. V. 712	5.60
6.50 Thorndarson	5.10
4.50 Thorndarson	3.00
6.00 Amplex W. D. 12	3.95
5.00 General Radio	4.35
6.00 Jefferson	5.00
7.00 Amertram	5.95
5.00 Acme	4.10

PANELS	
List Price	Our Price
BAKELITE—3/16 Inch Stock	
7 x 10.....\$1.35	7 x 15.....\$1.95
7 x 12..... 1.45	7 x 18..... 2.50
7 x 14..... 1.85	7 x 24..... 2.95
HARD RUBBER—Grade A	
7 x 10.....\$0.90	7 x 18.....\$1.45
7 x 15..... 1.35	7 x 24..... 1.90

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List Price	Our Price
Firth 23 Plate Condenser\$1.30
Firth Triple Sockets90
Firth Double Sockets	..... .70
Millard Rheostats	..... .45
Double Phone Cords	..... .80
Fada Type Switch Levers	..... .25
Firth Crystal Detectors	..... 1.00
Brach Lightning Arrestor	..... 1.25
Bulldog Phone Plugs	..... 1.00
Three Coil Mountings	..... 3.50
Two Coil Mountings	..... 2.75
Single Coil Mountings	..... .50
150° Variocoupler	..... 2.75
Variometers	..... 2.75
Vernier Rheostats 1.35
11 Plate Condenser 1.35
43 Plate Condenser 2.15
W D 11 Sockets30

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Make your own coils. Construct variometers, variocouplers, etc. No distributed capacity. Holds windings securely and permanently.
FOR BANK WOUND COILS—"For this operation of cementing the three turns together shells will not do."—Radio World, March 10.
Send 25c. for sample bottle
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WANTED
Thorough Radio Man
Experienced in vacuum tube repair; preferably one experienced on WD-11 tubes, but not absolutely necessary. Answer, giving full particulars, references, experience and salary wanted.
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The Na-ald Small-space Socket is molded from genuine Condensite. Requires but small space for mounting. Special slot reinforcement; virtually unbreakable. No excess metal to interfere with efficiency. Phosphor bronze contacts. Cannot be affected by heat. Exceptional value.
Equal in quality to any socket using bottom contact.
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No. 401
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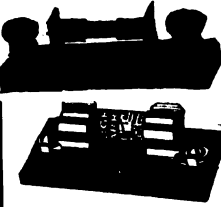
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The dials with absorption losses reduced to a Minimum
 Specially designed cross-section insures minimum loss. Beveled graduation and numbers are particularly clear. Knob so shaped that fingers do not interfere with easy, accurate reading.
 Na-ald dials are moulded from genuine Na-ald material. Rheostat heat will not affect them. They run true; cannot warp.
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 The only ARRESTER approved by National Board of Fire Underwriters, which retails for \$1.00. At your Dealers—Otherwise Send Purchase Price and Give Dealer's Name.
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 Makers of Teleradio. Supersensitive Phones



RADIO BROADCASTING MAP
 FOR the benefit of those interested in Radio and those who are becoming interested. Rand McNally & Company have prepared a publication containing a wealth of information of greatest value. It shows in the most comprehensive way, the location of the broadcasting stations, give their classification, the call letters, wave lengths, ownership, etc., of each. Everyone who wishes to get the maximum pleasure and enjoyment from Radio should have a Rand McNally Radio Map of United States. It is complete, accurate and up-to-date.
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 By CAPT. V. W. PAGE. This book describes the basic principles of aviation, tells how a balloon or dirigible is made and why it floats in the air. Describes how an airplane flies. It shows in detail the different parts of an airplane, what they are and what they do. Describes all types of airplanes and how they differ in construction as well as detailing the advantages and disadvantages of different types of aircraft. It includes a complete dictionary of aviation terms and clear drawings of leading airplanes. The reader will find simple instructions for unpacking, setting up and rigging airplanes. A full description of airplane control principles is given and methods of flying are discussed at length.
 This book answers every question one can ask about modern aircraft, their construction and operation. 375 pages, 150 specially made illustrations with 7 plates. Price, \$2.50
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The Passing of the Publishers' Friend

The passing of Stephen Farrelly removes one of the big figures from the periodical and news distributing trade in this country. Mr. Farrelly was eighty years of age, but he came of that sturdy stock to which the calendar means nothing and was active almost to the end.

For many years he was a moving force in the conduct and counsels of The American News Co., which owes so much to the activities, loyalty and strength of character of the members of the Farrelly family. Mr. Farrelly was helpful to and sympathetic with all the great American publishers, and never too busy to give his advice to the younger members of that craft. His big friendships and his effect on the business, social and spiritual life of New York were fully indicated by the immense assemblage of noted men and women from all walks of life who attended his funeral services at the Cathedral in New York.

Mr. Farrelly will be missed by his associates and all those who knew him, but at least his family have the satisfaction of knowing that he passed out into the Great Beyond full of honors and with the love and respect of every one with whom he had come in contact during his many years of business and public service.

Broadcasting Station Has Plate Glass Walls

THE Edgewater Beach Hotel, Chicago, will soon have a new broadcasting station, with the call WJAZ. It will be located on the main floor of the hotel, and its walls will consist of three thicknesses of plate glass. Spectators will thus be afforded a full view of the station in operation.

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140 W. 32nd St. New York, N. Y.

OCTAGONAL SHAPED LOUD SPEAKER

Handsomely Finished in Gun Metal for Use with Head Phones—SPECIAL **\$4.50**

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- Bannard 2200-Ohm..... 3.45
- Murdock 3000-Ohm..... 3.95

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- .006 Westinghouse Cond. \$0.60
- .006 Freshman Cond..... 1.00
- Antenella 1.75
- Bulldog Grip Plug..... .75
- 3 Plate Vernier Cond.... 1.25

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- No. 763—22 1/2 Volts..... \$1.25
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Every Product Sold on A MONEY-BACK GUARANTEE—Perfection Pays Parcel Post.

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Bristol	\$22.50	\$18.50	Single Sockets, Brass Tubing.....	\$1.00	\$0.40
Pathe	22.00	17.50	Double Sockets, Brass Tubing.....	2.00	.98
Wagnavez	45.00	29.75	Triples Sockets, Brass Tubing.....	3.00	1.35
Wodehern, Newest Model	7.50	5.99	Single Sockets, Red Moulded Condensite.....	1.00	.55
HEAD SETS			WD-11 Sockets, Extra Fine Quality.....	1.00	.45
Rico, 3000 ohms.....	\$7.00	\$4.25	VARIOMETERS		
Ditograph, 3000 ohms.....	12.00	6.50	Fisher Mahogany	\$5.00	\$2.50
Pector Precision, 2200 ohms.....	9.00	5.50	France Moulded	5.00	2.50
Baldwin Type C, Nath. Baldwin.....	12.00	9.75	Pathe Moulded	6.00	3.50
Baldwin Single Phone Type C.....	6.00	4.05	Eagle, Red Moulded Bakelite.....	8.00	5.50
N & K, 6000 ohms, made in Germany. The best phones made.....	16.00	7.50	VARIOCOUPERS		
TRANSFORMERS			France Mahogany, Silk Wound, Fibre Tubing.....	\$5.00	\$2.25
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WD-12 Audio Frequency.....	5.00	4.00	Fisher, 180 Degrees.....	5.00	2.50
Aero Type A28	5.00	4.50	Pathe, Moulded, Silk Wound.....	6.00	3.50
VARIABLE CONDENSERS			Eagle, Moulded, Red Bakelite, the Best Made	8.50	5.75
France, 43 Plate, Variable, with Vernier	\$7.70	\$4.75	France, 180 Degrees, Bakelite, Silk Wound	5.00	2.75
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43 Plate, Moulded Ends, .001.....	4.00	2.00	Exide "A" Storage Battery, 6 V., 80 Ampere Hours, Type 3.....	\$23.10	\$19.00
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Moulded, Fada Type, 6 ohms, 1 1/2 Ampere.....	\$1.00	\$0.40	LXL-18	3.00	2.00
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Framingham, Vernier	1.50	1.15	Homecharger, DeLux Model, for Alternating or Direct Current.....	16.50	16.50
Amoco Potentiometers, 360 ohms Resistance	1.75	1.00	Post Electric Soldering Iron.....	6.00	4.75
JACKS			PANELS		
Five Open Circuit	\$0.70	\$0.40	Hard Rubber, Unbreakable, 7 x 10, New.....	\$0.90	
Five Closed Circuit85	.50	Hard Rubber, Unbreakable, 7 x 18, New.....	1.60	
PLUGS			Hard Rubber, Unbreakable, 7 x 24, New.....	2.30	
Flat Plug	\$1.00	\$0.50	RECEIVING SETS		
Round, Bulldog Grip	1.25	.60	\$50.00 Tuska Regenerative Armstrong Circuit One Tube Set, Special.....	\$25.00	
DIALS AND KNOBS			125.00 Cutting & Washington 3 Tube Regenerative Armstrong Circuit Set. Will Receive Over 2000 Miles. Special.....	65.00	
3" Composition Dial and Knob.....	\$0.75	\$0.30			
1/2" Brass Bushing	1.00	.50			
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1/2" Hole	1.25	.50			
4" Composition Dial and Knob.....	1.25	.50			
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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. If copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

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CRYSTAL-TUBE for Crystal Sets. See advertisement on page 23.

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SPRING RADIO SALE—Here's your chance to buy quality radio apparatus at wholesale prices. All makes of apparatus and parts. If interested, send postage for complete list. N. E. Ristey, Spring Grove, Minnesota.

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American Equipment for High-Power Swedish Station

SIFFER LEMOINE, radio engineer of the Royal Board of Swedish Telegraphs, has spent the past two months in the United States making arrangements for the delivery of apparatus and equipment for the new high-power radio station to be erected at Goteborg, Sweden. The contract for this equipment, which was secured by an American company in competition with British, French and German bidders, provides for the supplying of a 200-KW Alexanderson generator, with all necessary equipment and apparatus, and plans and specifications for complete installation. The steel towers to be erected for the antenna will be similar in height and arrangements to those used in the latest American high-power radio stations, but the actual design of the towers and the material will be furnished by a Swedish firm. It is expected, according to information received by the Department of Commerce, that the installation will be completed and the initial tests made before the end of the year.

Goteborg is the most important communication center in Sweden, since it not only is the site of the proposed high-power radio station, but is the terminus of the cables from England and Denmark, as well as of the toll cable to Stockholm. The new station will be operated by the Royal Board of Swedish Telegraphs. A direct circuit will be established with the Rocky Point station of the Radio Corporation of America, thus providing the first direct radio communication between the two countries.

New York and Atlantic City Radio Exhibitions Combine

It is announced that the Permanent Radio Fair, Inc., New York City, has combined with the National Exhibitors, Inc., of Atlantic City, N. J. Manufacturers of radio products can now reach the twenty millions of visitors who patronize the all-year seashore resort annually. The exhibits of radio manufacturers will be displayed on the boardwalk, where there is space covering 7,000 square feet, beautifully laid out, including two of the finest stores along the boardwalk, with 200 feet of window space, and a concert hall seating 500 people. No admission will be charged at either the New York City or the Atlantic City expositions. Booklets will be distributed from manufacturers. Demonstrations will be given of the manufacturers' exhibits, and everything possible done to help the actual user of a receiving set.

Removal of Federal Institute

The Federal Institute of Radio Telegraphy has increased its facilities for manufacturing its "3YQ" audio-frequency transformer by removal to larger quarters at 1003 Broadway, Camden, N. J.

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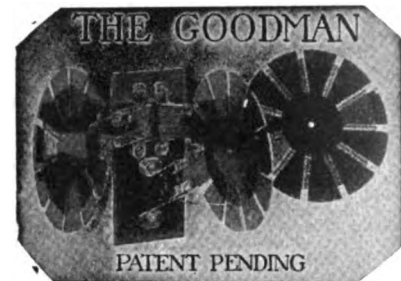
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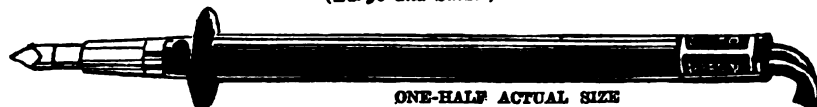
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An Appreciative Subscriber Finds Value in "Radio World"

EDITOR, RADIO WORLD: Realizing that the lot of none of your caste is any too happy, but that a word of sincere appreciation might brighten it a bit, I am sending this word of thanks for your good, practical magazine, and especially for your article by Ortherus Gordon in your issue of January 20, 1923.

Before running across RADIO WORLD of that issue I had scanned several so-called radio magazines, with their articles, high- and low-brow, and their data on the construction of sets, and it was not until I saw your article that I had the courage to essay building a set. The detail and clarity of that contribution gave me the necessary stamina, and I set about the purchase of parts and their construction and the building of the set described by Mr. Gordon.

After the usual delays—largely waiting for the receipt of good apparatus—I got the set together, and made it "perk" on February 17. Since that date I have received the following stations: WEAf, WGY, KDKA, WJZ, WLW, WDAJ, WCAE, WJAX, WNAC, WHAS, WMC, WDAP, WBZ, WOR, WIP, WMAQ, WQAA, WBP, WSB, WGM, WGI, KYW, WWJ and WHA.

You will note that this list covers the territory from Boston to Memphis, via Chicago, and from Troy to Atlanta; all received repeatedly, together with a Los Angeles station received once. It is very difficult to tune in Los Angeles on account of the powerful 360-meter stations near by. The fine part of the set is that it is not only very selective, but clear as a crystal.

I find your magazine is full of such practical data as contained in this article, and want to thank you many times for all of it.

Such articles repeatedly appearing in RADIO WORLD will make it the best periodical there is on radio.

Very truly yours,

Monticello, N. Y. LESLIE E. HICKS.
March 17, 1923.

Error in Economy Radio Advertisement

In our issue of March 10th was advertised 2-Coil Mounts De Forest License \$2.15. The Economy Radio Co., of 132 Nassau St., New York City, tell us that this price should be \$2.35.

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of the Famous MAWHINNEY RECEIVING APPARATUS
A series of 7 blue prints giving in full detail all the necessary information, specifications, and method of construction, and assembling of the MAWHINNEY RECEIVING Apparatus. This is the 5-tube receiving set that picked 5 stations in California, recently written about in Literary Digest and Radio Globe. The Blue Prints tell you in a very simple and clear manner just how to construct a duplicate of MAWHINNEY'S trans-continental receiving set.

If your dealer cannot supply you—
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AMPLIFYING TRANSFORMERS
Adapted for 1½ Volt Tube..... \$3.25

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Pathe Loud Speaker—List Price, \$22.00..... 17.50
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Clarifies Signals Unbroken Range, Zero to Five Megohms
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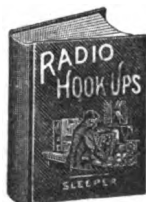
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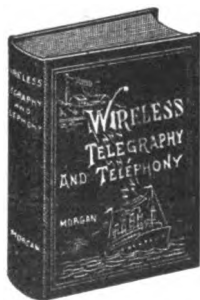
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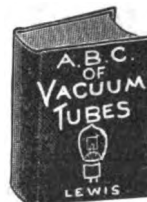
The man who wants to feel the real thrill of accomplishment, and who is not satisfied in the merely making use of what others have done for him, builds his own radio apparatus. Radio men can follow the data in "Radio Phone and Telegraph Receivers" with full confidence, because each piece of apparatus described was first made, tested and found efficient before the final design was accepted. Special receivers, both crystal and audion, are shown in detail. Regenerative circuits as well as audio and radio frequency amplifiers are described with clear photos, diagrams, and working drawings prepared especially for the novice and the man who wants to receive the radio telephone broadcast. A special feature is the phonograph type radio set and the loud speaker. Fully illustrated.....PRICE 75c.



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Throughout the preparation of this book, one purpose was kept in mind—Answer the Practical Questions of the "Novice," of the "Beginner," and the more advanced "Student." This book will help in the selection or construction of simple apparatus for the transmission and reception of radio telegraph and telephone signals. In the chapters on radio receivers the simplest crystal, the simple audion, and the regenerative types are described in quite some detail. The question of antennas, both for transmitting and receiving, are taken up. A good many helpful suggestions are given which will be of considerable aid to the experimenter. 16 chapters. Fully illustrated. PRICE \$1.00



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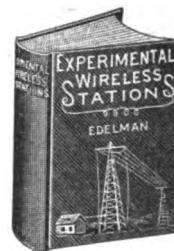
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