

The Radio Weekly

June 17

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RADIO WORLD

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I L L U S T R A T E D

The "Lone Fisherman" of 1922



(c. International Newsreel)

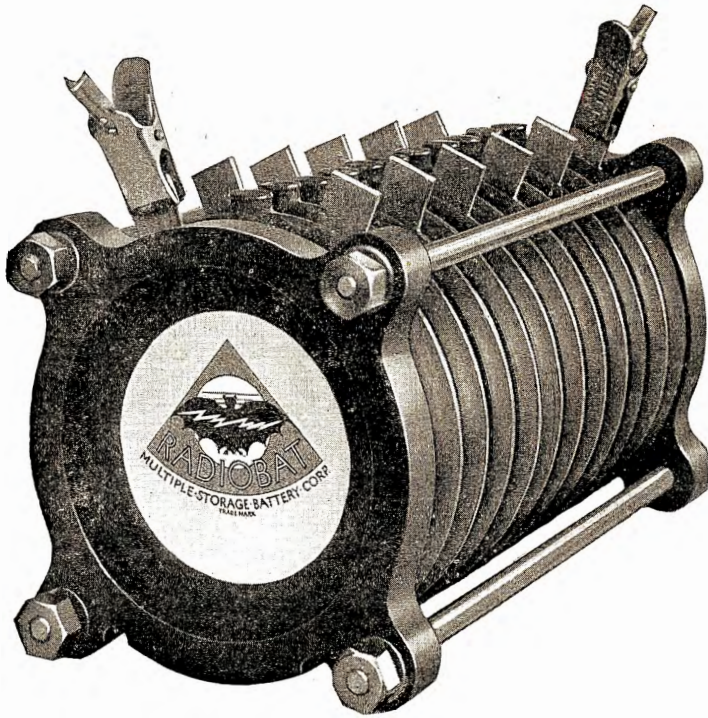
When Izaak Walton wrote his literary classic, "The Compleat Angler," away back in 1660, or thereabouts, he produced what has been, since then, the allegory of peace of mind and recreation and gentle solitude that are the greater part of the fine sport of fishing. But the genial philosopher did not reckon with many things—among them the possibility of radio taking part in most everything in the world, even the art of angling. No longer does he who invades the haunts of the finny tribe seek absolute solitude, as the photograph illustrating our front cover indelibly proves. Here, on the secluded banks of the Green River, Washington, where trout fishing is a real sport, the nimrod has erected his aerial and hooked-up his receiving set, ready to hear all that is going on in the faraway world while awaiting the glory of a "bite."

Tests of Inductance Coils—The Vacuum Tube's Start

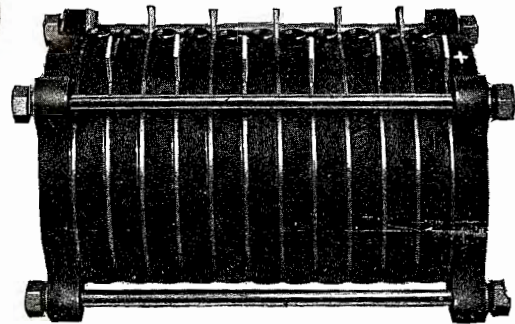
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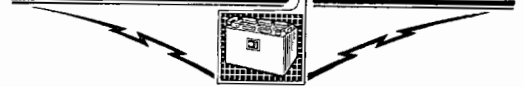
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President

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POLICY—Hutchison policy proposes rapid extension to annual production of 150,000 receiving and transmitting sets of varying sizes and prices.

HUTCHISON—The name "Hutchison" is well known in the scientific and commercial worlds. "Hutchison" quality wireless apparatus will be nationally advertised.

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To HUTCHISON RADIO COMPANY
52 Vanderbilt Avenue, New York City

Please send me full information on "Hutchison" and oblige,

Name

Address

City State

Occupation

RADIO WORLD

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June 17, 1922

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Big Army Balloons Race Through the Ether with Radio as Their Rudder



THIRTEEN entries were accounted for, prior to the great National Balloon Race which took place from Milwaukee, Wisconsin, on May 31. Out of this number, ten balloons were forced to land, leaving only three able to keep up the pace. Now that radio has taken such a prominent part in all aerial matters, the balloons were equipped with receiving and transmitting sets.

This meant that, from the start, direct communication was possible at most any minute in case of mishap or a call for emergency.

As the balloons were traveling across the wind-swept heavens, advice regarding weather conditions were broadcast to them. The broadcasting also enabled the officer in charge to keep in touch with land stations, and he was also in touch with amateur stations in case a landing had to be made.

In the upper photograph is shown Major Oscar Westover, U. S. A., of the Balloon Service. Below are several of the big gas balloons. The first three pilots to drive their balloons the greatest distance from Milwaukee are to be entered in the International Balloon Races to be held in Switzerland later this year.

Several of the pilots quit the race because they could expect no favors from the winds and wished to hold the distance they had covered. These included Ralph Upton of Detroit, one of the seven civilians shot high into the sky at the hop off. He descended near Painesville, Ohio, when shifting winds threatened to start him back over the crooked course his bag pursued.

Warren Rasor of Brookville, Ohio, another independent fier, came down near Fulton, Mo., rather than spend another night in the air. He landed only a few miles from the spot where J. S. McKibbin of St. Louis had descended shortly before.

Lieutenant James T. Neely, army pilot from Ross Field, Cal., dropped to earth near Dover, Ohio.

The bags which reached a high altitude after the hop off at Milwaukee, had much the same experience with air currents, and after following a course which would have taken them up into the Canadian wilds, shifted with the winds and crossed Lake Erie.

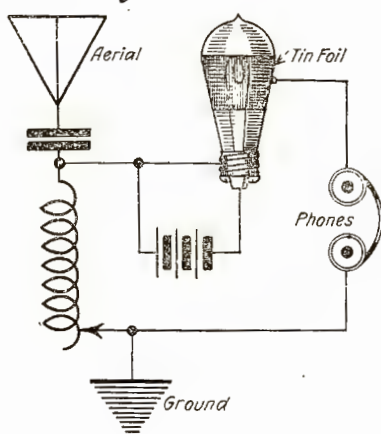
The Vacuum Bulb's Start in Life

By C. White

MANY users of the vacuum bulb no doubt think of it only as of comparatively recent origin; but, in fact, the theory of the vacuum bulb has been known to science since 1883. About that time, Thomas A. Edison noticed a peculiar darkening of the lamp bulbs after considerable usage. This was a challenge to the famous inventor to discover the real reason for such blackening. Mr. Edison learned two important facts from his observations: first, that many bulbs were blackened all over except for a fine white line in the plane of the lamp filament; and, second, that it was always the side of the filament connected to the positive terminal of the line that cast the shadow. The most natural hypothesis advanced was that small particles were given off by the negative side of the filament and bombarded the positive leg. These small particles have since been called electrons. On their peculiar property of traveling from negative to positive, and not from positive to negative, has been founded the whole underlying theory of the vacuum tubes of to-day.

The next step in the development was the interposing of a metal plate or shield between the two legs of the carbon filament. Now we know from the general theory that a current will flow from the positive side of the lamp to the plate if we should place a wire between the two leads from the same on the outside of the lamp, but no current will flow if a wire be placed across the negative side and the plate. This is readily explained by the fact that, within the bulb, electrons, passing from the negative leg to the positive, hit the metallic plate thereby inducing negative charges. Therefore, when the positive side is connected to the plate terminal exterior, to the bulb, a current will flow because the two terminals have opposite charges on them. Of course, when a wire is connected across from plate to negative leg, no current will flow since both terminals have negative charges. Now, if an alternating potential be applied to the lamp, current will only flow through a wire connected from the plate lead to one end when that end has a positive charge on it. This action is called the rectifying action of the tube. A common application is the mercury arc-rectifier and the tungar rectifier.

Professor J. A. Fleming changed the shape of the plate into a shield around the filament and gave it the name of the "Fleming Valve." The Fleming valve was nothing more than the old Edison two electrode—the filament



Schematic diagram of the simple valve designed by Dr. J. A. Fleming. Suggested by C. White. Drawn by S. Newman.

and the plate—tube with its design changed. The rectifying action of the two-electrode tube found application as a wireless detector, and was used as such extensively by the Marconi Company before the advent of the superior three-electrode bulb of to-day. The trade name for the two-electrode bulb is Kenotron.

Dr. Lee DeForest made the final big step in the development of the vacuum bulb when he introduced a third electrode known as the grid. The action of the grid may be described briefly as follows: If between

the heated filament and the plate we place a B battery with the positive side attached to the plate, a flow of electrons will start from the filament to the plate; and, if we interpose a grid or sieve, naturally the electrons will have to pass through it to reach the plate. Of course a positive charge induced on the grid will accelerate the passage of the electrons while a negative charge will retard the passage, thus varying the external current in the plate circuit. When the three-electrode tube is used as a detector of radio waves, the varying pulse of the incoming wave is connected across the filament to the grid. This variation of charges on the grid alternately accelerate and retard the passage of electrons to the plate thus producing a change of current in the phones which are connected in the plate battery (B battery) circuit. Although the change on the grid is small, the total result of the change in the phone circuit is very large. It is this fact that makes the vacuum bulb a very effective detector of radio waves.

As an interesting experiment, I would suggest that those who love to delve into the scientific side, try the following: Take a small miniature bulb (4 or 6 volt size) and silver or coat it with tin foil. If a battery be attached to heat the filament and the whole affair be connected in a circuit, as shown in Figure 1, an efficient Fleming valve detector may be had.

Radio Corner of a Passenger Car



(c Underwood & Underwood)

This is the radio corner of a passenger coach on the Lackawanna. The reception of radio messages is now an accepted fact on several railroads. Soon it will become a regular element in the life of all travelers.

How to Select the Right Set

By E. L. Bragdon

It is said that a large percentage of motor-cars are sold through the color of the body and wheels and the design of the lines. The engine and driving mechanism are considered merely as an incidental.

The beginner in radio is probably buying the most of his equipment on the basis of the number of dials, the size of the cabinet, and the mahogany finish. It could hardly be otherwise when an industry springs into being with the rapidity of radio. Moreover, it is idle talk to argue that the beginner may be shown in a few minutes just what he needs for an outfit. But a few pertinent facts about the kinds of sets available.

In the hope of reaching as many possible users of radio sets as manufacturers could meet with their supply, only three classes are formed:

1.—The man who lives on the third floor of a six-floor apartment house, or hotel, and is, thereby, prevented from having an aerial on the roof.

2.—The average amateur who lives where a wire can easily be strung from house to tree.

3.—The radio beginner who lives in a remote district, many miles distant from a broadcasting station of any kind, and whose very position makes him a fitting prospect for an outfit which will bring to him regularly and clearly the daily news of the world.

Practically every city of size in the country now sports one or more broadcasting stations, and as a six-story apartment house, or hotel, sug-

To the Amateur

Buy the very best outfit you can afford. You can find plenty of space to erect the ideal aerial; say, 150 feet in length and 75 feet in height.

With this antenna to pick up the ether vibration, and a good outfit to convert the waves into sound, your enjoyment is guaranteed. Nothing would then be too far away to be your own.

Using two stages of radio-frequency amplification and one or two of audio-frequency amplification, you should be able to tune in any broadcasting station doing business in this country.

And it is doubtful if the seeming maze of amplifications would be at all mystifying to you.

gests such a city it can be assumed that the beginner who lives on the third floor of one of these houses would be satisfied at the start if he were able to hear the local stations. The distance is short; but on account of having no outdoor antenna, the capacity of the receiving set must be greater.

Although the ordinary loop aerial consisting of ten or a dozen turns of wire about a four-foot frame is the more compact, the writer favors coil aerial formed by laying four or five turns of wire behind the picture give slightly better results if separated

one strand from the next, but excellent results have been obtained with the strands placed helter-skelter behind the molding. Only one end is used, the other end hanging free.

With an antenna of this type, the owner needs only a single vacuum-tube detector set, hooked up with what is known as the "regenerative circuit," to listen in on all the more powerful broadcasting stations within a hundred miles. Because of the fact that every part of the equipment is forced to work at its maximum efficiency, a radio receiving-set with as few fixed circuits as possible is to be preferred. That is, a set should not be purchased which has a fixed tuning-coil, but which provides a variable condenser for variations in tuning.

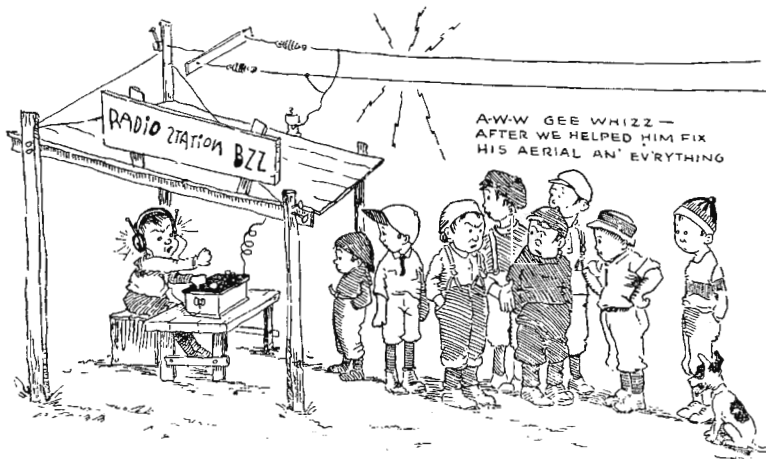
A crystal detector set should not be considered for use with indoor antennas, even though many instances have been reported where truly astonishing distances have been covered with similar layouts. It is always better to play safe and secure a single-tube outfit with a regenerative circuit. Success is then assured. A set of this description should not cost more than \$100, including all incidentals such as storage battery, dry battery, and phones.

Compared with his shut-in brother of the apartment, the radio amateur living where an outdoor antenna may be raised has a simple proposition. A single copper-wire strung between two points 75 to 100 feet apart, and as high in the air as facilities permit, will make as good an aerial as he will need whether his outfit be the most simple or the most intricate.

If this man is living within twenty-five miles of a broadcasting station, and does not feel wealthy enough to invest in one of the better grades of receiving set, he will get really satisfactory results with one of the simple crystal-detector sets costing not more than \$18 to \$25. Nothing has yet been found that will beat a crystal detector for picking up radiotelephone sounds. Its range, of course, is limited, but what it gets is without a semblance of distortion. There are several types of crystal outfits. In some of them, there is little beyond a detector, a phone, and a crude coil. The tuning is carried out by taps terminating in switches. Close tuning is impossible. Amateurs sending code are apt to break in and ruin an evening's entertainment. If this happens

A Corner in Radio

Cartoon by H. C. Diefenbach



Radio World's Hall of Fame



(c. Underwood & Underwood)

DR. LOUIS COHEN

Discoverer of the Cohen capacity coupled-receiver used in all government radio stations. Dr. Cohen is connected with the George Washington University, Washington, D. C., and the Bureau of Standards. With Major Mauborgne of the United States Signal Corps, he invented a device which, it is claimed, will eliminate static. It is called "The Drain Coil."

(Continued from preceding page) the only recourse is to shut down for the time being. Other outfits are made up of a very good design of tuner with a variable air condenser connected across its terminals for close tuning. With this set, interference usually may be ruled out, leaving the air free for the crystal set, it is best

to pay as much as the pocketbook will allow.

The man residing within a short distance of a broadcasting station may prefer a vacuum-tube outfit because of the greater latitude made available by it. Since he is in a position to do fine long-distance work, he should buy the best vacuum-tube set

on the market. A single-tube outfit with close-tuning facilities will provide a good base for future additions of amplifying units. If current literature is carefully studied, he will find that some sets, particularly those making use of honeycomb or similar coil, have a wave-length range from 200 meters up to 25,000.

The Beginnings of Broadcasting

It Has Created Over a Million Receiving Stations at a Cost of \$75,000,000

By *L. R. Krumm*

IN February 27 of this year, there was held, in Washington, an open hearing before a committee of radio engineers, military officers, and governmental representatives, appointed by the Secretary of Commerce to formulate proposed laws and regulations to meet the new radio-conditions which have developed since the termination of the World War. Nearly two hundred representatives of various commercial, amateur and governmental radio interests attended this conference.

The main purpose of this conference was to devise means to meet the problems which had arisen through the establishment of the radiotelephone broadcasting stations, which have caused the installation, during the past year and a half, of from 700,000 to 1,000,000 radio-receiving stations, representing a probable expenditure of approximately \$75,000,000.

Previous to the establishment of broadcasting stations working on absolutely dependable schedules, the public's interest in radio had been limited to the technically inclined amateur operators with some knowledge of the electrical principles involved in radio telegraph communication. These men were "dyed in the wool" faddists on radio. They wanted to know what "made the wheels go round" and how to make them go. They wanted to establish radio telegraph transmitting stations. For this it was necessary to study the Continental Morse Code and secure operators' licenses from the government. All this they did in addition to investing considerable money and time in the purchase and installation of the equipment.

It was estimated, before the World War, that there were some 6,000 licensed amateurs transmitting stations and, probably, 50,000 receiving stations which required no license. All these were closed during the war. The amateur receiving stations were allowed to re-open April 15, 1919. On October 1, 1919, amateur transmitting stations were allowed to operate again. The amateur radio activities had languished during the war period and probably there were fewer amateur stations after than before the war.

During the war, Mr. Frank Conrad, Assistant Electrical Engineer for the Westinghouse Electric & Manufacturing Company had become interested in radio work because he had given his best efforts to assist the

L. R. Krumm, Superintendent of Radio Operations of the Westinghouse Electric & Manufacturing Company, is one of the best informed men on wireless of the present day. Mr. Krumm served as Lieutenant Colonel, Signal Corps of the A. E. F.; was eighteen months in France on the staff of the Chief Signal Officer, General Edgar Russell; and had charge of all radio operations of the A. E. F. For his service during the World War he was awarded the Distinguished Service Medal by the United States, and the Legion D'Honneur by France. Mr. Krumm came to the Westinghouse Company from the Army. Previous to his service, he was Chief Radio Inspector of the Bureau of Navigation, Department of Commerce.

government in producing the very highest type of radio equipment for the Army and Navy. Practically the only type of equipment which was produced in quantity and delivered in France in time to be of any service to the American troops and which met the requirements of warfare was an airplane transmitter known as SCR-73 set, developed and produced by this company. Mr. Conrad's activities covered, however, more than this equipment, as he was interested in the development of various types of radiotelephone sets. To aid him in his experiments he was given a special license to operate, during the war, at his home in Pittsburgh, Pa.

After the armistice he retained his interest in this work, and, operating under this special license was able to continue development of his radio station to a degree of success exceeding anything heretofore attained. The Westinghouse Company, which, previous to the war, had no radio interest, also decided that a company of its magnitude could no longer exclude radio from its activities and had entered this branch of the electrical business. It was, therefore, intensely interested in Mr. Conrad's researches and he continued his work with its encouragement and assistance.

In the winter of 1919, Mr. Conrad established at his residence in Pittsburgh, a radio telephone broadcasting station and began the regular broadcasting of music and entertainment. This station was then known as 8XK, the call letters assigned in the new license he carried from the Department of Commerce. At first his efforts

were confined to the broadcasting of phonograph music every Wednesday and Friday night. Soon his supply of records was exhausted and, one night, in response to many letters requesting the latest popular music, he announced that he had exhausted his records and was financially embarrassed trying to keep up with the demand for new music. He suggested that, possibly, his hearers would like to help him out in this dilemma. He received nearly 500 records. The magnitude of the response to this appeal indicated the appreciation of his audience and the demand for its continuance.

He broadened his activities by providing a studio in which artists, instrumental and vocal, could render selections for transmission from his radio station, a short distance away.

H. P. Davis, vice-president of the Westinghouse Electric & Manufacturing Company, who was responsible for his company entering the radio field, had been watching not only the technical development of the equipment but also the attitude of the public toward broadcasting, realized the necessity of providing this service in a systematic and properly organized manner as a part of his company's business operations, and, therefore, in the fall of 1920 began the construction of a broadcasting station at the East Pittsburgh works. Through Mr. Davis, therefore, more than anyone else in the country is due the credit for starting broadcasting on a nationwide scale. He was the first man to sense the tremendous importance of the radiophone.

Experiments were carried on for several weeks previous to election night in November, 1920, when it was intended to inaugurate this service by broadcasting the election returns. A special license was obtained from the government radio inspector in Detroit, Michigan, and the call letters 8ZZ were assigned to the station in the beginning. The election results were startlingly satisfactory and the letters of appreciation received by the company dispersed any doubt as to the advisability of continuing broadcasting. Plans for the improvement and enlargement of the station were immediately inaugurated and regular nightly programs were announced with specially selected artists as entertainers. A wave length of 330 meters was originally assigned to this station.

"I believe that radio is absolutely necessary to the future of the world."—MARCONI.

Hook-ups

By Albert P. Taylor

IT may be all right for a physician to equip his car with a receiving set. He needs a little recreation between calls, anyway, and that seems an excellent way in which to get it. Several good songs over the ether should brace him for the next call on a colicky baby. How about the dentists, though? If a former proprietor of a tooth or two left with the "painless extractor" were to own a sending outfit, he'd likely shut himself in his room and confide to the 200 meters at his disposal a few reassuring remarks about "that D. D. S., with his C-W steel pliers." On the other hand, it would help some while the drill is making contact with a bare nerve to have a loud-speaker nearby rendering, "One Sweetly Solemn Thought." We advocate radio sets for all physicians and dentists. Even chiropractors would benefit, if "the daily dozen" were on the air.

* * *

Don't you think theatrical producers and managers of singers should make exceptions to their ruling against broadcasting by their stars? If one could listen to some of them and not see them, it might help a lot. A beautiful voice is frequently transmitted from a rather homely "set."

* * *

Here's a new one: Broadcasting of church services is not new, but have you heard of a church advertising free radio concerts? We have. The pastor of a small country-church organized a radio club among the boys with a girl's club about to organize. Well, everybody was invited to a free radio-concert given in the church—and they came! Might help some other churches to try this.

* * *

We are informed, on pretty good authority, that there'll be receiving sets installed in offices of some of the baseball managers this year. What's the use, after all, of lettin' the bleachers see just how you feel, when the "Pigmies" are swatting your "Cherubs" all over the diamond. Radio has a good many redeeming features.

* * *

Had a new "fan" stop us the other day to ask, "Which of the radio magazines do you consider the best?" He seemed to think there were a good many to choose from. We convinced him, however, that the magazine you

are now reading "brought in everything full and clear," and that he could "receive" every week. Of course, with the interest of RADIO WORLD at heart, we didn't advertise the fact that we have a line or two in it.

* * *

When Paul Godley has something to say, most of us listen in. This time he was speaking of radio's bearing on political parties. Seems like there are a few little issues between the camps now; but if, as Godley says, the time may come when the popularity of a political party will depend on the character of its broadcasting policy—! Well, all we can say is, there'll be quite some folks knowing what they are voting for.

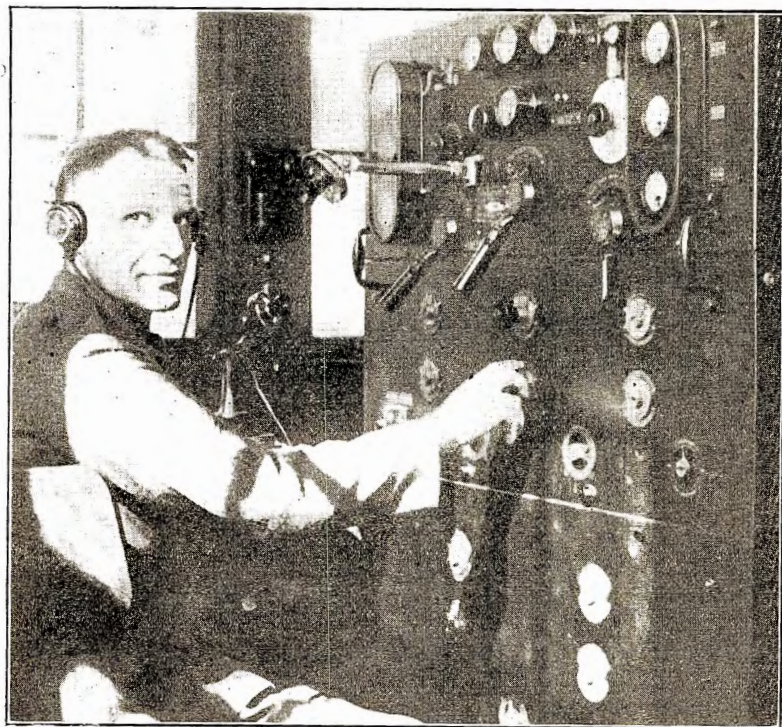
* * *

Haven't heard of any date set for the old-timers' feed—have you? If it does come off there sure will be some "interference" in the banqueting hall.

Resonance Is Essential to Good Tuning

AS stated, high frequency currents are seriously affected by resistance, more so by far than low frequency alternating currents such as are used in house lighting systems. If an inductance is placed in the circuit by itself the opposition of the coil to the radio-frequency currents is so great that the current flow through the receivers and detector would be too small for detection. This objection or opposition of the inductance coil is called reactance. Fortunately though, the reactance of inductances and condensers are of different kinds. They can be called positive and negative for ease of explanation. It follows then that if the inductance applies too great an opposition in the form of reactance, we can add some condenser capacity and gradually overcome it. By increasing the reactance of the condenser, we come to a point where the capacity and inductance are exactly opposite and equal. The high-frequency currents can then flow through the circuit with practically no opposition. When this point is reached, the circuit is in a state known as *resonance*. Resonance is essential for tuning.

The Mighty Transmitter at the Presidio, California



(c. International Newsreel)

One of the largest radio stations in the world is now in operation at The Presidio, the United States Army Reservation at San Francisco, California. This station has the power to transmit a message more than half the distance around the globe. The operating board is photographed in clear detail. A sergeant is in charge of the controls.

The Radio Primer

A. B. C. for the Beginner Who Must Have the Facts Put Plainly and Tersely, and all Terms Fully Explained

Revised Radio Dictionary

RADIO WORLD begins, with this number of THE PRIMER, a complete revised radio dictionary. Since the first issue, we have published a number of radio terms and their meanings; but many new ones have come into being and many amateurs have joined the ranks, so that if repetitions are made, they will be appreciated, we are certain, by these readers. With this new glossary, we will present the most complete list of words used in radio, with clear and explicit meanings—a list that will enable every reader to possess an up-to-the-minute compilation of all definitions that are necessary to a thorough knowledge of radio. This will be worth preserving. Begin with this number.

Aerial—Referring to a number of wires so arranged as to receive electrical waves.

Aerial (cage type)—An aerial consisting of three or more wires suspended between two hoops instead of the usual straight type of spreads. The cage has no particular electrical advantage.

Aerial (inverted L type)—An aerial made of one or several wires in the horizontal portion with the lead-in coming from the end.

Aerial (T type)—An aerial having one or more several wires in the horizontal portion, with the lead-in coming from the center of the flat top.

Antenna—Same as aerial. Heinrich Hertz, the discoverer of electric waves, originated this term.

Alternating Current (A. C.)—A current which changes its flow periodically. (Alternates.) An electrical current in which the direction of flow is constantly changing during a period of time. Thus when we speak of a 500-cycle alternating cur-

rent, we mean one that completely reverses its direction of flow 500 times per second. The alternating current plays an important part in many phases of radio.

Alternator—An electric generator for producing alternating current.

Ammeter—An instrument used for measuring the flow of electricity through a given circuit. An ammeter is connected in series with the flow of current. When large currents are handled, a heavy conductor is placed across the ammeter proper. This conductor is known as the shunt, and permits the handling of large currents.

Ampere—The unit of measurement of the strength of an electric current.

Amplifier—A vacuum tube which adds local energy to the incoming signal. This term is used in reference to either an amplifier tube or an amplifier receiving unit. It builds up or magnifies so as to speak the waves or sounds in a receiving set.

Amplitude—The highest point reached by a wave or oscillation. The crest of a wave.

Atmospherics—Often termed "static." Stray noises in space, electrical discharges in the ether, and, in reality, minute electrical-lightning storms. It is difficult to tune out these disturbances for they have no definite wave length.

Audibility—The measurement of the strength of the incoming signal.

Audio Frequencies—Frequencies corresponding to vibrations which are normally audible to the human ear. All frequencies below 10,000 cycles per second are termed audio frequencies.

Audion—An exhausted vacuum tube containing three elements namely filament, grid, and plate.

The Beginner's Catechism

By Edward Linwood

WHAT is the function of a single slide tuner in a receiver?

A single slide-tuner enables you to change to the wave lengths desired, depending upon the wave length desired in proportion to the amount of inductance and capacity used.

* * *

What is the function of a loose coupler in a receiver?

The object of a loose coupler is to provide a means of tuning the open and closed circuits, thereby transferring the energy from the aerial circuit to the detector circuit.

Into what number of types may receiving circuits be classified?

There are four types, namely: Plain, or simple receiver; Conductively coupled; Inductively coupled, and Capacitively coupled

* * *

What is meant by each type?

The simple receiver is simply employing a detector and head phones with the aerial and ground.

The conductively coupled set is that in which a tuner, or coil, of wire is employed such as a single slide or double slide tuner.

The inductively coupled set is one

that employs two coils, namely primary and secondary. They are also called magnetically coupled sets.

The capacitively coupled set is one that employs two condensers which are connected between the primary and secondary as in the drawing. This enables the adjustment of coupling by aid of condensers.

* * *

What happens if the coupling should be tightened when using a loose coupler?

The receiver then responds to a wider range of wave lengths, because it increases the damping of the receiver as a whole.

* * *

What is the advantage of having the coupling of a receiving set so that it can be varied?

It allows the receiver to be tuned sharply. This, in turn, would eliminate much of the interference experienced from the undesired stations, even though they may be working on practically the same wavelength. The different degree of damping from each transmitter is responsible for this.

Hints on Building an Antenna

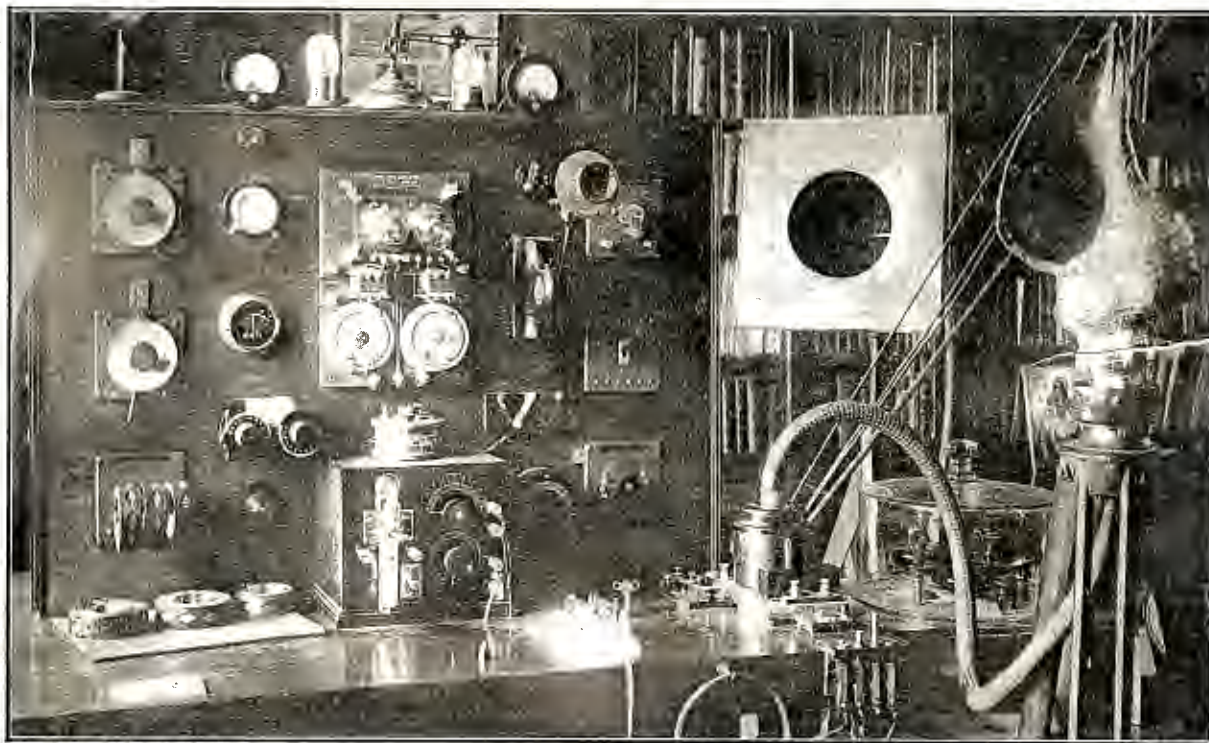
WHEN installing a receiving set for wireless telegraphy, or telephony, the following suggestions in regard to the antenna may be of value.

Care should be taken in selecting a site for the erection of the antenna. Avoid placing an antenna in such a position that its wires are parallel to lighting lines, high-tension power lines, or telephone lines. If there are any such wires near the contemplated site, be sure to erect your aerial so that its plane will be at right angles to, and so far as possible, from such wires. It is very important to observe these precautions if the best results are expected. The antenna may be erected between two trees, if available, or from the corner of a house or building. The best method, however, is to erect two masts and support the antenna between them.

The antenna may be erected at any height; and the higher the antenna the better the results. An antenna erected at a considerable height from the surrounding buildings is less liable to pick up static, which greatly interferes with the reception of radio signals.

There are numerous types of aerials for receiving purposes. The best, for the amateur, is either the straightway inverted L type, or the

Invention Enhances Quality of Music



(c. Ewing Galloway, N. Y.)

Horn devised by Rev. Frederick L. Odenbach to kill "tinny" effects in music.

REVEREND FREDERICK L. ODENBACH, director of the Observatory of St. Ignatius College, Cleveland, installed in that institution, the fine radio set shown in the accompanying photograph. The unusual part of it is the shell-shaped horn, his own invention. This horn, is an enemy of jazz.

"With this horn attached to a receiving set," Father Odenbach says, "jazz will eliminate itself, since every sound is brought out to the smallest detail. Jazz distilled in this way is found to be one-third dissonance, one-third bad tuning, and one-third the beating of drummers gone mad. Coming out of the shell, in full force, it

will drive a cat out of the room."

Here are his directions for making the horn: For the shell, a triton, or conch shell, is needed. The tip is sawed off to give an opening about an inch and a half. The aperture is wound out at the sawed point, up the winding cavity, until, at the smallest, it is about the size of a finger. Fit it on a block of wood in order to hold it solid, then attach a rubber hose and run the hose to a magnavox attached to the radio receiving set. A garden hose will do. The anatomy of the human ear gave Father Odenbach his basic idea for the horn.

For concert halls, Father Odenbach has perfected a pyramid horn of

thin wood, which is seen next to the shell horn. This horn is not quite so clear, as the shell horn, but it is a splendid magnifier. For the wood horn, he constructed a truncated pyramid, two inches square. All four sides are thin, shellacked wood; the opposite sides are of pine and two of maple. Connect the opposite sides by thin slivers of wood fitted into the interior. Over the mouth is fitted a thin sheet of wood with a round hole, six inches in diameter; slabs such as are used behind pictures in frames are best for this purpose. A rubber hose is run from the small end to a magnavox. The vibration of the wood acts as a sounding board

(Continued from preceding page)
T type. These aerials receive their name from the method of connection of the lead-in wire. In the inverted L type, the lead-in wire is taken from the end of aerial. In the T type, the lead-in wire is taken from the center of aerial.

The aerial may consist of a number of wires. While a one-wire aerial will give excellent results for receiving purposes only, an aerial consisting of two or four wires has greater capacity and is to be preferred. If it is

desired to receive from short wavelength stations, I suggest that aerial be not more than 100 feet in length. Another important feature in connection with the antenna is the lightning ground-connection. All antenna should be "grounded" when not in use. An antenna properly grounded acts as protection against lightning in the same manner as lightning rods neutralizing static charges in its vicinity. A good ground connection may be made to a water pipe or if such is not available to a rod or pipe driven

into the earth in a damp spot. A single pole, double throw-switch of large capacity should be placed in circuit between the aerial lead and the ground connection, No. 4 stranded rubber-covered wire being used for connection from the ground switch to the ground connection.

A ground connection must also be provided for the instrument. This may be made on a water pipe, a radiator, or any metal which is a good conductor of electricity and which is also connected to the earth.

He Preaches from the Skies



(U. Underwood & Underwood)

Lieutenant Belvin W. Maynard, U. S. A., the noted flying parson who preaches occasionally a sermon by radio while up in his airplane. This illustration shows a huge Fokker plane equipped with an installation comprising a General Electric Company's 100-watt tube transmitting set, by which his sermons are sent out by radio. The receiver used was made by E. W. Dannals, a well-known Navy radio expert. On one flight to Albany, communication was intercepted and sent to the flying field at Mineola, L. I. Mr. Maynard said that WJZ was heard plainly at Troy at a height of 1,000 feet. The photograph also shows Bernard Ferguson (left) baritone singer, who sang from the plane, Mr. Maynard (center) and his assistant W. H. Sobey alongside.

Gridless Tubes

SOME vacuum tubes work best without a grid condenser and leak. To a certain extent, this depends on the "characteristics of the tube." This is a phase that seems hard to understand, but, really, it is not. It has to do with the actions of the tube when the current and voltage on plate, grid, and filament are altered. Some tubes must have a certain quantity of voltage and current on the principal elements before they will act as detectors. Sometimes the grid should be positive; sometimes negative. The use of a grid condenser is dependent on these variables.

A good many tubes will work equally as well with or without a grid leak. This is due to a point of the negative charges of the grid whether they glide off through a 35-cent grid leak especially made and designed, or through an attractive path in the tube itself. If the insulation around the base of the tube is none too good, the charges will trace their way in that manner. Sometimes the grid condenser is mounted on a poor insulator, thus providing, without special arrangements, a good grid leak.

Tests of Inductance Coils

By Fred. Chas. Ehlert

COILS of wire are wound in many different ways, but all constitute what is known as an "inductance coil." The study of such coils has been made in circuits carrying direct currents, or alternating currents, of low frequency such as 60 cycle. At such low frequencies, the same number of amperes flow in every part of the wire constituting the inductance coil, and the distribution of the current over a given cross-section is practically uniform. At high frequencies, the current density is not uniform over a given cross-sections of a wire, nor is it the same for different cross-sections of the wires.

The current flow is modified by induction effects of magnetic as well as electro-static nature. For direct current, the resistance coils can be determined by Ohm's law; but, at radio frequencies, Ohm's law by no means gives complete information regarding the resistance of a coil. The study of the non-uniformity of current density in a particular cross-section is known

as "skin effect," and considerable work has been done on this subject. The difference in the current flowing across different cross-sections of the wire forming a coil are caused by the capacities distributed along the winding of the coil.

An inductance coil behaves in an electric circuit primarily as an inductance. The potentials of the different parts of the coils are, however, different from each other and from the potentials of the ground. For this reason the coil behaves also to a certain extent as an electric condenser or rather a system of condensers. The impedance of these capacity paths is low at radio frequencies, and the capacities constitute shunt paths for the radio-frequency current and cause charges to collect at various points of the coil thus creating back electromotive forces. There are several effects of the non-uniform distribution of current along the wire, or which the most important is the increase in the resistance of the coil with the frequency. At radio frequencies, the re-

sistance of an inductance coil depends on the point of the coil at which an electro-motive force is inserted and the current measured.

On account of the importance of inductance coils in radio communication, careful study, both theoretical and experimental, has been made at the Bureau of Standards, Washington, D. C., on capacity effects and other effects in inductance coils at radio frequencies.

If an inductance coil is connected in series with a condenser, it is found that the true capacity of the whole circuit, as computed from the observed resonance frequency and the known inductance, is not the same as the capacity of the condenser alone. The difference largely is due to the distributed capacity of the inductance coil. A general discussion of the effects of the distributed capacity of inductance coils may be found in a leaflet by Mr. Breit, Bureau of Standards, Washington, D. C.

Every amateur should study this subject thoroughly.

Short Waves from a Simple Circuit

By Stanley Bryant

OUT in the country, where the air is free and space is not at a premium, the amateur is not limited to his aerial. It comes, for him, merely a question of how good an antenna he can afford. It is never a question as to how he can arrange for any aerial at all. But conditions are different with the city amateur. If he started late in the game, he notes with dismay that the top of his apartment-house roof already sports from two to ten aerials. There's not a chance for one of his own. At least, that is the way it seems to him.

And he thinks it over, and finally comes to the first knotty problem: "Why can't I fix it up so that Bill," the youngster on the floor beneath him, "and I use the same aerial." He puts the question to other radio fans. With one accord they say that it cannot be done. They can't tell him why, but they know it is so. And they are quite correct, but—

A few days later, the radio department of a daily paper publishes a communication from a capable experimenter, giving the surprising results of his own tests with two receiving outfits hooked onto the same single-wire antenna. With both sides of the prob-

lem before us, the subject is well worth looking into.

Here are the facts: Two receiving sets of the vacuum-tube type, each having the same general characteristics, can be attached to the same aerial with very good results; but to secure any results at all, it is necessary that the two sets be in a position where they may be tuned simultaneously. For, as one set is tuned to the aerial circuit, the second set would be detuned. It becomes, then, a question of juggling the adjustments of both sets until a point is reached in each where the reaction between them is of a certain ratio to be determined only by trial.

It is not possible for two amateurs living at opposite ends of a single wire aerial to hook onto their respective ends and get satisfactory results. If their time of operation could be dovetailed so that neither was "on the air" when the other was, then the situation would be but little different from the ordinary layout. The fact that each set was grounded would not, in itself, prevent successful operation. The longer the aerial the less effect the ground at the far end would have. But if this factor seriously

affected the reception of broadcasts, it would be a simple matter to arrange so that each station would be insulated from the ground by a vacuum gap while not in operation.

* * *

Condensers—the Handy Andy Radio Device

WIRELESS hounds who hark back to the early days when QRM was merely three letters of the alphabet, and a license something for dogs and married people, had little use for the quiet unassuming condenser found so frequently in present-day radio outfits. If the station owner was a plutocrat, he had a variable condenser of 23 plates; but, more often than not, the five or six dollar set was too great an obstacle. He would have preferred a "variable;" but inasmuch as his set seemed to work without it, why worry.

But notice the situation now. There's the variable in the ground lead of the tuning inductance! There's another across the secondary of the same inductance! It's quite the thing in some circuits, to have a variable across the telephones and the B battery to by-pass the Armstrong currents, if such a term may be used.

In truth, there is more money tied up in variable condensers to-day than our old wireless sets cost complete.

But they are worth it, every one of them. An outfit with a correctly proportioned variable-condenser rightly placed is a thing of joy to manipulate. What with C. W., and its hair-line tuning ruling the waves, one or more variables are absolutely essential.

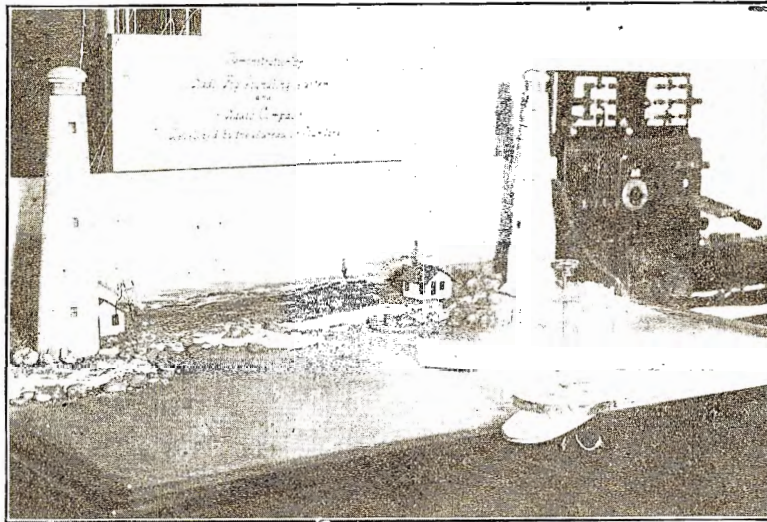
* * *

Code—the By-Product of Your Interest in Radio.

WHEN the fine edge of your interest in broadcast music, speeches, and canned songs commences to wear off, don't come to a hasty conclusion that "there's not much in this radio stuff." Give a thought to code.

There is something fascinating about the Code. It is an accomplishment to learn it. It is a further accomplishment to be able to take down some of these "fists" that are shoving messages on the night air with a motion as smooth as a baby's face. Perhaps you won't be interested in the message. That isn't the point. But the message represents an actual two-way conversation between two enthusiastic amateurs, miles apart. Their sparks—or waves—are attractive.

Radio Models at Bureau of Standards



(c. Underwood & Underwood)

Everyone interested in radio has heard of the Bureau of Standards at Washington, D. C. This department experiments with and designs the finest radio equipment, as the Navy and Army must have the latest and most modern devices. The accompanying photograph shows two models of a radio fog-signaling system and radio compass. Note the two lighthouses equipped with transmitters with the radio station at the base of each tower. These radio-compass stations send out signals during heavy fog in order that incoming vessels may pick up these signals and get their true bearings.

Radiograms

PRESIDENT HARDING'S MEMORIAL DAY ADDRESS, delivered at the dedication of the Lincoln Memorial, Washington, D. C., May 30, was heard by more persons than any address ever made by a President of the United States. It was broadcast by wire from the massive memorial erected in honor of The Great Emancipator, to the government station at Arlington, and then given to the Hertzian waves on a length of 2,650 meters.

RADIO LOCATED TWO YOUNG BUFFALO RUNAWAYS several weeks ago, it is learned. The lads, aged fourteen years, left their homes ostensibly to go to school. When they failed to return at night, their mothers telephoned the Federal Telephone and Telegraph Company, and a complete description of the boys was broadcast from WGR, the radio station of that company. The message was picked up at a station west of Erie. The next day, the man who caught the message, while motoring, saw two boys who answered the descriptions of the runaways. They admitted they were the missing boys—and were returned to their anxious parents.

THE GOVERNMENT'S EDICT AGAINST POLITICAL BROADCASTING HAS MET WITH OPPOSITION. The American Radio Association, through F. W. Brown, its executive officer, protests the discontinuance of the politician's privilege to send his views over the ether waves. Secretary Hoover will be asked to permit the use of government stations by political candidates, notwithstanding the orders of Theodore Roosevelt, jr., acting secretary of the Navy.

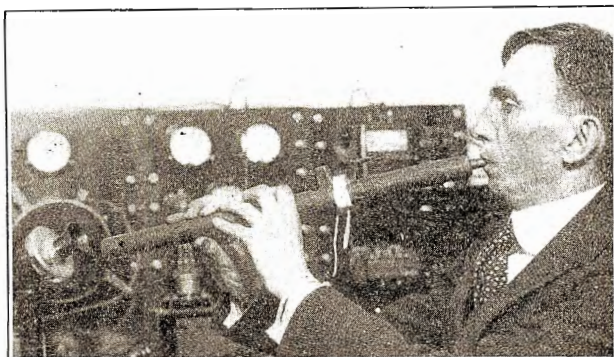
WITH A RADIO SET IN OPERATION, A PASSENGER TRAIN RAN THE HUNDRED MILES FROM OKLAHOMA CITY TO LAWTON, OKLA. The train was a passenger express of the Frisco Lines. The run established a record as the longest continuous communication, without interruption, ever held by a fast-moving train.

AN APPROPRIATION OF \$68,000 HAS BEEN ASKED BY THE CITY OF CHICAGO to purchase a further supply of radio apparatus for its police department. Chicago claims to be the first city to apply radio to police purposes, and it has found this crime-detecting utility a great success.

THE PACIFIC COAST STATES CLAIM 25,000 OWNERS OF RECEIVING SETS. Some estimate the number at 50,000. What the country will soon need is a radio census taker. "Some of our lads," says a Far Western enthusiast, "are picking up messages from Japan." This should make any easterner tune up.

AMERICA IS SPENDING ABOUT \$6,000,000 a week for radio instruments. Conservative estimates also show that the radio manufacturers have a total of over \$60,000,000 worth of

Indians Hear Songs by Radio



(c. Wide World Photos)

Charles Wakefield Cadman, the eminent composer, playing an Indian love song on a native flageolet (the Indian saxophone), a finely tempered wood-instrument, at a broadcasting station in Los Angeles, California. The music was heard in a number of Indian reservations where receiving sets had been installed.

orders booked ahead. Next year this country will be spending \$10,000,000 a week for radio sets, but the manufacturers will be abreast of the demand with their deliveries.

WARNINGS SENT TO MOONSHINERS BY RADIO have foiled a number of raids on illicit stills in the mountain districts of the South, prohibition officials declare.

A GREETING BY WIRELESS TO PRINCESS JULIANA, OF HOLLAND, FROM 5,000 PATERSON, N. J., SCHOOL CHILDREN, of Dutch parentage, was sent recently by Mayor Van Noort of that city.

RADIO ENHANCED A BUSINESS MEETING when the Yorkville Chamber of Commerce, New York City, featured the news and music that comes through the air at its quarterly session.

CHICAGO TAXI-CABS ARE TO BE SIGNALLED BY RADIO. Patrons hope, thereby, to get better and quicker service. The scheme is to use the radiophone at the central office of a large company where calls are heaviest. The company has installed a transmitter in its garage, and receivers on the stands and cabs, to notify drivers where they shall report for their fares.

A SAFETY-FIRST MESSAGE TO LOOK OUT FOR RAILROAD CROSSINGS was broadcast last week. It was sponsored by the American Railway Association in connection with the national "careful crossing campaign which will be kept up until September 1.

LOUIS FALTONI, OF ROSWELL, N. M., has been awarded the silver loving cup donated by Herbert R. Hoover, secretary of commerce, to the wireless operator who constructed and operated the most efficient amateur station in the United States, in 1921. Mr. Faltoni's station, in New Mexico, has been heard in every State except Maine and the Territory of Hawaii.

HIGH-POWER WIRELESS STATIONS AT BOGOTA BAY, COLOMBIA, AND CUBA will be completed, this year, by the Radio Corporation of America. The great Buenos Aires station will be in operation in the summer of 1923.

FRANCE HAS THE MOST POWERFUL RADIO STATION IN THE WORLD in the American-built Lafayette towers near Bordeaux; but this will be superseded, at the end of this year, by the Port Jefferson station, Long Island, N. Y., of the Radio Corporation of America, which then will be the most powerful station in the world. The station under construction at Saint Assise, near Paris, will be second.

THE BRITISH WIRELESS CHAIN CONNECTING ENGLAND WITH THE EMPIRE will have one station comparatively close to Argentina—the station at Bathurst, Cambia, on the extreme western point of Africa, where the continents of Africa and South America make their closest approach.

HOLLAND IS BUILDING one station at home and one in Java in order to communicate a distance of 6,100 miles, almost entirely overland.

"WILL RADIO REPLACE THE CABLE IN TRANS-OCEANIC COMMUNICATION?" was a question put to L. W. Austin, head of the United States Radio Research Laboratory. "Frankly do not believe it will," said Mr. Austin. "If it should, it will be because atmospheric disturbances have been practically eliminated. But, even now, there are certain classes of traffic which can be sent by radio much more economically and quite as satisfactorily where delays of a few hours are not objectionable."

A CHIME OF SIXTEEN BELLS WAS HEARD 800 MILES AWAY. The chiming took place in Watervleit, N. Y., and was picked up in Athens, Ga. The bells were mounted on pine supports and their music was carried by wire to the General Electric Company's broadcasting station at Schenectady, N. Y. (WGY), at which place it was put on the air. Despite the fact that the bells were "played" inside a foundry, their music was heard clearly in many places. The largest of the bells, the "tenor" weighs 4,800 pounds; the smallest, 225 pounds.

PLAINFIELD, N. J., IS THE FIRST MUNICIPALITY in that State to get permission to operate a limited broadcasting station for police and other civic purposes.

PLANS FOR DIRECT RADIO BETWEEN AUSTRALIA AND GREAT BRITAIN have been announced. They provide for a giant station that will transmit 12,000 miles.

Radio and the Woman *By Crystal D. Tector*

WOMEN dislike newspapers and other publications to publish only alleged funny stories in order to represent the feminine interest in radio. Most of the women interested in the new marvel, who have talked with me, claim that they are mighty serious. They object to being made the butt for jokesmiths.

Most any big department store will tell you, if you ask at the radio sales-department, that at least half the inquiries for sets and parts are made by women, and that their knowledge of the science is equal to that of the men.

The Hawaiian songs broadcast on Saturday by WWZ, (Wanamaker's) came over the ether clear and distinct. Miss Edith MacDowell, a soprano, played the ukelele; Miss Grace MacDowell, contralto, added to the accompaniment on a guitar.

I stood in a radio shop on Amsterdam Avenue, New York, one evening, last week, and heard a wonderful violin solo, by Fritz Kreisler, come through. I noticed four enraptured young women near me. It certainly was a fine bit of broadcasting. "I could almost imagine that Kreisler, himself, was playing in the room here," said one of the young women.

Miss Maude Fealy, the actress, recited the Shakespearean philosophization, "The Quality of Mercy," into the transmitter at WJZ, Newark, last Monday. On Saturday, Miss Susanna Crocroft sent over the waves, from the same station, "Woman's Place in the Health of the Nation."

A woman subscriber writes—and I am always pleased to receive letters pertaining to radio from RADIO WORLD's feminine readers: "For keeping the men folks at home, radio beats anything I know of. I have asked my husband and my sons, repeatedly, if they imagine they will ever tire of it. Their answer is that it produces too many surprises."

"It does not make any difference, in reference to the wave length, whether the series condenser is placed in the ground lead or in the antenna lead." Another woman reader thus answered a neighbor, also a woman, who asked her how the variable condenser should be placed in series with the primary inductance, in order to receive short wave-length stations on a long antenna. She wants RADIO WORLD to tell her if her answer is correct. It is.

Every week-day afternoon, in a smart tea room on Fifth Avenue, the radiophone sends forth its program while the fair patrons sip tea and chatter. Recently, in the buffet car of a passenger train, a dozen women passengers and one man surrounded the radio receiving-set.

Mrs. J. George Fredericks, noted radio expert, recently broadcast a most interesting talk on wireless.

Miss Jessie E. Koewing, only woman announcer of broadcasting programs, and stationed at L. Bamberger & Company's store (WOR), Newark, N. J., says that it was through her ability to play the violin that she secured her present position. Called on to broadcast her music, Miss Koewing became so absorbed in the marvelous possibilities for positions for women in radio, that she determined to enter this great field in a more useful capacity than that of performing for her unseen audience. Evidently officials

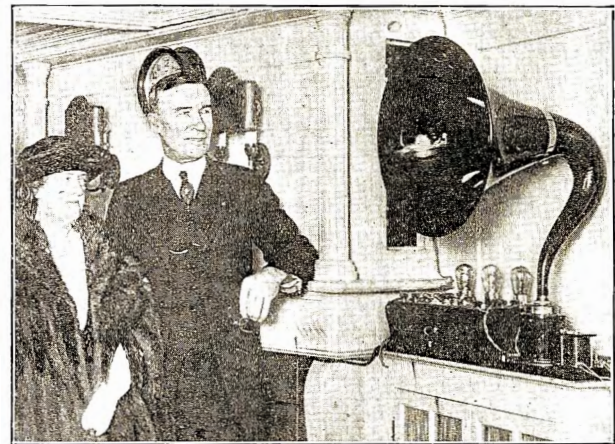
of Newark's big department store strengthened this decision, when, on ascertaining that her voice was the sort that broadcast splendidly, they suggested she work for them. Miss Koewing intends to devote all her future efforts to radio. At present she is working hard on code. She asks why, when her work brings her into touch with great artists whom she has wanted to know, and who she might not meet otherwise—should she be interested in anything else?

A friend who has just returned from Europe, says that travelers display more genuine interest in the carefully restricted radio rooms on ocean liners, than in any other part of the ship.

Will women figure in the radio trade? Perhaps not. At any rate, it is interesting to note that a society woman in Boston has become interested in a new radio manufacturing concern. She insists that it is no more difficult for her to attend to business than it is to take care of her social responsibilities, and she enters the radio field feeling that there is a great chance for her to show the world at large that no science or business is too complex for the feminine ambition.

There is one thing that radio is doing for the attractive young women of the stage—it is opening up another avenue of escape for photographic and other publicity. And, oh! how the young things are taking advantage of this great opportunity.

A Mayor on His Vacation



(c. Keystone View Co.)

Mayor Cryer, of Los Angeles, California, aboard the steamer "Yale," on a vacation trip, kept in touch with his office by the ship's radio. The photograph shows the Mayor and Mrs. Cryer.

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.

MILWAUKEE RADIO SHOW.—
Lester Building, Chicago, June 25 to July 1.
FIRST CENTRAL WEST RADIO SHOW.—
Auditorium, Milwaukee, Wis. Week of June 21.
SPRINGFIELD RADIO EXPOSITION, Springfield, Mass. Under auspices of Springfield, Mass., "Daily Union." June 19, 20, 21, J. P. O'Connor, managing director.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 14 to 22. U. J. Hermann, managing director, 549 McCormick Building.

KANSAS RADIO EXPOSITION will be held at the Kansas State Fair, Hutchinson, Kansas, September 16 to 22 inc. A. L. Sponaler, Secretary.

FIRST INTERNATIONAL RADIO EXPOSITION, Grand Central Palace, New York City, George Brokaw Compton, Secretary. Date not set.

An Explanation

THERE appeared in RADIO WORLD, dated May 13, 1922, an illustrated article entitled "My Practical V-T Detector and Two-Stage Amplifier," appearing under the signature of Frederick J. Rumford. The editor of "Radio News" informs the editor of RADIO WORLD that a similar illustrated article appeared in his publication under date of September, 1921. Inquiry made by RADIO WORLD of Mr. Rumford discloses the fact that Mr. Rumford's secretary mailed RADIO WORLD the wrong article, which was published by us in good faith. We thank Mr. H. Gernsback for calling our attention to this error, which we regret having made.—Editor, RADIO WORLD.

THE Bureau of Standards has issued a statement to radio receivers, generally, explaining how static, strays, or atmospheric, may be reduced. Don't be surprised if your new receiving set gives forth a first-class imitation of a boiler shop in full operation instead of an anticipated lecture on the culture of silk worms. A great deal of work has been done by radio

engineers and scientists in efforts to reduce the interfering noises caused by these strays. At important government and commercial stations certain devices and methods are in use by means of which strays are considerably reduced and it is possible to obtain fairly reliable reception during the intense heat of the summer season.

Latest Wonders of Radio as Appli



(Left) This is what a you plish when his own ra Leppert, jr. cian and h building r years ago, seriously Batteries, speaker an and stand enthusiast pert reside where he l

(c. Ew



(Left) For some time, O. D. Orvis, radio operator at Bamberger's Department Store, Newark, N. J., had trouble with his receiving set—and, what worried him most, it always came during the luncheon hour. The photographer discovered, and indelibly recorded, the cause of the trouble. Miss Josephine Garvin, ably supported by Miss Ruth Mott and Miss Bertha Bitzer, located the lead-in switch—and no wonder Mr. Orvis couldn't listen in!

(c. Kadel & Herbert, News Service)



(Right) The out-o'-doors enthusiast is a busy "bug" these sunny days. No vacation will be complete without radio. Walter and J. V. Candide, of Flatbush, N. Y., are experimenting with a receiving set, the aerials of which they are attaching to trees. They are planning a camping trip this summer, and will make several important experiments before starting. Both are known as inventors of valuable radio parts.

(c. P. & A. Photos)



(Right) Joseph D. R. Freed, the twenty-two-year-old president of the Freed - Eisemann Radio Corporation, N. Y., whose business associates call the "Henry Ford of radio," because of his inventiveness.

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



(Left) Radio World has never let slip by an opportunity to tell how strong a link binds radio to motoring. The photograph shows the Misses C. Therine Stevens and Mary Williams of Boston, enlivening their idle moments in a car fitted with radio.

(c. International News Reel)

(Right) The high-tension the police boat, "John" one of the powerfully eq operated in New York New York City. This fi of the most up-to-date o the world. Radio was a a means of entertainme means of service, several and the result has been fying.

(c. Kadel & Herbert News

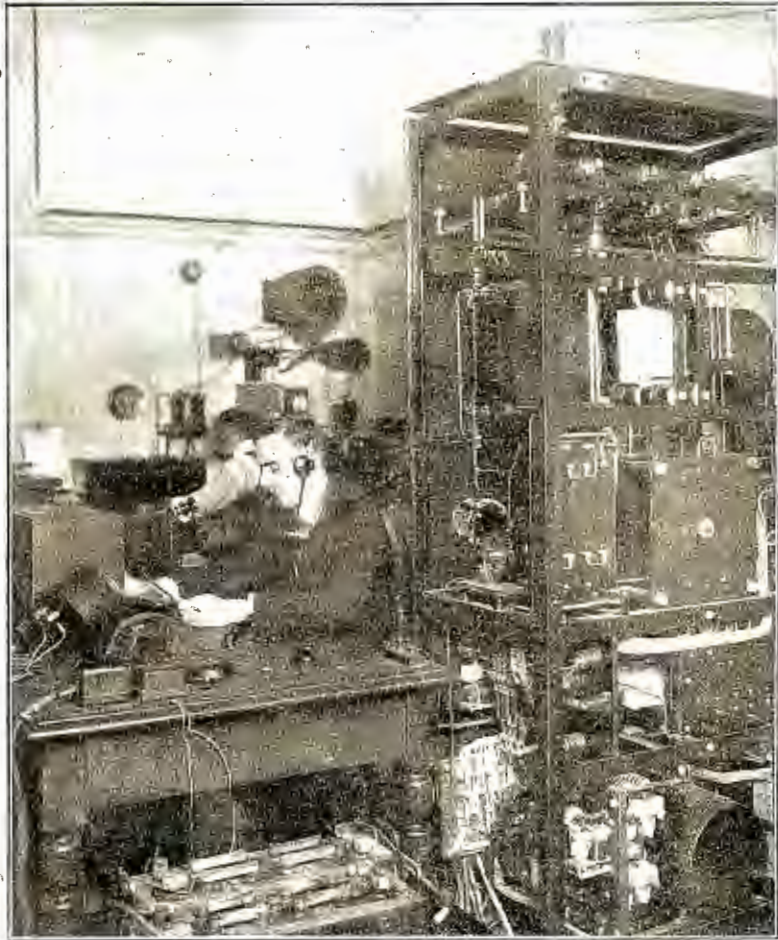
ed to Pleasure and Pragmatic Uses

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Galloway, N. Y.)

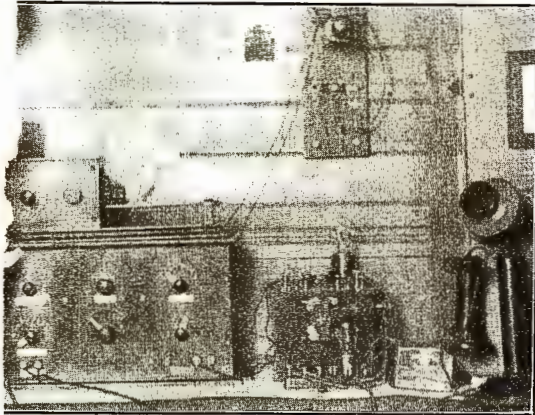
(Right) This is a photograph of the radio room of the United States Post Office Department, at Washington, D. C. from which market and weather reports, and, also, information of value to miner, rancher, orchardist, and lumberman is disseminated by far-reaching ether waves. This outfit, like all others used by the government, is of the most perfect make—for Uncle Sam finds radio his most useful messenger. For instance: every night, at 11:00, the weather report is broadcast. The time tick goes at 10 p. m.

(c. Harris & Ewing, Washington, D. C.)



(Below) You may imagine that Mr. J. G. Daly, in the photograph, is telling the conductor of the Fifth Avenue bus, New York, on the upper deck of which he is taking an outing with Miss Katherine Mulcahy, to "keep the change;" but this is not so. He simply does not want to be interrupted until the broadcasting they are hearing through their radio set, connecting with the bus, is over.

(c. Kael & Herbert News Service)



(Above) Albert T. Darling, manager of B. F. Keith's Royal Theatre, The Bronx, New York City, in his radio-equipped office. Mr. Darling is "long," as they say in Wall Street, on business improvements. He realized that radio would help him and he had a set installed. Orders for seats are received and with a correctness and dispatch that, it is expected, will make radio a necessity in every well-managed theatre, in the future.



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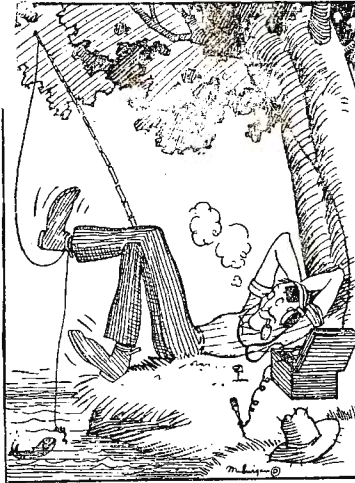


Service)

Broadcast Bill's Radiolays

(Copyright, 1922, Westinghouse Electric & Manufacturing Co.)

The other day Abe yelled at me, "Go get yer hook an' line; let's go down on the Kickapoo, the fish are bitin' fine." I sez, "All right, I'll be there just as soon as I can get my fishin' tackle ready and my good receivin' set." Then Abe said, "What the dickens be ye goin' to do with that?" I sez, "Don't get excited er start talkin' through yer hat, yer goin' ter see some fishin' 'a la mode' right up ter date; cause things bin movin' mighty fast on this here farm of late" Abe ast me heaps of questions, but sez I, "You wait an' see the newest type of fishin' underneath some shady tree." I strung a wire between two trees while Abe was diggin' bait, connected up an' tuned her in—I didn't hafta wait; fer soon's I got those earmuffs on, I heard a band a playin' an' then a feller sang a song like our ole mule a brayin'. Abe said he wasn't intersted an' started up the crick; I said I guessed I'd stay here where the grass was nice an' thick. So, I stretched out there in the shade prepared to fish or lissen, an' anglin' after fish er news there wa'n't no chance a missin' either one; first come, first served—I couldn't ask fer more, a little speckled



"The newest type of fishin' "

shiner or the latest baseball score. The first thing on my program was a song sung by some gal; then I pulled in a croppie to

the tune of "You're My Pal." It wuzn't long till Abe come back an' set down side o' me, "Say, let me have them phones a while, you go an' fish," sez he. Now Abe's a friend a mine, an' so I had to let him take the earmuffs for a while an' lissen, just fer friendship's sake, I let him lissen quite a bit—it musta bin two pieces—an' then I sez, "Give me them phones er else our friendship ceases." Well, after arguin' a spell we said we'd arbitrate, for durin' th' discussion, Abe had upset the bait; an' so we took a phone apiece; we didn't fish no more, an' Abe an' me is friends again, same as we wuz before."

When on Your Vacation

If you contemplate going away for the summer months, don't forget the various things that have to be done before locking up the house. If an outdoor aerial is erected, make sure of proper grounding. See that the grounding switch, has not corroded at the terminals, possibly preventing proper electrical connections. This is of importance to all who are closing their homes for the summer.

If it is too much of a job, the proper thing to do would be to take down the aerial, roll up nicely, avoiding kinks and breaks, and stow away.

Answers to Readers

ARE the ordinary dry cells connected in series of say, four, eight or twelve, as effective in a regenerative receiver as a storage battery? I have read a few articles regarding dry cells but have not been able to get any satisfactory information.—C. E. S.

Connecting dry cells in series will not increase the life of a dry cell, but simply add to the voltage. However, for expert information concerning filament lighting, purchase a good radio storage-battery of some well-known make. It will repay you for dry cells, fourfold. Read the article on storage batteries, by George W. May, in your copy of RADIO WORLD No. 6, dated May 6.

* * *

Could you give me the best type of aerial I could use, by examining the enclosed illustration?—Charles H. Yaeger, Rocky Hill, Conn.

According to your illustration, use your antenna as a "T" aerial running it east and west.

* * *

How many steps of amplification do I need to receive WJZ? I am 250 miles away and wish to use a loud speaker. Can I receive Arlington on the hook-up herewith?—John B. Hough, Warrenton, Virginia.

Your first question is hard to answer. However, if a good reliable regenerative set is purchased, including a two-step amplifier, some good results may be obtained for the distance you mention, with a loud speaker. Probably a good amplifying loud-speaker, such as the Western Electric makes, with three more steps would give you service. Bear in mind, you will then have five steps and a detector. Regarding your second query, it is impossible to hear NAA, (Arlington) with that set. You will have to get a winding on the coupler that will enable you to get up to his wave of 2,500 meters.

Owing to the large numbers of questions received from readers it is impossible to answer all in this number. Your replies will appear in the next or future numbers of Radio World.

Is the Keystone Lightning Protector approved by the fire underwriters? Is an arrester as good as a lightning switch? Would a phonotron be all right to use as an amplifier, such as the King Amplitone, with a detector and one-step amplifier, using a Murdock phone?—Frank H. Dargue, Kittanning Pa.

Your first question will have to be taken up with the National Board of Fire Underwriters, 76 William St., New York, N. Y.

Arresters sometimes fail; but once the aerial is grounded the lightning is killed.

The phonotron is a device regarding which we can give you no information further than that published in RADIO WORLD. Lieutenant Paddock, U. S. A., Fort Wood Radio Station, N. Y., is the only person we know who could enlighten you. Fort Wood, we believe, is the only station equipped with phonotrons. This instrument is controlled entirely by the United States Navy Department.

I have a crystal set consisting of a single-slide tuner, De Forest type, with a pair of 2,000-ohm phones, 3 wire, 30 feet long, 35 feet high. My aerial runs straight with telephone wires, being about two inches away. Will this interfere with my set. I have heard a human voice but once, but not loud enough to be understood. What can I do to hear distinctly and eliminate interference?—"Wireless Bug."

Answering your first query; try and see if you can run your aerial in one stretch, about 100 feet. One wire aerial is far better than any 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 feed; and, if possible, keep it clear from it as much as possible. The further you get away from the telephone wire, the better it will be for strength of signals. Don't place your ground wire on the same ground near by the telephone company. Seek a new ground. With all this in view, signals should respond, provided you have a good sensitive crystal.

Can I use a loud-speaker horn, with one vacuum tube on an inside aerial? The tube used is a UV 200?—Jack Polkinhorn, Washington, D C

This is NOT possible with an indoor aerial; but with the aid of a two-stage amplifier and a good power-amplifying loud-speaker, signals using loops are sure to be heard

* * *

How far can I receive with a De Forest receiver type D. L., 800 with two-stage amplifier? What length should my antenna be and in what direction should it run, to get best results?

Will another stage of amplification enable me to receive further?

Which should I use, 2,000-ohm or 3,000-ohm receivers?

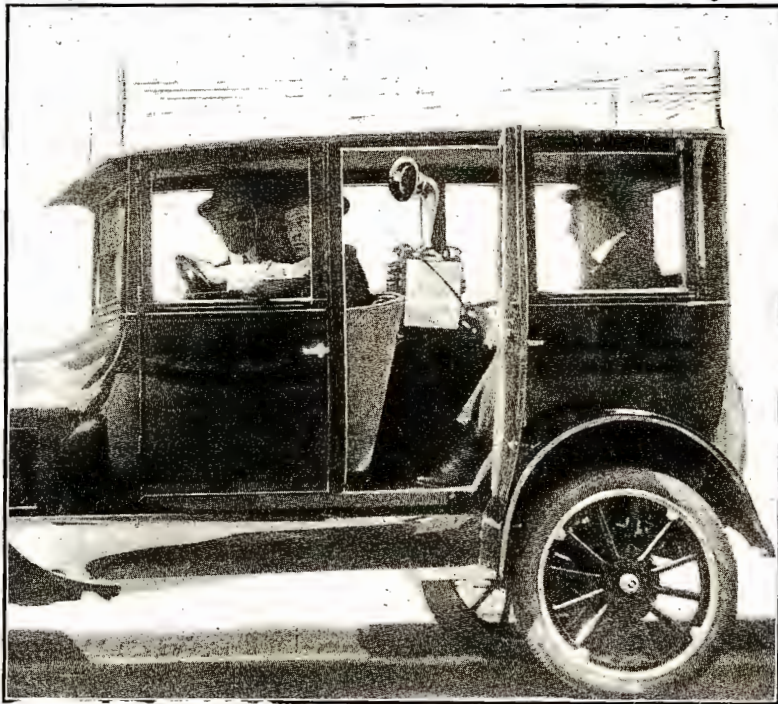
* * *

Would using two or more sets of receivers have any bad effects on my machine?—J. N. Lignon, St. Louis.

Your first question is too broad to answer; but with a good antenna erected, very good results should be obtained. Your antenna for receiving purposes only, should be one straight wire about 100 to 150 feet long. The direction will be where the lead-in was taken off.

One more step of amplification will increase amplification; but it is difficult to say if it will increase the range. You can use the 2,000-ohm or the 3,000-ohm. Remember only one set can be actually in operation at one time.

Radio Now Joined to Motoring



(Photograph from World Wide Photos)

One of the latest developments in the radio industry is the radio motor-car. Experiments have proved that radio equipment operates satisfactorily in most cars made to-day. One well-known manufacturer of automobiles is applying this method by installing radio equipment in his car. An aerial is erected on the roof, or hood, of the car in such a manner that the appearance does not look junky, yet, after the aerial is up, the set is placed in the car, the ground connection being made to the metal frame. Then everything is ready for reception. Following this method, anyone may install a radio set in his car, and, while journeying along the road, may keep in touch with the nearest broadcasting stations. With a car equipped in this fashion, it is possible to journey within a radius of twenty-five miles of a station and pick up messages.

THERE are several ways that the motorist can equip his car to receive the various interesting programs which are being broadcast daily, is the belief of H. Clifford Brokaw, technical director of the West Side Y. M. C. A., Automobile Schools, in an article in the New York "Tribune." He can suspend an antenna aerial above the top of his car from a projection in the rear to one in the front. This can be connected with a receiving set in the back seat of the car. From this receiving set he can hook his ground wire directly to the frame of the car. In this way he can receive messages while the car is in motion.

Or, he can use what is known as a loop or coil antenna. This consists of a boxlike frame on which is wound turns of wire. It should be made so that it can rotate around an axis. The wires should lie in the same vertical plane. This antenna can be placed in the end of the car over the back of the rear seat. The antenna on an automobile is somewhat like the fifth wheel on a coach. The fifth wheel on a wagon is a semi-circular piece which has another piece resting on it that acts as a bearing to facilitate the turning of the front axle when steering the vehicle. It is a so-called wheel placed in a horizontal position which keeps the body from turning exactly with the front wheels. The fifth wheel of an auto might be called the loop-antenna, which is placed in the rear of a car to facilitate the receiving of broadcast programs for the enjoyment of the passengers out on a motor tour.

The most practical use of the radio in connection with motoring, however, is not while the car is in motion. This is especially true of some cars which are noted for their rattling capacity. The electrical equipment of a car in action might also interfere with the clearness with which messages could be received.

The ideal use of the radio as an asset to the motorist comes when he arrives at a point of destination for his week-end trip.

So he gets out his radio outfit. For an antenna he takes a wire about 100 feet long, attaches a string to one end of it and to the end of the string a stone. He throws the string over a branch of a tree about thirty feet high, so that the string, and not the wire, has the contact with the tree and the stone acts as a weight to keep the string from slipping off the branch. Then he stretches this wire for about seventy-five feet in the air, attaches it to his receiving set, takes another 100-foot wire which he strings along the field and attaches this as a ground wire to his receiving set.

Now the motorist is ready to listen in.

For a receiving apparatus the motorist can use a crystal set which doesn't require any current to operate. Such a set will ordinarily pick up messages a score of miles away. If, however, he desires to work on a larger radius, he will want to use a vacuum-tube set. This will require a special bank of dry cells and a storage battery. For a storage battery he can tap onto the one that is apt to be in his automobile.

MAGNAVOX Radio



WIRELESS TELEPHONY

Yesterday a scientific marvel, to-day the most thrilling interest and enjoyment with-in reach of the average American home.

In the air, day and night, superb concert and dance music, important addresses, hilarious vaudeville, world weather reports; also correct time signals being broadcast by radio-transmitting stations in every part of the country.

Here is a new world of information, education and inspiration; an "Aladdin's" dream realized in actual fact when you install in your home any one of the many simple receiving sets with a Magnavox Radio.

The Magnavox Radio makes it possible for you 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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"EVERYTHING IN INSULATION"
VARNISHES, COMPOUNDS, PAPERS, ETC.
MITCHELL-RAND MFG. CO.
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The HI-GEE RADIO CONCERT RECEIVER
Price, \$29.50



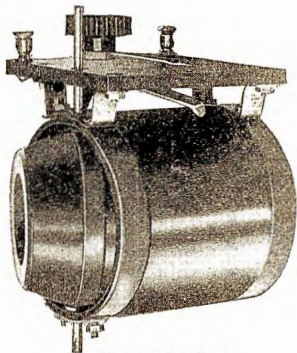
The above instrument comes to you completely assembled, ready to wire; all parts mounted on genuine Formica Panel, set in quartered oak cabinet with hinged cover. Panel is properly shielded so that no "body effects" are experienced with this instrument. This is truly a HI-GEE quality instrument consisting of two variometers, one variocoupler, socket and rheostat. (Rheostat not shown in above cut).

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(Patent Pending)

Our "EVERY-WIRE-CONTACT" Coupler as illustrated is made strictly along scientific lines—the primary coil has a lever contact affording an every-wire-adjustment of this element which eliminates the disadvantages of the old style primary or tuning coil with soldered taps and its poor selectability—at the same time the rotor is accurately fixed with perfect air gap allowing further finer tuning—the unit is ideal for use in regenerative or crystal sets.

We Are Prepared To Ship
In Quantity.

MORELAND SALES CORP.
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Newark, New Jersey

There Should Be 300,000,000 Wave Lengths

THEORETICALLY there should be 300,000,000 different wave lengths available; but, in practice at the present time, there are considerably less than 20,000, says a writer in the New York "Tribune;" but even these are badly congested, and with the advent of broadcast radiophone entertainment the congestion is becoming worse daily.

The problem is not merely one for the legislators. Their efforts can only end in regulation, which of course will only ameliorate the situation and not solve the problem. The solution lies in the hands of the radio engineers, who will have to devise apparatus which will eliminate a great deal of the present interference, and at the same time give us a greater number of available wave lengths to operate on by making them more sharp both in the transmitting and receiving stations.

In theory it is possible to operate, for instance, on every individual wave length between 360 meters and 370 meters, but in actual practice this is just a wave band, and all stations operating on wave lengths within those two limits will interfere with one another.

The advent of continuous wave telegraphy and telephony has done a great deal toward making tuning sharper, so that wave lengths fairly close together can operate without interfering.

To Obtain Good Tubes

AMATEURS who are constructing their own experimental tubes find chief difficulty in obtaining a good vacuum, says the "Evening Telegram," New York. The following is a simple but effective method of doing it:—

Have a small glass tube projecting beyond the end through which to draw the air.

Get rubber bulb, or ball, large enough to hold all the air contained in the valve and more and which should fit on the glass tube.

Squeeze all the air out of the bulb or ball, and holding it, so squeezed, fit it on the glass tube.

Now let go and, the bulb on, seal up the glass tube by holding it over a bunsen burner.

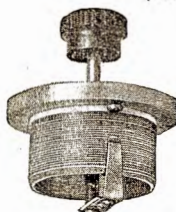
Many tubes that seem to be gone entirely can be revived by this method.

To Adjust Crystal Detector

In order to keep a crystal detector in perfect adjustment, first find the most sensitive spot by a buzzer test. When the point of the "cat's whisker" is well placed, drop some hot beeswax or paraffin around it. In practice, this has kept the whisker in the right place for months, and eliminates the necessity of seeking the elusive sensitive spot every time the set is to be used.

The Ajax All Vernier Rheostat

(Patent pending)



10,000 Adjustments

The ideal rheostat for fine control of Amplifier and Detector Tubes. Aluminum Base. Asbestos Insulation.

2amp. .7ohm. 2 1/4 in. base, \$1.75 postpaid.

4amp. .7ohm. 3 1/8 in. base, \$2.00 postpaid.

Buy from your dealer or send to
PHILLIPS MCH. CO., 28 Newberne St., West Somerville, Mass., Mfgs.
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Radio Set Complete

Enjoy daily concerts, weather crop and sporting news.

Complete Outfit \$12.75
Including 2,000-ohm Phones
Immediate Shipment

Can be installed in 30 minutes by any one.

Full instructions with each set. Send check or money order to.

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Selling Agents Wanted

Radio Apparatus

Immediate Shipment from Stock

Frost Head Phones, 3,000-ohm ... \$6.00
Frost Head Phones, 2,000-ohm ... 5.00
Diograph Head Phones, 3,000-ohm ... 12.00

Estru Lattice Type Variometers ... 5.00
Estru Lattice Type Varlo Couplers ... 4.50

These are small compact instruments of the lattice type with no unnecessary frame work. Maximum efficiency, sharp tuning. Ideal for portable sets and for those who build their own because of easy accessibility.

3" Bakelite Dials with knobs75

43-Plate Variable Condensers ... 4.00

23-Plate Variable Condensers ... 3.75

These condensers are of the very highest quality. Fully guaranteed.

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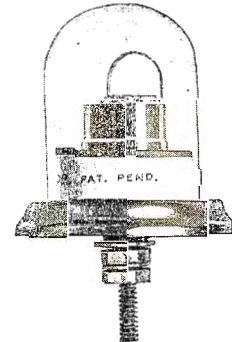
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RADIO DETECTOR



(Actual Size)

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In using the GREWOL you don't have to find the spot.

THIS DETECTOR IS ALWAYS SET AND READY

GUARANTEED ONE YEAR
IF YOUR DEALER DOES NOT HANDLE THE GREWOL SEND US \$2.00 AND WE WILL MAIL ONE TO YOU.

DEALERS WRITE FOR PROPOSITION

RANDEL WIRELESS CO.

9 Central Ave., Newark, N. J.

Radio Patents

RECENTLY ISSUED

FRANK GARACA, of Cleveland, has invented an improvement for batteries that are used in generating electricity, and that will make it unnecessary to use chemicals. He claims that a battery, supplied with his improvement, when extraneously heated will generate electricity.

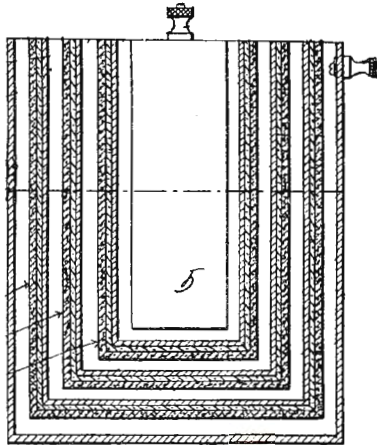


Figure 1.

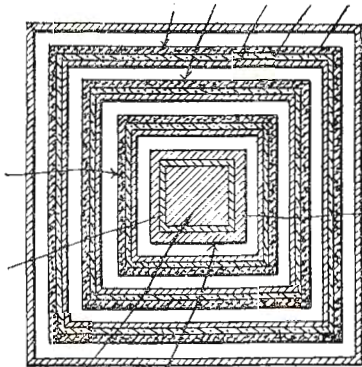


Figure 2.

Figure 1 represents a vertical section through a battery constructed in accordance with this invention, and Figure 2 is a transverse section taken on the line 2-2 of Figure 1.

HARRY T. HIPWELL, of Pittsburgh, has secured patent papers on a container for dry battery-cells which is intended to provide a simple but efficient means whereby any desired number of cells may be connected up, at any time, to secure the required voltage, without opening the container wherein the cells are located. As an article of manufacture, it is a battery-package including a boxlike receptacle comprising a body; battery cells in the body and provided with terminals; and a cover whereinto the body is telescoped, the side walls of the cover overlapping the side

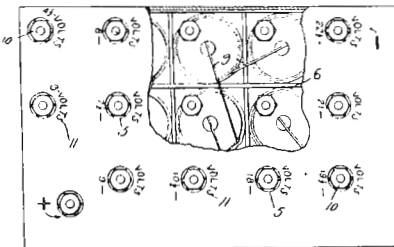


Figure 1.

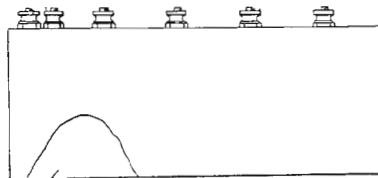


Figure 2.

Figure 1 shows in top plan, a device constructed in accordance with the invention. Figure 2 is a side elevation.

walls of the body to reinforce the receptacle in the retention of the cells, the cover comprising a top disposed above the upper edge of the body and provided with openings through which the terminals extend, the top having markings located closely adjacent to the openings and indicating the voltage available at each opening, the terminals projecting above all portions of the receptacle, to render them accessible, the body acting as a guide for the cover, whereby the terminals of the cells will be directed into the openings, when relative telescopic movement between the body and the cover takes place.

Old Commercial Apparatus

MANY, many years ago, when wireless was in its infancy, says "Radio Review" of "The Evening Mail," New York, Marconi invented what became known as the magnetic detector. This was used to replace the unreliable coherer. The magnetic detector was little more than a makeshift when compared to the crystal detector which was introduced a few years after Marconi made his contribution to the art. The crystal detector was much more sensitive than the magnetic detector. Then the modern three-element vacuum tube invented by DeForest made its appearance.

The vacuum tube is perhaps the most sensitive instrument ever produced.

The reader will think that every ship on the high seas is provided with the most modern receiving and transmitting apparatus. Some of us will be surprised to learn that a large number of trans-Atlantic ships lying in New York harbor at this very moment are equipped with magnetic detectors! That shows how progressive some of our large commercial radio companies are.

Latest song: "I'll Give You the Key to My Cellar, but Please Keep Away From My Roof!"—The New York "Globe."

One of the Smallest Radio Receiving Sets

NO doubt, every radio owner knows that, at times, signals come in stronger than at other times. This is due to either weather conditions or the erection and construction of transmitting and receiving stations. However all sorts of experiments are undertaken. Probably a new aerial is devised and, if not, possibly the set may be taken apart and reassembled. This experimenting gives some practical knowledge to him who undertakes the job. Experiments are being made by thousands of



(c. Keystone View Co.)

One of the smallest type of receiving sets ever made. Note the position of the detector and coil which, evidently, should be the tuner. It can be held on the tip of one's finger.

radio enthusiasts, and if one compares the various equipment of the moment with that of a few years ago, he cannot help but notice the improvement and design of apparatus.

The accompanying photograph pictures a unique experiment, the work of Allen Turner, a newspaper artist of Los Angeles. It is one of the smallest receiving sets made. It is called the "Radio Cricket," and can be used by anyone if an aerial and ground are connected to it.

It measures less than a half inch in height, and has 650 turns of wire in the coil. The crystal detector is mounted on top. There is no question that some would call it freakish, but Mr. Turner claims that it is a practical receiver for anyone. That it is much smaller than the photograph represents is evident by comparing the photographed fingers with your own. They are several times as large.

With sending stations interfering with one another, the radio is almost certain to encourage great forward strides in the art of cussing.—The "Evening Telegram," New York.

Radio Merchandising

Letters that Speak for Themselves

Sold 20,000 Rheostats in 3 Days

Remarkable Sales Directly Traced to
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Should Give You Equally Profitable Results*

Champlin Manufacturing Co.

Electrical Specialties

90 West Broadway, New York

Radio World Co.,
1493 Broadway,
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Gentlemen:

New York, N. Y., June 5, 1922.

Please run copy of advertisement for the following issue, as in June 10th, number. This is getting us satisfactory results for we can trace directly orders for twenty thousands of our rheostats due to your magazine. Needless to say we appreciate this very much, since it represents business for the first three days only, after the appearance of our ad.

Yours truly,

CHAMPLIN MFG. CO., (Signed) O. GOODRICH.

90 Per Cent Mention Radio World

LIBERTY RADIO CO.
Church & Liberty Streets,
New York, N. Y.

June 6, 1922.

Radio World Co.,
1493 Broadway,
New York City.

We are glad to inform you that from all the advertising we have in the various newspapers and magazines, we find that 90 per cent. of the mail we receive mentions that our advertisement was seen in RADIO WORLD.

Wishing you continued success, we remain,

Very truly yours,

LIBERTY RADIO CO.,
(Signed) DAVID KANOPLY.

New Firms and Corporations

Notices in this department are considered as purely interesting trade news and published without compensation to us. We welcome trade news of this nature. All notices having an advertising angle are referred to our Advertising Department, and are placed under Classified Advertising at 5 cents a word, or as Display Advertising at \$5 an inch.

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

The Kelley Radio Company, 127 East Pearl St., Cincinnati. Capitalization, \$15,000. Winton F. Kelley, president; Ralph P. Ruddy, vice-president; E. A. Leuchtenburg, secretary; Henry S. Voelker, treasurer; H. H. Hurn, Manhattan, realty, \$10,000; E. A. London, I. Weissberger & Leichter, 93 Nassau St., New York.)

Independent Electrical Co., 928 7th St., San Diego, Calif.

Simplex Radio Laboratory, 27 Highland Ave., Washington, Penna.

Paramount Radio Parts and Die Corp., 176 North St., New York, N. Y.

Northern Radio Supply Co., Manhattan, realty, \$10,000; E. A. London, I. Weissberger & Leichter, 93 Nassau St., New York.)

Franklin Radio Corp., Philadelphia, manufacture wireless telephone, \$250,000. (U. S. Corporation Co.)

Manhattan Association of Radio Scouts, 73 Madison Avenue; M. Schwartz, field scout executive.

Midwest Radio Corporation. Radio apparatus, \$500,000. J. M. Frere, J. A. Frere, M. A. Alexander, Wilmington, Del. (American Guaranty Trust Co.)

Millard Radio Corporation. Manufacture radio apparatus. \$1,250,000. Theodore L. Ernest, S. E. Freeland, Samuel Baras, New York City. (American Guaranty and Trust Co.)

Bacon Electric Co., Manhattan, \$25,000; M. and A. Abraham, R. Deibel. (Attorneys, Krakower & Peters, 305 Broadway, N. Y.)

Paramount Radio Parts and Die Corp., 174 North St., New York, N. Y.

Dr. Hutchison's New Firm

DR. MILLER REESE HUTCHISON, until recently chief engineer to all the Thomas A. Edison interests, has organized the Hutchison Radio Company, with a capital of \$1,000,000.

The Hutchison Radio Company will market immediately a crystal detector set and long range receiving apparatus to retail all the way from \$25 to \$300. Dr. Hutchison's policy proposes early production at the rate of 500 receiving sets a day of varying sizes and prices, and the production is to be nationally advertised under the name "Hutchison."

The company has taken over the broadcasting and receiving station owned by Dr. Hutchison. Associated with him are G. Stanley Meikle, formerly research engineer of the General Electric Company, and a staff executive of the United States Steel Corporation; Henry C. Knox of Brumley, Chamberlin & Company; and Edward Fallows, organizer of the American Brake Shoe & Foundry Company.

Over 17,500 Radio Companies Incorporate in 5 Months.

Over 17,500 incorporations of radio companies were filed in twenty States of the United States, according to estimates gathered from various capitals. These aggregate a capitalization of over \$90,000,000.

Radio Captains of Industry

NO. 1.—A. H. GREBE



(C. P. & A. Photos)

Mr. Grebe is the designer and manufacturer of the Grebe Regenerative Receiver, shown in the accompanying photograph. It is part of the radio equipment of his motor-car. He is a well-known radio expert and engineer, and one of the pioneers in radio manufacturing.

Lefax

LOOSE-LEAF FACTS

RADIO HANDBOOK

**Knows all—tells HOW
—and never grows old!**

Whether you buy a complete radio outfit or build one yourself, Lefax explains just how it works and how you can change it to get best results under varying conditions.

Lefax is technically correct in everyday language. Lefax never grows old. New events will be covered on new sheets sent free each month to every owner up to July 1st, 1923.

Order through your radio or book store or send \$3.50 direct to Lefax, Inc., 157 N. South 9th Street, Philadelphia, Pa.



CUSTOM TAILOR MADE TO FIT YOUR INDIVIDUAL CAR

Made in our custom shops after your order is received. We ship ordinarily in 2 or 3 days. Perfect fit guaranteed when correct name, year and model of car is given. You can easily apply it yourself.

\$4.40 and up
Parcels Post Paid

We furnish instructions and all necessary tools, wets and fasteners. Our Catalog No. 10 with samples is free for the asking.

LIBERTY TOP & TIRE CO., Dept. R2 Cincinnati, O.

Send Radio World the Name of Your Firm

Twin City Electric Company, 301 Main Street, Lewiston, Nez Perce Co., Iowa.

Gray, Trimble, Follick Company, Bloomington, Ill., consolidation of James Gray Company and the Trimble-Follick Electric Company.

H. E. Hefner, Lexington, McLean Co., Illinois.

Wilbur J. Young, Covington, Fountain Co., Ind.

C. L. Smith Electric Co., 122 Virginia St., Indianapolis.

Androphy Electric Co., 8 Oliver St., Derby, Conn.

A. J. Levinson, 80 Bank St., New London, Conn.

Kreiger & James, Conway, Faulkner Co., Ark.

T. S. Halverson, 212 E. 2nd St., Pomona, Calif.

Robert A. Bosch, 928 Geary St., San Francisco.

Domestic Electric Co., 208 E. 4th St., Davenport, Iowa.

Shelly Electric Co., 109 N. Water St., Wichita, Kan.

Dunellen Electrical Supply Co., 267 North Ave., Dunellen, N. J.

Ra-Tone Electric Co., 1267 Park Place, West Detroit, Mich.

Thor Electrical Shop, 130 Pearl St., Grand Rapids, Mich.

C. H. Mannison, Reed City, Osceola Co., Mich.

Radio Receptor Co., Manhattan, \$5,900 to \$15,900.

Triangle Radio Supply Co., Manhattan, \$30,000; L. Friedl, H. A. Linde. (Attorney, H. C. Adams, 220 Broadway, New York.)

Home Electric Shop, 254 S. Wabash St., Wabash, Ind., successor to C. W. Schlemmer.

Lawrence T. Baldwin, 742 Westcott St., Syracuse, N. Y.

Electric Parts Corp., 400 Boyden St., Syracuse, N. Y.

Webb & Cook Electrical Co., Asheville, Buncombe Co., N. C.

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Radio Supplies AT A BIG SAVING

	List Price	Our Price
Radiotron UV 201 Amplifying Tube	\$6.50	\$5.85
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Murdock Phones, No. 56, 3,000-ohms, Per pr.	6.00	5.40
Federal Phones, 2,200-ohms, per pr.	8.00	7.00
Acme A-2, Amplifying Transformers Semi-mounted	5.00	4.50
Paragon Amplifying Transformers, mounted	5.00	4.50
Federal Plugs	1.75	1.50
Everready B Battery, Type 766, 22½ Volt	3.00	2.50
Everready B Battery, Type 763, 22½ Volt	1.75	1.35
Brach Vacuum Gaps for lightning protection, Inside Type	2.50	2.25
Outside Type	3.00	2.75
Paragon V.T. Sockets	1.00	.85
Paragon Rheostats	1.50	1.35
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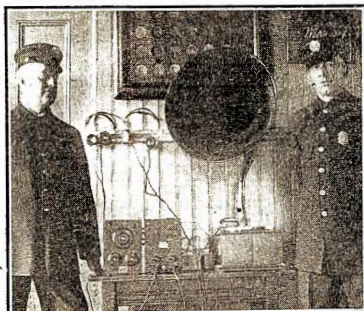
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From the Twenty-Four-Hour-a-Day Boys

Editor, RADIO WORLD: We have read every issue of your valuable and interesting paper, except the first number which we could not procure even by searching the stores of Boston. You have some very interesting pictures of radiophone sets. I am enclosing ours. We think we are the first fire station in New Hampshire, if not in New England, equipped with an R. C., Westinghouse set.

Our loud speaker consists of a Music Master Edison horn attached to a West-



Receiving set of Combination 3, Dover, New Hampshire, Fire Department.

inghouse victrola attachment by a piece of chemical hose, it works very satisfactory.

We have heard over twenty different broadcasting stations and ships.

The amusement of listening in certainly is wonderful and shortens the hours of those who put in twenty-four for a day's work.—L. H. Steuerwald, Combination 3, Dover, N. H., Fire Department.

A Chance for Inventor

RADIO has started the jokesmiths and humorists a buzzing. Perhaps one of them is responsible for the story of the woman, with charitable intent, who asked her municipal authorities to protect all cats that are obliged to sacrifice their whiskers to receiving sets. In her pity, the benefactress of feline hirsute adornment states that there are now 1,702,392 radio sets, each of which must have at least one cat's whisker; and that the time will come, if radio increases, when the supply of this important element will be nil, because "the atrocity is certain to develop whiskerless cats."

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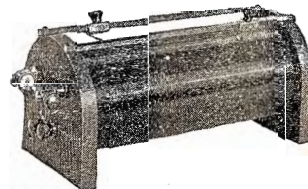
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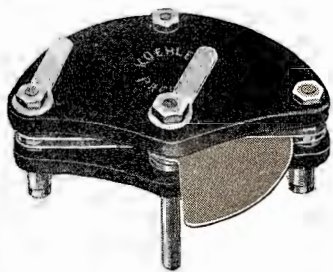
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FROM PUBLICATION OFFICE,
1493 BROADWAY, NEW YORK, N. Y.
TELEPHONE, BRYANT 4796
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ASSOCIATE EDITORS:
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Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

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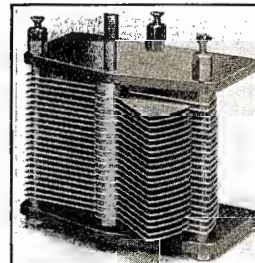
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The rate for this RADIO WORLD QUICK ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., if copy is received at this office before 4 P. M. on any second Tuesday preceding date of publication. RADIO WORLD CO., 1493 Broadway, New York City. (Phone, Bryant 4796.)

SAVE MONEY—Supersensitive galena quarter pound, 55c., half pound, \$1.00. Big sample, 30c. Streiff, 73 Flatbush Ave., Brooklyn, N. Y.

Exchange jolly interesting letters through our Club Stamp appreciated. Betty Lee, 4254 Broadway, New York City.

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We can make immediate delivery on a limited supply of Type R-3 Magnavox, \$45.00, 14" Horn, and Type R-2, 18" horn, \$85.00. Dealers and agents, discount 10% on 1, 15% on 2 or more. C. O. D. or cash with order. THE KEHLER RADIO LABORATORIES, Abilene, Kansas, Dept. W.

The Standard Radio Log and Record.—A Continuous Diary and Record of all station activities. Provision for recording Calls Received and Sent with location, distance, wave length and other information. Sections for keeping records of Calls Frequently Used, Station Data, License Numbers, Equipment Inventory, Notable Performances, etc. Flexible binding, 48 pages and cover. Price 30c., prepaid or from your dealer. Metcalfe Publishing Company, 56 Harrison Ave., Springfield, Mass.

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Approximate Inventory \$4,500 which includes a goodly supply of Phones and Bulbs. For a quick sale will sacrifice for \$2,550 in cash or negotiable securities. Inventory List supplied on request.

Address: C. B. TISSOT, "RADIO WORLD," 58 Schaeffer St. Brooklyn, N. Y.

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All that its name implies
Get a copy from your radio dealer or news stand today—20c.

PUBLISHED BY
Pacific Radio Pub. Co., Inc.
Pacific Bldg., San Francisco

Radio World, 52 issues, \$6.00

Balking at What the Public Really Wants


IN an interesting communication to the New York "Times," June 3, Mr. Alison Keyes, a resident of Brooklyn, N. Y., makes a plea for more ambitious programs from the broadcasting stations. Mr. Keyes says in part:

But when—oh, when—will this new super-power be used as the vehicle for other things than the commonplace, the trivial? "Ain't It a Shame to Steal on Sunday?" upon one radio program last week must, of course, have had a wide appeal, and I am aware that most radio sets are installed in homes because the males of the family want to hear the baseball scores at a minimum expenditure of time and strength. But when may some of the rest of us who balk at "what the public wants" listen in? Surely we should be allowed our turn. "Bits From the World's Best Literature" radioed the other evening sounded like a step in the right direction, but many of us would like a longer stride. When will Julia Marlowe (or a voice like hers, if such a voice there be, which I very much doubt) read us Shakespeare by radio? Thousands would enjoy it and through it the millions might be converted to Shakespeare—propaganda of a very safe and sane sort. The result might even cast doubt upon Mr. William H. Brady's classic of the theatre-ticket broker who said: "Honest Bill, I can't sell Shakespeare!"

What a triumph if we could sell Shakespeare by radio!

Subscribe direct or through your news dealer. \$6.00 a year.

-something different?



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220 WEST 42ND ST., NEW YORK

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This Summer will be your first Radio Vacation. In the mountains, at the seashore, or in camp, radio will predominate all else. You will need RADIO WORLD. Subscribe for 3 months, \$1.50. Radio World, 1493 Broadway, New York. —(Adv.)

RKM for This Week

By Roy K. Moulton, the famous humorist of "The Evening Mail," New York. Copyrighted by Mail and Express Company.

DEPARTING from the custom of other broadcasting stations, we have decided to insert a little pep into the programs sent out from here. The RKM station has become so popular that there has not been sufficient listening space for all those who wished to hear and on several evenings we have been forced to broadcast two programmes at the same time.

Our programme for next Monday evening will deal almost entirely in topics of current interest and will be as follows:

7:10 P. M.—Reading of the minutes of previous meeting.

7:22.—New Business. Motions and resolutions.

7:39.—Initiation of candidates. No horse-play or rough-stuff.

7:57.—Sketch: "Damon and Pythias," by Senator Caraway and Attorney-General Daugherty.

8:09.—"My Impression of America," by Laddie Boy, the White House Airedale.

8:27.—Dance music by Chick Binks' famous Pousse Cafe Tin Can and Frying Pan Orchestra.

9:01.—Aerial performance by Miss Lilian Leitzel, queen of the circus.

9:27.—Exhibition by Wide Awake Hose Company No. 1, of Rutherford, N. J., including getting into uniforms, sliding down brass pole, putting out fire and reeling up hose.

9:51.—Exhibition of speed in mid-Atlantic by steamship Majestic, largest liner afloat.

10:00.—Correct time from the Sunshine Biscuit factory.

10:23.—Canned music by Cool & Schaller, the famous Washington Heights trout-stream twins, during which they will break several records.

10:38.—Addresses by Polk & Co., authors of the city directory.

10:49.—Light refreshments served by Izzy Einstein, the well-known caterer.

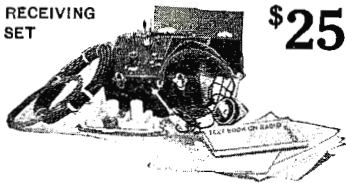
11:00.—Good night.

Does the Moon Affect Radio

The changes of the moon have been found by radio officers of the small American fleet in the Adriatic Sea to have a striking effect upon the efficiency of the atmosphere for transmitting radio communications. The officers have succeeded in drawing curves and other diagrams based upon months of observations, which, they assert, reliably serve to indicate what atmospheric and celestial conditions affecting radio service will be met at any particular date in the future.—The New York "Telegram."

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\$25

With Double Head Phones

Also Copper Antenna Lead Wire, Ground Wire, Insulators and all the necessary parts that will enable you to hear everything within a range of from 25 to 50 miles. Also included is a radio text-book with complete instructions and valuable charts.

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No mess, trouble, dirt—no moving of batteries—loss of time—no effort on your part—no technical or professional knowledge needed.

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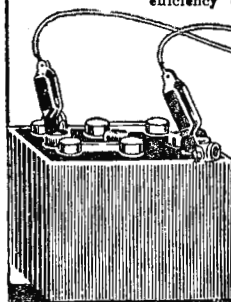
successfully meets all charging conditions, and is the only rectifier combining the following essential Homcharging features.

1. Self-polarizing. Connect battery either way and it will always charge. No danger of reverse charging, ruined battery or burnt-out rectifier.
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Approved by Underwriters. Immediate Delivery. Attention Motorists.

Will charge your auto battery as well as radio battery. Send for Bulletin No. 58 for further information.

For sale by all radio, electrical and accessory dealers or shipped, express prepaid, for purchase price, \$18.50. \$20 West of Rockies



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Full particulars and Booklet free.

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Subscribe for RADIO WORLD. Out every seven days. RADIO WORLD is published on Wednesday, from 1493 Broadway, New York City.

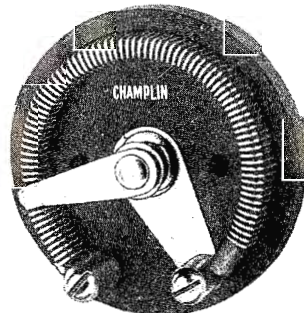
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To Mr. Garrick: "73s"

Editor, RADIO WORLD: I have read Mr. Garrick's letter in RADIO WORLD No. 4, dated April 22, and want to say that I agree with him in every particular. To Mr. Fancher, of 1BVB, I would say that he misunderstood the right meaning. Mr. Garrick doubtless meant the cheap crystal sets which are being sold to the unknowing public. (Usually by displaying them on the counter and having a two- or three-step amplifier hidden from view and hooked on to a loud speaker).

As for Mr. Abbot, I would suggest that he become better acquainted with the American amateur and learn about his work and aims. Does he know that the amateurs handle thousands of messages every month in all parts of the country, free of charge? Is that a public benefit or not?

We amateurs have organized our own American Radio Relay League, which day and night, is striving to attain a state of perfection that will enable messages to be sent with safety and accuracy to any part of this country and in less time than by any other method.

Last year, we sent a message from Hartford to Los Angeles and received an answer in six and a half minutes!

In other tests, our stations have been heard in England, France, Germany, Alaska, Honolulu, etc. Does such work mean anything, or is it to be curtailed just because someone wants to sit down at night and hear the "wonderful music?"

We have enough to put up with now. If a station near a broadcasting center wishes to do some work he has to wait until midnight; for if he tries it before, his receiver is overwhelmed with a wondrous array of music, beat notes, harmonics, etc.

And to Mr. Garrick-73s., de A Rechert, 2TT.

Are You Going Away For the Summer?

If you are on our subscription list, send in your change of address.

If you purchase RADIO WORLD at the newsstands, and intend to leave town, we suggest that you subscribe direct or through your newsdealer at \$6.00 a year, \$3.00 six months, \$1.50 three months, and have RADIO WORLD reach you regularly while you are away.

RADIO WORLD,
1493 Broadway, New York, N. Y.

THE MARVEL OF WIRELESS

REG. U. S. PAT. OFF.
OF WIRELESS

If you live within 30 miles of a radio broadcasting station, you can bring the speeches and music right into your own home with the nationally famous MARVEL! The set comes complete, including telephone headset, complete aerial equipment, aerial and ground wires, lightning switch, insulators, ground clamp, complete, simple instructions, Complete code chart, etc. Nothing additional needed.

\$15

Remember, the MARVEL is built by the same engineering skill that designed radio apparatus now used by the U. S. Navy, and every MARVEL Set is on a money-back basis. If your dealer is not supplied, send check or money order for immediate shipment from stock. \$1.50 extra will bring you an interesting book on wireless—150 pages, 150 illustrations. Or send 25c for a 72-page illustrated beginner's radio book.

FREED - EISEMANN

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KEYSTONE VARIABLE CONDENSERS

21 Plate
\$3.55

43 Plate
\$4.50

Our selection of materials and built-up type design give assurance of low energy loss and high efficiency.

Agents and Jobbers write for information.

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Wholesale Distributors of

Radio and Electrical Supplies

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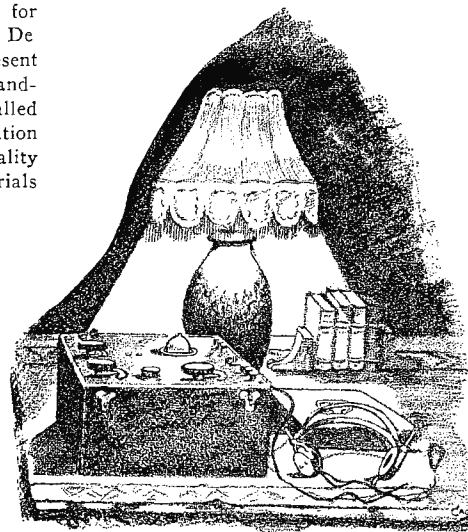
SPRINGFIELD - - - - - MASS.

Telephone River 3515

De Forest Dependability is an inbuilt quality that only years of experience in the building of radio apparatus and a thorough knowledge of radio science can give. It is not a tangible element that one can grasp or point out yet its presence is essential to satisfactory performance.

To those who are looking for satisfactory performance, De Forest Radiophones also present technically correct design, handsome appearance and unequalled efficiency. De Forest Reputation and Prestige insure the quality of the workmanship and materials used being of the highest.

The Everyman Receiver is for 30-mile reception; the Radiohome Receiver is a vacuum tube set efficient up to 100 miles; for use with either of these sets there is the "DT-800" Two-Stage Amplifier. MR-6 Receiver includes an unsurpassed tuner, tube detector and two-stages of amplification. Ask your friends who use them.



DeForest Radiophones

"The Standard of Dependability"

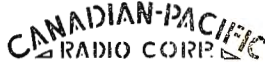
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Eliminates outside and inside wires. This attachment will enable you to use any electric-light socket in your home. No danger of any kind, no worry from storms. Save cost of all aerial construction. Attachment comes ready to connect to your receiving set. Fully guaranteed. Price \$3.50 postpaid.

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Factory, offices and demonstrating rooms, Testimonials open for inspection. Strictest investigation invited. Call or write for information.

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26 Cortlandt St., New York.

How to Learn the Code

MORE than half the pleasure of mowing and operating a radio-receiving outfit is lost if code messages cannot be understood.

In learning the code, the easiest way is to call the dashes "da" and the dots "dit." Most of the letters should be learned in pairs, as follows:

- E—dit.
- T—da.
- I—dit, dit.
- M—da, da.
- S—dit, dit, dit.
- O—da, da, da.
- H—dit, dit, dit, dit.
- A—dit, da.
- N—da, dit.
- U—dit, dit, da.
- D—da, dit, dit.
- V—dit, dit, dit, da.
- B—da, dit, dit, dit.
- W—dit, da, da.
- G—da, da, dit, dit.
- L—dit, da, dit, dit.
- F—dit, dit, da, dit.
- R—dit, da, dit.
- K—da, dit, da.
- P—dit, da, da, dit.
- X—da, dit, dit, da.
- Q—da, da, dit, da.
- Y—da, dit, da, da.
- C—da, dit, da, dit.
- J—dit, da, da, da.
- Z—da, da, dit, dit.
- dit, da, da, da, da. 2—dit, dit, da, da.
- da. 3—dit, dit, dit, da, da. 4—dit, dit, dit, da. 5—dit, dit, dit, dit, da. 6—da, da, dit, dit, da. 7—da, da, dit, dit, da. 8—da, da, da, dit, dit. 9—da, da, da, da, dit. 10—da, da, da, da, da.

This all looks foolish and sounds like baby talk, but it will produce results. The object of learning the letters in this way is to know them by their sounds rather than by their appearance; in other words, *by ear and not by eye.* Practice during spare time by translating newspapers, magazines, car signs, etc., into "da-dits."

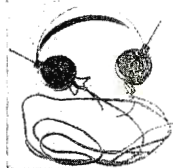
A telegraph key, buzzer and dry battery form a small, inexpensive means of producing "da-dits" so that they sound like regular wireless signals, and will provide educational entertainment for any one or for any group of people who are at all interested in radio.

If you wish to enjoy radio to its fullest, take advantage of this.

LISTEN-IN PHONES

Retail at
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Enjoy your Radio Concert with Century Specialty Phone. Absolute Satisfaction Guaranteed or Money Refunded.



PRICE \$5.85
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Three reasons why we highly recommend these phones.

1. Highest quality of material used throughout.
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"Ground Floor" Opportunity to cash in on
WONDERFUL PROFITS
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Write To-Day

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Reduces static, eliminates lightning arrester and unsightly outside aerial. Ideal for apartments and city users who cannot erect aerial.

Fine oak cabinet and nickel fittings with green silk cord and plug ready to attach to nearest lamp socket. Price postpaid \$5.00. Dealers and jobbers wanted.

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

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Static or the Program?



Don't Use Your Ears As Leyden Jars! Get the Radio Programs Free of that Summer Pest—Static, at a cost of only \$2.00.

JACOBUS

Static is not a necessary evil with any kind of receiving set. You can get the programs as clearly in summer as in winter.

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Static can be drained off your lead-in wire as water is carried from a roof—automatically. Just say JACOBUS to your dealer or show him this ad.

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You can see the sparks sifting through the vacuum lamp harmlessly to the ground. Even lightning cannot reach your set. The Watchdog, "JACOBUS," protects your set and home. Write for free circular giving hook-ups and advice on static elimination.


Ask your dealer about it

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VEST POCKET RACE TRACK

Wonderful novelty. Absolutely new. Beautifully nickeled Race Track Watch. Miniature track. Twelve numbered horses. Watch them run. Fascinating sport. Descriptive letter on request or watch mailed prepaid for \$1.50. KARL KNIGHT, Dept. R, 49 Hanover St., Boston, Mass.



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DEALERS—

IT WILL PAY YOU TO COMMUNICATE

Manufacturers and Distributors

Wiener Wireless Specialty Company

21 Academy Street
Newark New Jersey

A New "Ham's" Views

Editor, RADIO WORLD: I noticed, in your issue of April 22, an article signed by Ralph R. Garrick, operator JART 3 P.M. I would like to express my opinion of this article and its writer.

It is, without doubt, the most narrow-minded statement I have seen in many days and, certainly conveys the impression that the writer has a cramped intellect. It is this type of man who impedes progress. As for answering some of the statements, I will first say that I am one of the new "hams" and am, also, one of his nineteen of the twenty. I do not claim to be able to tell anything about wireless. However, if he will look around him, he will find that his class is in a very decided minority and should expect consideration in the same proportion. The broadcasting stations are accomplishing more good in one evening than this man and his kind, unless they change their attitude, will accomplish in a lifetime. He does not seem to realize that there are many invalids and many people living at distant points who are receiving, by wireless, their only form of wholesome amusement and entertainment. If this man, Garrick, is such a clever radioman, why does he not arrange to operate at a wave length so that the broadcasting stations will not interfere with his joy of living? —James H. Hoeveler, President, Hoeveler Warehouse Company, Pittsburgh, Pa.

Louis Dreyfus, Broadway musical publisher, gave C. B. Dillingham, the theatrical manager, a box of cigars when the latter sailed for Europe last week. Two days later, he received the following wireless from "S. B.": "Thanks for the cigars. They made me seasick."—The New York "World."

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De Forest Crystal Set (inc. phone)	\$25.00
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ROTORS AND STATOR SECTIONS



Carefully and accurately made from specially selected and treated woods. Not "mere wood turnings" but manufactured to pattern makers standard. Rotors packed 50 and 100 in package. Stator sections packed 100 and 200 in package. Dealers! Send for interesting circular and attractive proposition. Write Dept. 46.

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Mayer Double Slide Tuning Coil

A most efficient double slide tuning coil wound with bare, highly polished, hard drawn No. 26 B. & S. copper wire. The strands are .0012" apart and are immovable. Mounted on a durable wooden frame, base and sides beautifully finished in mahogany. Can be used for loading coil. Base 10 1/2 x 5 1/2 inches. Height 6 inches.

Radio Supply Service UP-TO-THE-MINUTE

The radio dealer needs a new kind of jobber service to meet the demand of a new and different business. North Ward Service is developed especially to meet the need. Give it a trial!

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Switch Lever
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Get Our Prices and Discounts.

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The Radio Builder

Complete Knockdown Radio Receiving Set

Complete with Plans, Aerial, Lead in Wire. Coils, Detector, Switch, Insulators and all necessary parts. Easy to set up. This set without Head Sets.

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Mail orders promptly filled
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Our Name is Our Guarantee.

FORD MICA CO., Inc.
14 CHRISTOPHER STREET, N. Y.

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SOME twenty years ago, the late George R. Webb, of Baltimore, who was largely interested in the independent-telephone business in Wilmington, Baltimore, and Pittsburg, originated the idea of sending music over telephone wires in order to increase the revenue of the various large telephone plants which he controlled.

He developed a loud-speaking transmitter and receiver, by which he sent music from a central point over the telephone wires to the homes of the telephone subscribers with wonderfully pure articulation and great volume. This service was introduced into Wilmington, and music from the Central Exchange, by the use of a loud-speaking transmitter and receiver, was given to several thousand subscribers. It is still successfully operated in that city.

Later, these instruments were adapted to the purpose of dispatching trains, and, at present, all the trains in Washington, D. C., terminal are operated by them, the transmitter being in the dispatcher's office and the receivers scattered throughout the various sections of the terminal. The reproduction of the voice without distortion and the rapidity with which trains are handled is an asset to railroad companies.

READ RADIO BOOKS

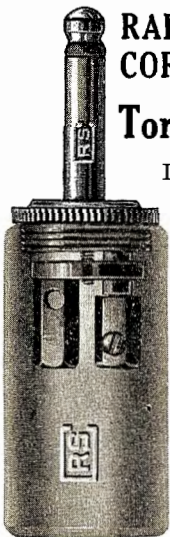
By JAMES R. CAMERON

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All conductive parts are of heavy machined brass, insulated throughout. Screw binding post terminals.

Handle is of light, strong insulating material.

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The Dictograph Radio Head Set is an overwhelming success. Sales are breaking all records. Dictograph leadership is established in radio as elsewhere for the most accurate and sensitive sound reception apparatus. The famous, nationally advertised name Dictograph insures quick sales.



3,00-ohms
Retail Price
\$12.00

Cash in on the demand for this wonderful new radio phone. July production now ready. Order from your jobber, or direct.

DICTOGRAPH PRODUCTS CORPORATION

Charles H. Lehman, President
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Branch offices in principal cities through the world

Write for information about the new Dictograph Loud Speaker. List price \$25.

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THE ANCHOR BRASS & ALUMINUM CO.

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CINCINNATI, OHIO



The Aristocrat of all Radio Receiving Instruments Brings Entertainment to Your Easy Chair

The Air-o-phone is the perfected radio-phone de luxe, ready to be placed in the finest drawing rooms, in cottages, apartments, country clubs, bungalows or yacht clubs everywhere.

There are no installations to make, no "aerials" to install, outside or inside; no groundings or other electrical connections whatever. The instrument is a self-contained, beautifully finished, solid mahogany cabinet; the inside loop or terminal being contained in a decorative mahogany stand. A roomful of people can listen or dance to the Air-o-phone. No ear sets are required.

This marvellous instrument, which has been tested in the area of the twenty-two principal broadcasting stations of U. S. gives a wonderfully clear rendition of the concert programs, dance music, operas, bed-time stories and news events sent out daily throughout the country. Perhaps you have hesitated buying a really practical home instrument because of the technical details connected with the installation of the average receiving "set." No knowledge of radio is necessary for the operation of Air-o-phone. There are no extras to purchase, no text or guide books to follow.

DEALERS Important

Department stores, music dealers and general stores everywhere are doing a profitable business with Air-o-phones, not only are they selling Air-o-phones at a profit but the very fact that with the Air-o-phone they are able to give wonderful entertainments attracts large crowds daily to their stores.

We have a very attractive dealer's proposition. Write for it at once. Be the first dealer in your city to show the wonderful Air-o-phone.

The **AIR-O-PHONE**

TWO TYPES AND SIZES

FOR THE HOME

Drawing Room Type complete, \$450.00.

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Country Club Type, (very loud) \$550.00.

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