

Subscribe \$5 dollars a year. Ephraim put our Radio together before this time
Easy Ways to Make and Operate Sets—Pages 5, 11 to 14

Radio Digest

Illustrated

50,000 COPIES EVERY WEEK

Vol. 1. No. 5 Copyright, 1922, E. C. Rayner CHICAGO, ILL., SATURDAY, MAY 13, 1922 PRICE TEN CENTS

LIMIT BROADCAST STATIONS

BANK BROADCASTS ON FARM STATION

COUNTY AGENT AND BANK PRESIDENT GET LICENSE

Finance and Markets Sent Out Nightly to Airphones of Rural and City Audiences

Special to RADIO DIGEST
 CANTON, OHIO. For the first time in the history of the radio, a broadcasting station in order that their clients and members may have delivered in their homes the most interesting features of finance and farming.

The City National Bank of this city and the Montgomery County Farm Bureau conceived the idea that it would be a remarkable step forward in both banking and farming if they could establish a Radio broadcasting station and in this manner broadcast every evening features of interest to those interested.

Harry Darst, president of the bank, and A. F. Hedges, county farm agent, formulated the plans and secured the license.

In order that the station might be well
 (Continued on page 7)

Airphone to Fight Fire with New Gas

Prophet Predicts Helicopters Will Replace Fire Engines in the Future

NEW YORK.—Somebody seems to take a step or two into the future and predicts that firefighting will be done by Radio. The fires will be extinguished with gases which are given out from helicopters and all rescues made by the air from airships. Directions given for these vehicles of the air will be by the chief using a Radiophone transmitter. In fifty years the fire houses will disappear and in place of them helicopters with engines will be kept on the roofs of the buildings ready for the Radiophone signal. The most stubborn fire will be extinguished with a newly discovered gas harmless to human beings, so says a local prophet.

DOG HEARS MASTER'S VOICE BY AIRPHONE

LEXINGTON, KY.—An Airedale terrier in the Radio receiving room of the University of Kentucky heard his owner at Pittsburgh call him. The owner was speaking from the Pittsburgh (KDKA) broadcasting station. The dog was sleeping as his master's voice came in. He sprang to his feet, wagged his tail and then capered about the Radio outfit.



R. E. Leppert, Jr., 17, Harrison, N. Y., making a receiving panel in his laboratory at home

CONFERENCE URGES 250-MILE RANGE

All Plants to Be Located Seven Hundred and Fifty Miles

Hoover to Assign

Available Wave Lengths Limit Licenses Issued to New Broadcasting Stations

WASHINGTON, D. C.—Restriction of transmitting ranges and wave lengths and control of the location of Radiophone broadcasting stations with the idea foremost in mind that Radio communication is a public utility and as such must be regulated by the Federal government in the interest of the public, where the essential decisions reached and reported as final to the department of commerce by the recently sitting conference on Radio telephony, called by Secretary of Commerce Hoover. Above all other considerations, the one that the public was to be considered, was not forgotten, and the proposed legislation, when acted upon by Congress, will revise the present Radio communication laws of the United States in such a manner as to make them the most complete and model Radio regulations in the world.

The conference, with members consisting of seven civilians and a like number of government officials well-known for their activities and interest in Radio communication, not only prepared a report on technical matters but recommended essential points in legislation necessary to give the Secretary of Commerce authority to make and enforce regulations in order to accomplish the ends recommended.

Conference Report Broad in Nature
 Besides the general resolutions of the conference, the report is very broad in nature and covers the entire field of Radio
 (Continued on page 2)

YUCATAN TO INSTALL RADIOPHONE STATIONS

South American Country to Get Music and News

NEW YORK.—Yucatan, seldom mentioned in news dispatches on Radio developments, is expecting soon to put the Radiophone to comprehensive commercial use. Felipe Carrillo, president of the republic, realizing that the major portion of his country is ignorant of world affairs through lack of proper railroad, telegraph and telephone facilities, is considering installing receiving sets in the small cities and villages. Music, news, governmental speeches and educational lectures are to be broadcast.

To Equip Mail Planes on Cross Country Trips

Range Finders Provided for Fogs and Storms

WASHINGTON.—Air mail planes of the Post Office Department are to be equipped with Radiophones. The planes to be equipped are those on the transcontinental route between New York and San Francisco. The Radio sending and receiving set to be placed in these planes of the air mail fleet has a radius of 200 miles, which is ample for keeping the ship in touch with the starting and landing station. Range finders will be provided to enable the pilots in foggy and stormy weather to find the stations toward which they are flying.

AUTO RACE DRIVER TO USE RADIOPHONE

INDIANAPOLIS, IND.—A Radiophone will be used by one driver in the 500-mile automobile race at the Indianapolis motor speedway May 30th to keep in touch with the pit during the long grind. The car is a small one of popular make, but rebuilt for racing purposes. The Radiophone will aid the driver to keep in touch with his pit and to know his place and other valuable information.

CONFERENCE REPORTS

(Continued from Page 1)

communication in detail. The report is divided into five sections as follows: Section I, Allocation of Wave Bands for Radio Telephony; Section II, Power Limitation, Geographical Distribution, and Hours of Operation of Broadcasting Stations; Section III, Considerations to Be Followed in Granting Licenses; Section IV, Recommendations Relative to the Amateur; Section V, Technical Methods for the Reduction of Interference.

The owners of recently acquired receiving stations are more concerned with the proposed legislation affecting broadcasting stations. Related to all stations, therefore including broadcasting stations, is the edict of the conference that the secretary of commerce have control of the establishment of all Radio transmitting stations except amateur, experimental and government stations, and of the operation of all non-governmental Radio transmitting stations. It is also recommended that he have control of the erection and establishment of certain classes of Radio stations, among these being broadcasting stations.

The secretary of commerce shall also assign a specific wave length to each Radiophone broadcasting station, (except government and amateur), which length shall be within the limits pertaining to the class of service of that station.

Divides Broadcasting Stations Into Classes
Radio broadcasting stations are divided by the report into four general classifications for the purpose of regulation. These are government, where the broadcast is by

broadcast service, and in order to prevent interference with the short wave length stations, must be sent on a wave length falling within 2,850 to 3,300 or 1,550 to 1,650 meters.

Set Power Wave Length Limitations

Broadcasting station ranges will not be unlimited, if the report of the conference is unchanged by Congress, for it is specified that the Secretary of Commerce assign to each of these stations a permissible power based on the normal range of the station, such normal ranges for the different classes of service, to have the following average values, large or smaller values being prescribed when conditions warrant:

Government broadcasting stations, 600 miles.
Public broadcasting stations, 250 miles.
Private and toll broadcasting stations, 50 miles.

Another recommendation is that the same wave length not be assigned to stations within the following distances of one another, except that these distances may be lowered if the normal ranges of the stations are correspondingly lowered:

Government broadcasting stations, 1,500 miles.
Public broadcasting stations, 750 miles.
Private and toll broadcasting stations, 150 miles.

The allocation of wave lengths prescribed by the conference for all classes of Radio service is given in tabular form on this page.

Location and Schedule Reservations Made
Best service with a minimum of interference is the objective of a provision in

selected from among and by the amateurs of each locality for the purpose of assisting the district radio inspectors in enforcing the Radio communication laws. The amateur deputy inspectors would serve without compensation, or for the salary of one dollar a year if legally necessary.

Technical Investigation of Interference Asked

Technical interference elimination methods should be carefully investigated and experimented with by the Bureau of Standards according to the conference report. A comprehensive program of research is laid out for the bureau, and provision to give widespread publication of the results and findings of the researches is asked.

It is also asked that apparatus and methods causing unnecessary interference when more satisfactory apparatus and methods are commercially available at reasonable prices, be barred at the discretion of the Secretary of commerce.

Included in the report of the conference is a provision for the appointment by the President of an advisory committee to the Secretary of commerce to consist of not more than twelve members, half of whom would be from the government and half from outside of the government.

FIRST FIRE WAGON TO USE AIRPHONE

Los Angeles Fire Chief Asks Council to Install Radio Sets

LOS ANGELES, CALIF.—Announcement of plans now being worked out to furnish the "squad wagon" of the Los Angeles fire department with radio telephone of the latest design in equipment for the sending and receiving of aerial messages, are now under consideration by Fire Chief Ralph J. Scott, who declared that there is a vital need for this equipment in the department at this time.

Scott pointed out that the so-called "squad wagon" carries a crew of firemen who are especially trained for life saving, and which is equipped with first-aid kits and acetylene torches, steel cutting equipment and life nets.

There is only one such wagon in the fire department at this time, was the statement of Scott, and it was pointed out that a radio outfit would afford a quick method of getting in touch with a fire station any time when needed.

Scott declared that while the cost of installing a receiving and sending radio telephone system on the squad wagon would be but nominal, he did not have sufficient funds in the department at this time to cover the purpose. However, he stated that he may within the near future request the city council to make the necessary appropriation in a fund with which to purchase the equipment, which would give the Los Angeles fire department the first piece of fire apparatus to be equipped with a radio telephone set.

Summer Broadcasts May Have Trouble

Hot Weather Not Conducive to Good Reception, Claims Dayton Expert

DAYTON, OHIO.—Broadcasting on a large scale has been in existence for only a short time and has not gone through a summer. Some experts say that summer will present obstacles which will be an acid test for Radiophony.

It will be well for the Radio fan to keep experimenting, while turning the knobs to bring back to concert strains, to see if he can discover a way to eliminate atmospheric. This will be a great help in Radiophony. Half the fascination of Radio is in "fishing in the ether" for broadcasts. The apparatus is far from automatic. It requires experience and a fair knowledge of the science to obtain the best results.

You will find that midday in midsummer will be the time for the minimum of Radio efficiency and when the atmospheric will be the worst. Midnight in midwinter, when the static is practically unnoticed, is the time for maximum Radio efficiency.

Amateur Speed Test Chicago Show

A contest to determine who is the fastest amateur radio operator in the country will be one of the features of the National Radio show to be held in the Leiter Building June 26th to July 1st. Scores of organizations will participate in the show. Milo E. Westbrooke has been chosen general manager of the affair.

Radio fans will have an opportunity to determine just what the army and navy are doing in Radio experiments in technical schools in Chicago and elsewhere. Many of these schools plan on having large displays of their handicraft.

Radio Digest Illustrated

TRADE MARK

Published Weekly by E. C. RAYNER, Publisher
123 West Madison Street, CHICAGO, ILLINOIS

SUBSCRIPTION RATES

Yearly.....\$5.00 | Foreign.....\$6.00
Single Copies, 10 Cents

Entry as second-class matter applied for at the postoffice at Chicago, Illinois, under Act of March 3, 1879.

Vol. 1 Chicago, Saturday, May 13, 1922 No. 5

CONTENTS

Limit Broadcast Stations; Bank Broadcasts on Farm Station; Airphone to Fight Fire with New Gas; Yucatan to Install Radiophone Stations; Equip Mail Plane on Cross Country Trips..... 1
Los Angeles Equips Fire Wagons; Summer Troubles with Broadcasting; Amateur Speed Test Chicago Show..... 2
Mexico Installs Radio on Trains; Brooklyn Show; The Antenna Brothers—Comic.... 3
Explains Working of Receiving Set.....
Radio Receiving Sets (Illustrated).....
WGI and KDKA Prove Pioneers.....
New Device Sends News in Secret.....
Table of Broadcasting Stations..... 8-

EDITORIALS

The Radio Conference at Washington; Crooks Are Hunted by Radio; Radiophones and the Schools; Indi-Gest Humor 1
How to Make Gas Pipe Loud Speaker; Detroit Show Winning Sets; Home-made Amplifier; To Make and Use Crystal Detector Set..... 1
Characteristics of Vacuum Tube Amplifiers, Benjamin F. Miesner..... 1
Care of Apparatus..... 1
Fixed and Variable Condensers, Harry J. Marx..... 1
Diagrams and Hook-ups (Loose-leaf Sheet). 1
Questions and Answers..... 1
Radio Illustrated..... 1

Looking Ahead

Broadcasting Stations of note will be illustrated each week. A page of article and pictures showing the latest stations in use.

Radiophone Broadcasting Stations correct week. This feature will be of interest every owner of a receiving set.

Instructions for the Beginner, by Harry J. Valuable information for the amateur novice. There is also a clip sheet, gives diagrams and hook-ups useful every owner of a set.

How to Make. A whole page will be devoted to kinks and how to make apparatus at an exchange of ideas on stunts work by the amateur.

Series of Articles covering the Construct a Set Using Two Steps of Radio Freq Amplification, Vacuum Tube Detector Two Steps of Radio Frequency Amplifier with a wave length range of 150 meters, by an authority.

BE SURE TO GET RADIO DIGEST
It Will Be Hard to Find a Copy on the News Stands
SUBSCRIBE NOW

SEND IN THE BLANK TODAY

Publisher,
Radio Digest, Illustrated,
123 West Madison St.,
Chicago, Illinois.

Please find enclosed check M. O. for Five Dollars for One Year's Subscription to Radio Digest, Illustrated.

Name.....

Address.....

City..... State.....

CONFERENCE ALLOCATION OF WAVES

The following table gives the allocation of wave lengths for Radio telephony recommended recently in the final report of the Conference Radio Telephony to Secretary of Commerce Hoover. Wave bands marked "exclusive" can be used for no other type of service, while those marked "non-exclusive" are available for other types of Radio communication, subject to regulation:

Use	Wave length Meters
Transoceanic radio telephone experiments, non-exclusive.....	6,000—5,000
Fixed service telephony, non-exclusive.....	3,300—2,850
Mobile service radio telephony, non-exclusive.....	2,650—2,500
Government broadcasting, non-exclusive.....	2,050—1,850
Fixed station radio telephony, non-exclusive.....	1,650—1,550
Aircraft radio telephony and telegraphy, exclusive.....	1,550—1,500
Government and public broadcasting, non-exclusive.....	1,500—1,050
Radio beacons, exclusive.....	1,050—950
Aircraft radio telephony and telegraphy, exclusive.....	950—850
Government and public broadcasting, exclusive.....	850—750
Government and public broadcasting, 400 miles or more from the seacoast, exclusive.....	750—700
Government and public broadcasting, 400 miles or more from the seacoast, exclusive.....	700—650
Marine radio telephony, non-exclusive.....	750—650
Aircraft radio telephony and telegraphy, exclusive.....	525—500
Government and public broadcasting, exclusive.....	495—485
Private and toll broadcasting.....	485—285
Restricted special amateur radio telegraphy, non-exclusive.....	310
City and state public safety broadcasting, exclusive.....	285—275
Technical and training schools (shared with amateur).....	275—200
Amateur telegraphy and telephony (exclusive, 150 to 200 meters) (Shared with technical and training schools, 200 to 275 meters).....	275—150
Private and toll broadcasting, exclusive.....	150—100
Reserved.....	100—0

ments of the Federal government; including the broadcasting by public utilities; state governments or political subdivisions as cities and counties, universities and such others as may transmit informational and educational service; private, where broadcasts, without charge, of news, entertainment or other service are made by any station; and toll, when a charge is made for the use of the broadcasting station.

Any station carrying on two or more of the classes of broadcasting services must be licensed for each class of service independently. Besides the assignments of wave lengths and control of power used by broadcasting stations according to the nature of their service and their location, special restrictions of power and wave lengths used are placed upon stations located in coastal regions, so that these will not interfere with the marine communication traffic.

Will Permit No Advertising

Answering the much debated subject as to the future of broadcasting as a means of advertising, the report of the conference clearly indicates that the other shall remain undisturbed by appeals for business, direct or indirect. In this regard it is stated that the generally demanded classes of broadcasting services and communication are so many that the introduction of advertising broadcasts would require an extensive assignment of wave lengths, the availability of which are hardly great enough for the more needed services. It is therefore recommended not to permit advertising by means of broadcasts.

In view of the demand for broadcast service by the general public, it is also deemed advisable to discourage "point-to-point" communication over land by Radio where communication of other means is effectively maintained. Also it is defined that a message addressed to a prescribed number of particular stations is not a

the report for an investigation by the Secretary of Commerce of the geographical distribution of broadcasting stations. To further eliminate interference in any one locality, it is recommended that in congested districts, the Secretary assign suitable hours of operation to existing broadcasting stations.

Another feature in the conference report provides that when all available wave lengths in any one geographical region are already assigned, that no further licenses be issued in that region until cause arises for the revocation of existing licenses.

To obtain a license as operator of a broadcasting station, the report asks that the applicant have a knowledge of Radio transmitting and receiving apparatus and of the International Morse Code, sufficient to receive at the rate of ten words per minute.

Amateur Status Not Much Changed

The existing Radio communication laws provide very well for the amateur stations, and few changes are recommended. The wave length allocation, 150 to 275 meters, is higher than previously, but the plan is to divide the band into four bands. The band containing the lowest wave lengths will be assigned to damped wave stations, the next band to interrupted or modulated continuous wave telegraph stations, the third band to Radiophone stations, and the highest wave length band to the amateur stations employing unmodulated continuous wave telegraph transmitters.

The conference report defines an amateur as a person who operates a Radio station, transmitting, receiving, or both, without pay or commercial gain, merely for personal interest or in connection with an organization of like interest.

One innovation is the recommendation of a system of self-policing among the amateurs, including the creation of amateur deputy radio inspectors who would be

POLICE TEST SETS AT BROOKLYN SHOW

TO WIN TELEGRAM AWARD SOUGHT BY AMATEURS

Prize Winner Must Communicate with Apparatus Entirely Concealed on His Person

Special to RADIO DIGEST

BROOKLYN, N. Y.—One of the main features of the Radio show being held in Brooklyn is a contest of the New York Evening Telegram in which a prize of a Crocker-Wheeler motor generator set is to be awarded to the winner of the best Radio set. The set must be concealed entirely on the person of the operator. It also must enable anyone to maintain voice communication over a reasonable distance with other persons similarly equipped.

There is much interest to be taken in this contest because it is bringing out numerous sets that can be used by police, patrolmen, night watches and persons in similar occupations. If workable the police can use them in catching a criminal before he has gained too much lead on his pursuers. Such an outfit will enable one person to get in touch with another quickly and give warning of a fleeing criminal. The message can be relayed to another person farther along. Thus the criminal will be headed off before reaching any great distance.

Police commissioner Enright is to aid the judges in selecting the best set for the purpose. The importance of this contest to those interested in the improvement of the police force cannot be denied. Successful equipment of this type will go a long way toward checking the crime wave. Lack of immediate means of intercommunication is one of the most serious drawbacks when the bluecoats are called upon to prevent a crime or to hunt criminals.

Each set submitted is to pass through a series of tests and direct trials during the show. The tests are being made at the booth of the Evening Telegram radio department. The sets are tested out in pairs, one entrant talking to another via Radio.

The prize winning set will, no doubt, be adopted by the police department and each policeman will carry one on his person in the near future. With this network of Radio sets in a large city there will be little chance of bad characters getting away. Descriptions can be sent out quickly and a net laid to catch him before he moves many blocks away.

The generator set to be given as a prize is a machine of excellent construction and design. It will prove a welcome addition to the station of the winner. It is of special value in connection with vacuum tube transmission work.

Eiffel Tower Station Broadcasts Jewelers

Parisian Clocksmiths Correct Watches by Radio

PARIS, FRANCE.—Fifteen hundred small Radio receiving sets have been installed in Paris jewelry, watch and clock stores to enable the jewelers to catch the correct Greenwich meridian time as it is sent out daily at 10 o'clock in the morning from the Eiffel tower station. Formerly the exact time had to be obtained from the observatory by telephone.

The installation is simplicity itself. The outfit, about 9 inches in diameter, is hung on the wall in the shop. A copper wire is run down the basement to the ground or to a water or gas pipe for a ground, while the bulb from a nearby electric light and the insertion of a contact plug takes the place of the antennae.

ARMY REVEILLE IS NOW SENT BY RADIO

It is proposed that all calls in the army be broadcast by Radio. What will become of the fellow who used to toot reveille on the bugle in the early hours? This most unpopular fellow will lose his job now, but there is a hitch in this plan and that is, who is going to tune up the receiver to get the obnoxious slumber breaking call?

FAMOUS CITY DONKEY IN RADIO SPOTLIGHT

MILWAUKEE.—A Milwaukee Radio station broadcasted this plea over the middle west in quest of a donkey: "Anybody got a donkey? Ship him, pull him or drive him to Milwaukee at once. Must have one tail, and a leg at each corner. No questions asked."

TALENTED MOVIE ACTRESS LISTENS IN AND THEN PLAYS TUNE ON OWN VIOLIN



Pretty Betty Compson of the Paramount Studios entranced by broadcast violin teacher. © T. & U.

ANTENNA PROVES FATAL

Father and Son Killed by Live Wire

CLEVELAND, OHIO.—Karl Braun, a contractor, and his fifteen year old boy were electrocuted and a neighbor boy seriously burned when an aerial wire from a Radio receiving set crossed a 2300-volt electric feeder. The boy was first killed and the father in trying to save his son was also electrocuted.

HOTEL SERVICE DE LUXE

Dayton Hostelry Entertains Guests with Receiving Set

Special to RADIO DIGEST
DAYTON, OHIO.—The Miami hotel here, believing in service to its guests, has installed a Radio receiving set on its roof. In the afternoon and evening the guests can gather on the mezzanine floor and listen to concerts which are picked up from the large Radio broadcasting stations.

MEXICO INSTALLS RADIO ON TRAINS

INITIAL TEST SUCCESSFUL ON SOUTHERN RAILROADS

Dispatchers Keeping in Touch with Conductors at All Times Insures Safety

The Mexicans now have the Radiophone fever. To keep pace with the United States they are installing receiving sets in the coaches of their National railway systems. The chief engineer of these railways said that they have demonstrated Radiophones can be used to advantage in operating railroads. A three-day experiment was recently conducted by officials on stations 300 kilometers apart.

"A special train equipped with a receiving and transmitting station was sent out on the lines," said a Mexican railway official. "Orders were sent out from the station as the train moved about over the division. The dispatchers kept in touch with conductors at all times, regardless of where the train was—thus insuring safety for the passengers."

"As soon as all experiments are completed and the best equipment adapted for the purpose is found work will begin on installations. Plans are being worked out to utilize the existing telegraph lines for the new system of multiplex telephony, by which 15 or 20 conversations can be carried on over one wire at the same time. This will give the southern republic a splendid long distance telephone system until Radiophone plants become more numerous."

WASHDAY A JINX TO WESTERN FAN

Aerial Furnishes Laundress with Clothes Line for Hanging Weekly Wash

LOS ANGELES, CALIF.—R. H. Dixon, who lives at 1096 North Western Avenue, this city, has been the first so far as known in Southern California to report the "jimmying" of his somewhat unusual manner. The news which has been imparted to the radio manager of station KHJ, which is conducted by the Los Angeles Times.

After trying in vain to listen in to The Times' concerts and news, and adjusting his receiving set to all limits, Mr. Dixon decided to go up on the roof and there to his surprise he discovered the well-scrubbed family wash of the week hung in silhouette against the cooling evening ozone on his antenna, the laundress, having mistaken the radio aerial for the regular line on which the weekly wash should be put.

The radio-ether enthusiast, who was somewhat amused at the novel tryout, stated that the laundress would get her "radio orders," before the next wash day would roll around.

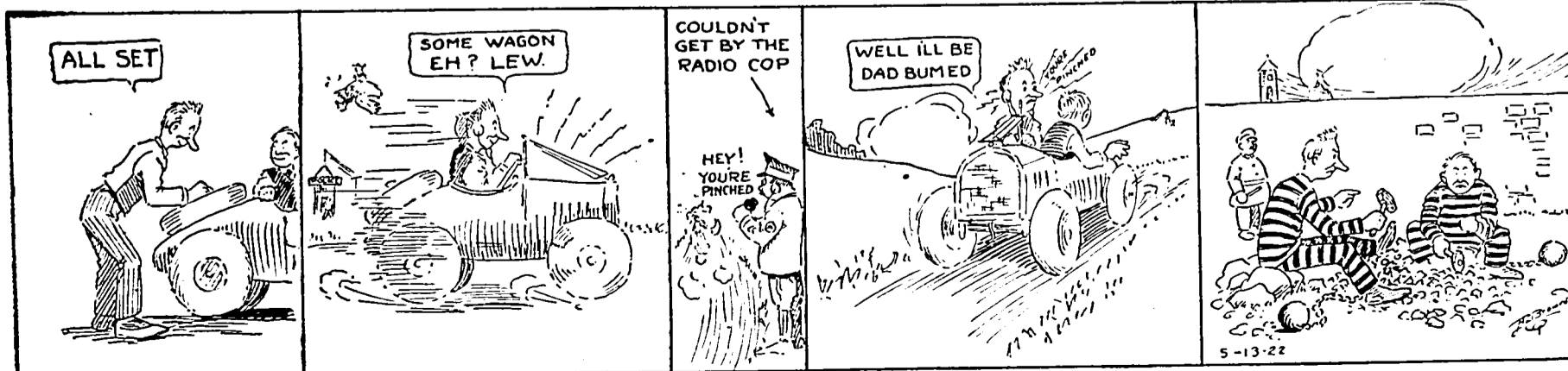
Airphone to Protect Banks from Robbers

SPRINGFIELD, ILL.—Bankers are beginning to realize that it is time to provide as much protection as possible and because the Radiophone provides a means of quickly following a thief have formed what is called the Bankers Radio Protective Association. The purpose of this organization is to flash reports to all the cities following a bank robbery. The association will have representatives scattered throughout the state to receive flashes announcing the theft of automobiles and bank robberies.

THE ANTENNA BROTHERS

Spir L. and Lew P.

INTERFERENCE



EXPLAINS WORKING OF RECEIVING SET

THIRD ILLUSTRATION OF STANDARD APPARATUS

Enables Beginners to Understand and Adjust Instruments for Receipt of Broadcasts

See Diagram Page 5

The set shown in this number is the Grebe CR-8 Receiving Set and has a range of 150 to 1,000 meters wavelength. It is made up of two units, the larger of which is the Detector Set, and the smaller a Two Stage Amplifier. The hook-up is what is called regenerative and is a patented circuit. This regenerative circuit is the original Armstrong Patent No. 1,113,149, taken out on October 6th, 1914. The Grebe Radio Co. are licensed to build sets using this circuit.

The Detector Unit

The set as shown can be operated, using either the Detector Unit alone or with the Amplifier Unit. To simplify the description we will describe the Detector Unit and its connections and operations first, afterward taking the addition of the Amplifier Unit. The Detector Unit, as seen from the front, has four binding posts, two in the lower left-hand corner marked "ANTENNA" and "GROUND" and two in the upper right-hand corner marked "OUTPUT." The wire from the aerial is fastened to the bindingpost marked "ANTENNA." The ground connection is hooked to the bindingpost marked "GROUND." The receivers are connected to the two bindingposts marked "OUTPUT." Now, taking the interior view of the Detector Unit, it will be noticed that we have four more binding posts, two on the left marked for the positive and negative of the "PLATE BATTERY" and two on the right for the positive and negative of the "FILAMENT BATTERY." The PLATE BATTERY is a 22½ volt "B" battery and the FILAMENT BATTERY is a 6 volt "A" battery. There are two holes in the back of the cabinet for the two sets of wires from the two batteries. The connections are made as called for, making sure that the positive and negative terminals of the batteries are connected to the binding posts as called for.

Tuning Controls

The Detector Unit has nine different dials and knobs. Under the center of the dial is a knob for adjusting the number of turns of the variocoupler we are varying the wave length adjustment of the set. The knob on the right permits a rough adjustment of the number of turns, while the knob on the left controls the adjustment for one turn at a time. The dial, above marked "COUPLER," turns the inner coil and, therefore, controls the flow of the current to the vacuum tube. The large dial on the left, marked "GRID VARIOMETER," and the same on the right, marked "PLATE VARIOMETER," controls the current as it goes to the grid and plate in the vacuum tube; in adjusting these we are able to eliminate the numerous noises that are apt to be created in our receivers and loud speaker. It will be noticed that under each of these dials there is a small projecting dial; these are Vernier Adjustments. That is to say, they make it easier to get an accurate adjustment of our larger dials and at the same time eliminate the trouble occasionally encountered called "body capacity." They are not separate dials, but are connected with the larger dials and work with them.

The small wheel dial projecting from the panel in the lower right-hand corner controls the flow of current to the filament of the detector vacuum tube. Turning it toward the right increases the voltage to the tube. The next wheel dial on the same detector panel is the one that controls the variation of the condenser in the antenna circuit. This dial is marked on the upper side with three lines and numbers, 375, 650 and 1,000. Setting this dial at any one of these numbers adjusts the set to approximately this wave length; finer adjustments are then made through the two tapped switch knobs as explained before.

Tuning the Detector Unit

In tuning the detector unit the condenser dial is set at the nearest wavelength value to that of the broadcasting station, such as 375 for a 360 meter broadcasting wave. The filament current is turned on and adjusted. The finer adjustments for more accurate wavelengths are then controlled with the knobs of the tap switches until the reception is heard the strongest. Then the center dial is turned for the maximum strength of the incoming

reception. After this the plate and grid variometer dials are adjusted for the maximum intensity and clearness of the broadcasting. Howling and squawking and other noises that are usually complained of can be eliminated, but it requires a little experience before the best results are obtained from the set.

The Two-Stage Amplifier Unit

The Amplifier Unit also has four bindingposts in the front of the panel, and in addition has the holes of the three telephone jacks for plugging in the phones at the detector, first or second stages of amplification as desired. When the Amplifier Unit is used the two bindingposts in the upper left-hand corner, marked "INPUT," are connected to the two bindingposts in the upper right-hand corner of the Detector Unit. The two on top are connected together and the two on the bottom are connected. The two bindingposts in the upper right-hand corner of the Amplifier Unit are used for the connections to the loud speaker when used. When the loud speaker is used, however, the receivers cannot be plugged in.

The interior view of the Amplifier Unit shows six bindingposts, that is in three sets of two each. The two on the left, marked "EXTERNAL FILAMENT," and the two in the center, marked "FILAMENT BATTERY," are connected to the positive and negative terminals of the 6 volt "A" battery, using the same battery as for the Detector Unit. The two bindingposts on the right, marked "PLATE BATTERY," are for a "B" battery, but in this case it is advisable to use another battery, voltage to be from 45 to 90 volts. Be sure that the terminals are connected as indicated for positive and negative. The wires are led in through holes in the back of the panel as in the Detector Unit.

Tuning with the Amplifier Unit

The Loud Speaker can only be used if the receiver plug is pulled out, as the plug disconnects the OUTPUT bindingposts when pushed in the jack. In tuning in for the two steps of amplification, the receivers are plugged into the jack marked for the first stage and the filament current adjusted by means of the small projecting dial on the left-hand side of the Amplifier Unit. Then the receiver is plugged into the second step and the projecting dial on the right-hand side is adjusted for the proper flow of current to the filament.

Don't be discouraged if you encounter difficulty in tuning this set; it is a difficult one to adjust properly, but the results are well worth the trouble. A little experience will soon show better results in the reception.

Animal Radio

It is remarkable how animal life will flock to the national parks and private grounds where birds of the air assemble in large numbers. We have all wondered how these creatures communicate with one another, how they become acquainted with farms and places where they may be protected and become tame. Now it is told that these creatures of the land and birds of the air use animal Radio. This may be a guess, but the naturalists are trying to determine if they have a way of communication by Radio waves unknown to the human family.

TU-WAY

New design plug, jacks, variable condenser, V. T. socket, rheostat & head sets. If your jobber is unable to supply, write us



Porter Jazzes Up Pullman Club Car

Snores and Broadcast Music Offer Entrancing Medley to Insomnia Victims

Special to RADIO DIGEST

DAYTON, OHIO.—Fletcher Hiles, negro porter on the club car of Big Four passenger train No. 6, which daily runs from Cincinnati, O., to Cleveland, O., is a Radio fan.

"I got the Radio bug," declared Hiles, "just like everybody else. I never was home long enough to do anything with it, so I asked the boss if I could put one of them upon the club car, that being the car that I have charge of."

"Well, he said yes, and I puts it up. It didn't work so good at first, but it works fine now. I gets all the passengers in my car now. They comes in to hear the music. I get Pittsburgh and all the big stations."

Hiles has his aerial strung from one end of the car to the other at a height of about two feet from the car roof. The apparatus is grounded through the wheels. The instruments are located in the smoking room.

OLD UPRIGHT SWANKS OVER PARLOR GRANDS

Old Style Piano Offers Home for Aerial

WINNIPEG.—The old upright piano seems to be a thing of the past, but it is now coming into its own again since Radiophone has taken such a hold on the country. It is just the thing to house the aerial and all the wires are strung in place.

An employee at the city hall has discovered the discarded piano as an aerial. All that has to be done is to attach the receiving set to the piano, taking care to effect the proper connection for a complete circuit, and presto! one has a Radio equipment. The city employee is sure the theory is sound and he is just waiting for the next long distance broadcast to put it into practice.

RADIO For Everybody
What do you want to know about Radio? Hook-ups, diagrams, laws, codes, code-work, definitions, testing instruments, use of equipment—everything you want to know fully explained and answered in the Quiz book. New edition now ready. Read this wonderful book for the best way to use your equipment, instruments—or to prepare for Government examinations for Operator's license, etc., etc. Price only \$1.00. Money-back guarantee. Send for it today.
National Radio Institute, Dept. 1188, Washington, D.C.

Headquarters for
Radio Supplies and Equipment
Radio Department
COMMONWEALTH EDISON ELECTRIC SHOPS
72 West Adams Street
Chicago, Ill.

Radio Apparatus Immediate Shipment

- 43—Plate Variable Condenser \$4.00
- 23—Plate Variable Condenser 3.75

These condensers are of the very highest quality, fully guaranteed.

Head Phones

- Frost—2,000 ohm..... \$5.00
- Frost—3,000 ohm..... 6.00
- Western Electric 2,400 ohm..... 15.00
- Dictograph—3,000 ohm..... 12.00
- Kellogg—2,400 ohm..... 12.00

Estru Variometers and Vario-Couplers

- Variometer \$5.00
- Vario-Coupler 4.50

These are of the lattice type, are small, compact instruments, with no unnecessary frame work, which makes them most easily wired. Maximum efficiency—sharp tuning. Ideal for portable sets and for those who assemble their own because of easy accessibility.

3 inch Bakelite Dials

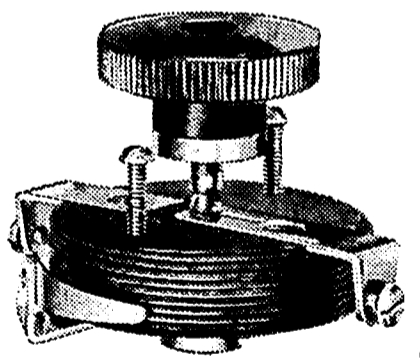
- Figures 0 to 100..... \$1.00

Keystone Lightning Arresters

- Type A—Having wire leads..... \$2.00
- Type B—Having binding posts..... 2.00
- Pipe Cap for Type A or B..... .90
- Pipe Point for Type A or B..... .90

Dealers Write for Our Proposition

Northern Radio Supply Corporation
542 W. Washington, Chicago, Ill
MAIN 2230-2276



IN the reception of Radio signals of all classes, especially continuous wave and distant signals, the closest possible control of the detector tube filament temperature is extremely necessary. A compact and serviceable

RHEOSTAT

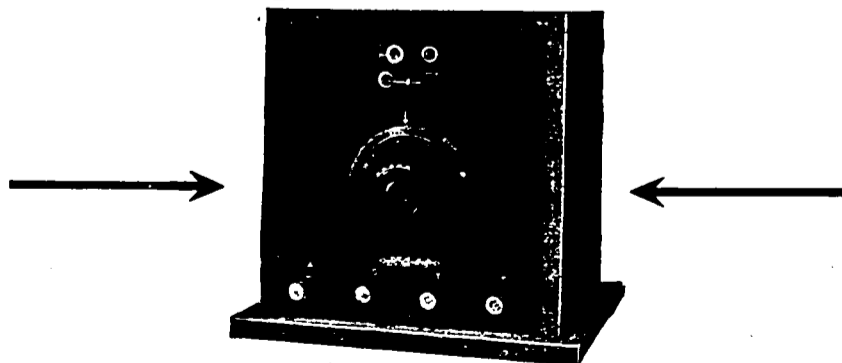
which gives this control has just been placed on the market.

The picture shows this rheostat mounted on a panel. As can be seen, the non-conductive drum is threaded, and in this thread is wound the required length of polished, non-corrosive resistance wire. When the knob is turned, the arm is rotated. This arm carries at its end a pivoted phosphor bronze contact tongue, the end of which follows the thread and consequently the resistance wire. In six revolutions of the knob, the tongue travels from one end of the resistance wire to the other, touching it at every point throughout its entire length. This gives the number of adjustments which is absolutely unlimited, and changes of one thousandth of an ohm are possible. In order to do away with the unnecessary turning of the knob, a simple cut-off is embodied in the rheostat. Adjacent to the point where the shaft makes contact with the lead-in arm, the shaft is grooved. When the knob is pushed in ¼", the circuit is broken. When the knob is pulled out again (away from the panel), the circuit is made. In other words, the tube may be turned on or off without changing the setting of the rheostat. This lends great convenience in its operation.

J. E. JENKINS

59 East Van Buren Street Room 605
CHICAGO, ILLINOIS

Naco Radio Receiving Sets \$20 Complete Without Condenser



For clear hearing and pleasing tone use a NACO set **NACO Radio Accessories**
STATE MANAGERS WANTED

"We are building our radio business for the future, not only for today. Courtesy and discretionate prices prevail"

National Motor Accessories Corporation
1446-1448 Woolworth Building, NEW YORK CITY

RADIO SUPPLIES STORES

Prompt Service—Quality Goods—Priced Right

Radio Division
TELEPHONE MAINTENANCE CO.

20 S. Wells St. Franklin 3986
5206 W. Madison, Austin 7041, 1122 E. 47th St.

Look for the TELMACO Sign

Radio Receiving Sets

Indicating the Operation of a Grebe Instrument

Antenna

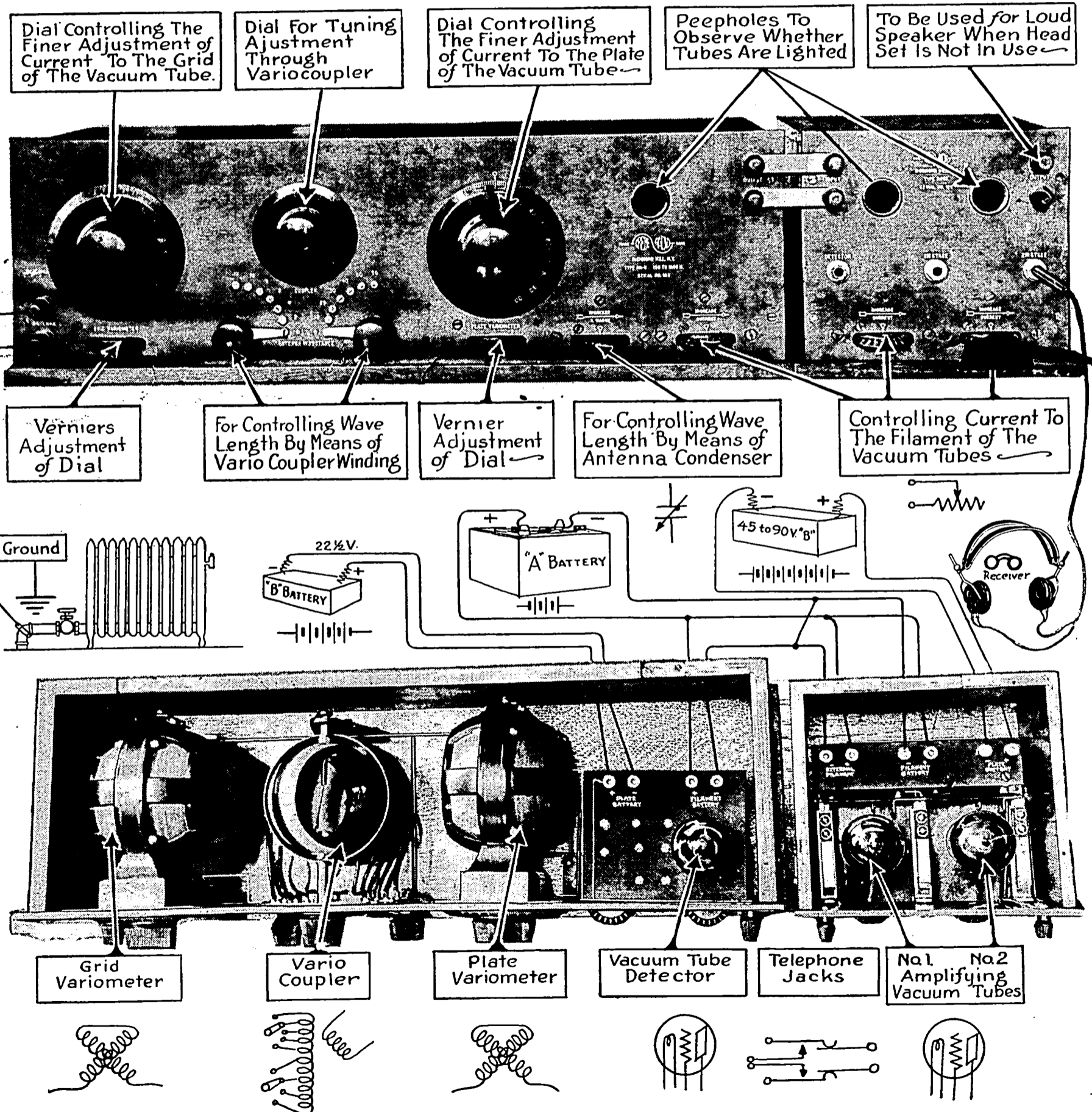
Pursuing the policy of submitting to beginners as much material as possible for the correct reception of broadcasts, RADIO DIGEST herewith gives the third of a series of standard receiving sets.

The front and interior views are shown. All the various parts are indicated and named. It is hoped that this will enable the novice to understand his own

set, even if it happens not to be of the particular make shown.

Full and complete instructions for installing, operating and tuning of the set illustrated are given in column one, page four of this issue.

The set shown below is known as Grebe C R-8 and is manufactured by Grebe Radio company, Richmond Hill, Long Island, N. Y.



WGI AND KDKA PROVE PIONEERS

**Medford Hillside, Massachusetts
Plant Claims the Honor of
First Daily Schedule**

Nov. 1 Birthday for KDKA

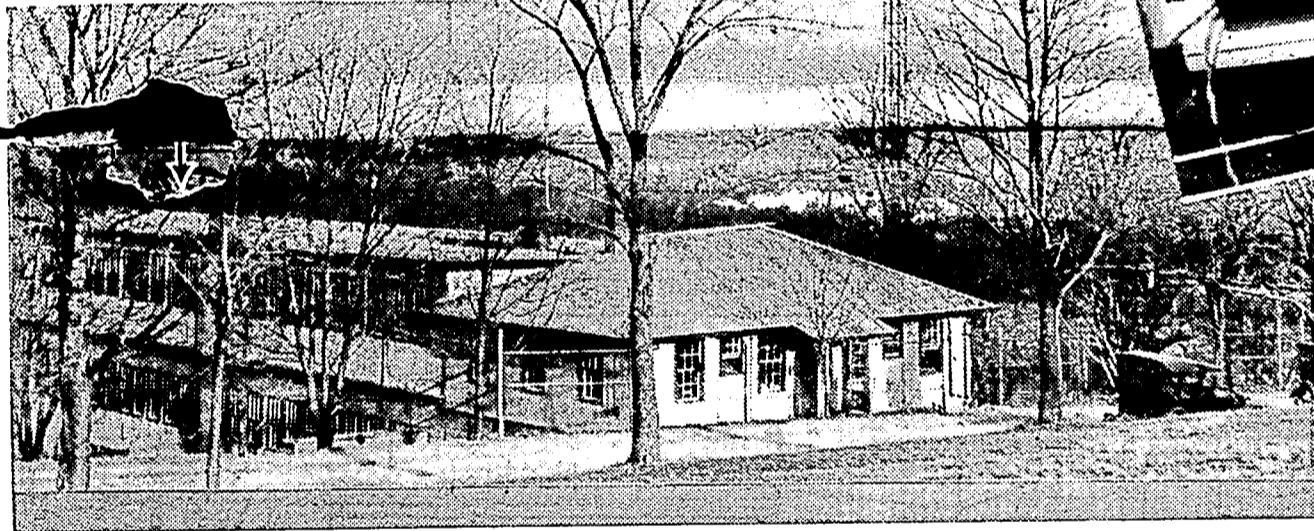
**Pittsburgh Station Started with
Election Returns—Was Originator
of Radiophone Church Service**

Station WGI, owned by the American Radio Research Corporation and located at Medford Hillside, Massachusetts, may rightfully claim to be a pioneer broadcasting station, for in 1915 its founder, Harold J. Power, began broadcasting music. No regular program was observed, however, until March 20, 1921, when a regular daily broadcasting service, claimed by its owners to be the first, was started.

The 1915 efforts were marked as successful when the music was heard by ships at sea 100 miles away, but today WGI thinks nothing of its consistent 1,000-mile range, to say nothing of the regularity with which it has been heard 1,500 miles to the South, and at many other points within a radius of 2,000 miles. It has been heard in Cuba, Prince Edward Island, Florida, Texas and as far west as the Mississippi.

Broadcast Extensive Program

The 500 watts input of WGI is given few opportunities to be idle and the transmitting tubes cool down very little between the many periods during which some sort of program is being broadcast. On week days, Eastern Standard time, the schedule is: 2:55 P. M., music; 3:00 P. M., current events supplied by the Boston Traveler; 7:30 P. M., baseball scores and late news flashes (Boston American) except on Tuesdays and Thursdays, when this feature is at 7:45 P. M.; 7:45 P. M., reports from the Boston Police Department, except on Tues-



Photograph to the Left Shows the Great Steel Tower and Home of Station WGI at Medford Hillside, Massachusetts. This Station is Owned and Operated by the American Radio and Research Corporation. Picture Above Shows a Corner of the Operating Room. New England Radio Fans Are Practically Dependent Upon WGI for Their Daily Broadcast. Two Thousand Miles Range is Not Unusual for This Yankee Outfit.



days and Thursdays, when this feature is at 7:55 P. M. On Tuesdays and Thursdays, at 7:30 P. M., a children's bedtime story is given.

Special additions to the regular weekday program are many. On Sunday mornings, a Radio church service is broadcast. The entire service, including many religious musical features, is transmitted. Throughout the week many divers specials are added. Among these are health talks,

business reviews, lectures and addresses, concerts, code practice periods, instructions for amateurs, market reports, and fashion talks.

KDKA Starts with Election Returns

Another claimant to the "first broadcasting station" title, and probably the most heard broadcasting station in the country is KDKA, which began on the night of November 1, 1920, with election returns as the only program. KDKA is

located at East Pittsburgh, Pennsylvania, and is owned and operated by the Westinghouse Electric and Manufacturing Company.

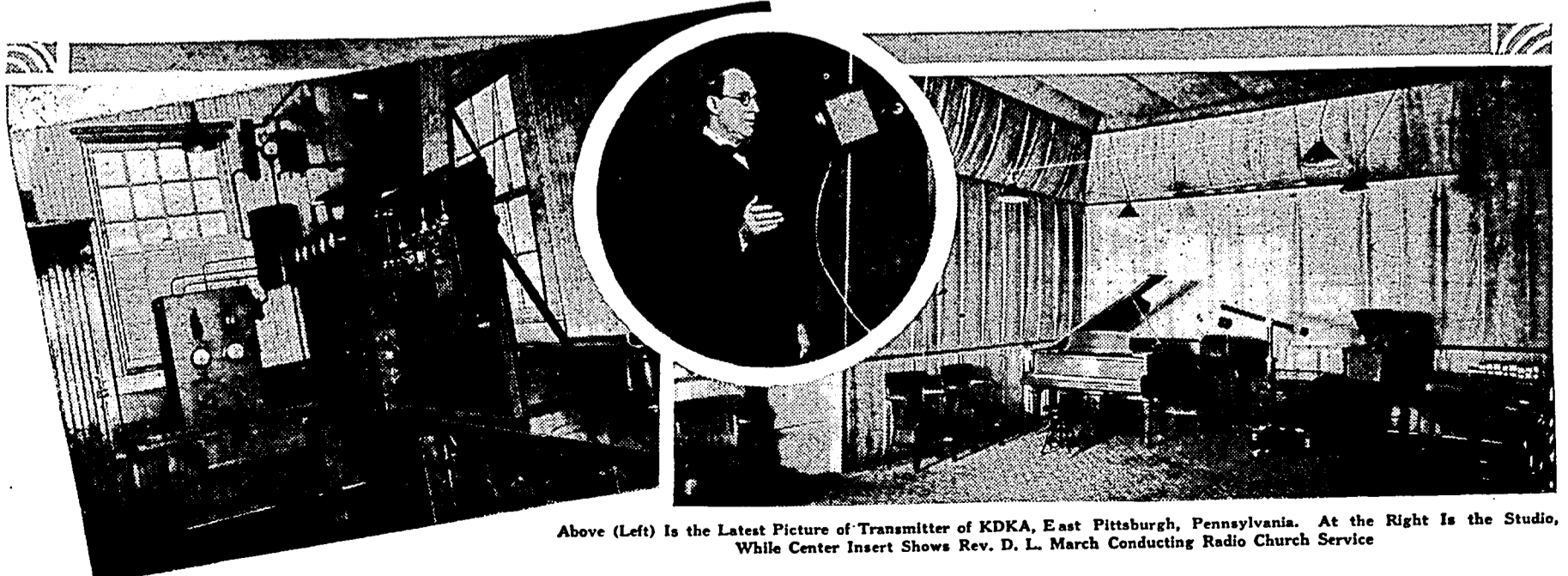
Beginning December 21, 1920, a nightly program was broadcast, and on January 2, 1921, KDKA transmitted the first Radiophone church service. Boxing bouts were broadcast in April of the same year.

Range Embraces Great Area

Programs by KDKA have been heard in

Canada, New England, Florida, California, Arizona, the Dakotas, Cuba, Mexico, on many ships in the Atlantic Ocean, and even in Venezuela. An official report from the station gives its range to the north as 500 miles, south, 2,500 miles, east, 2,300 miles and west 3,000 miles. The great range of the station is accomplished on only 500 watts input.

The regular weekday program of KDKA
(Continued on page 7)



Above (Left) is the Latest Picture of Transmitter of KDKA, East Pittsburgh, Pennsylvania. At the Right is the Studio, While Center Insert Shows Rev. D. L. March Conducting Radio Church Service

NEW DEVICE SENDS NEWS OUT SECRET

Thirty-Two Methods of Adjustment Makes Uncipherable Codes

Radio Transmitter Used Instrument Looks Like Typewriter —Sends Message 800 Miles in Experiment

Few new uses for Radio are considered as important as the printing Radiotelegraph which, according to its patentees and manufacturers, the Morkrum company of Chicago, is destined soon to supplant the wired distribution of news. Recent tests in Chicago, Washington, D. C., and on the Pacific coast, have proved, it is said, the practicability of the device.

In the operation or application of five little magnets which form part of the apparatus lies the secret of the printing telegraph or the teletype. This quintet of magnets by means of various combinations or adjustments receive and interpret electrical impulses from a Radio transmitting station. A camshaft translates these impulses or messages on a machine resembling a typewriter. The magnets may be arranged in 32 ways. In cooperation with the receiving station the broadcaster may use any one of the 32 methods of adjustment. Each of these ways may be established as a code thus enabling secrecy in the transmission or dissemination of news or other form of information.

If the broadcasting and receiving stations are adjusted to print the letter B, an impulse from the former station is received by the B impulse on the receiver and the mechanism of the latter then prints that letter. By agreement between the operators of the sending and receiving stations the letter B may be impelled through the ether in many other combinations or codes thus establishing the secrecy necessary to the dispatch of news by competitive agencies.

By changing the speed of the motor which drives the receiving set and by informing the transmitting operator as to the alteration, a new code is formed. An operator bent on learning the message of another would be forced to ascertain the wavelength, motor speed and keyboard code of the latter.

The teletype broadcaster is composed of a CW Radio transmitter and a teletype; the receiving set is composed of a standard Radio receiver, a Radio polarized relay and a receiving teletype. The relay is necessary to change the oscillatory Radio waves into straight, steady impulses to enable interpretation.

When the operator of the sending Radio teletype depresses a lettered key he releases a rotating cam contractor which transmits a series of signals corresponding with a unit of the code then in use. This part of the Radio transmitter corresponds with a telegraph key. It is placed in the grid circuit of a CW transmitting set and interrupts this circuit as would the key in ordinary Radio transmission.

At the Radio receiving end the signals are received, rectified and amplified as in ordinary Radio sets. Thereafter the signals cause the operation of a Radio polarized relay. Then the local operations are like those which would occur if the apparatus were controlled by a wired system.

The Morkrum company's experiments with different types of relays show, it is said, that messages may thus be sent satisfactorily for short distances or to places 800 or more miles away, depending only on the power of the broadcasting station.

The printing telegraph or teletype is arranged for the use of tape or page. The former is less expensive; it is adopted to light work. The latter device, which is operated by motor, functions like a typewriter and registers or prints as many as 80 words a minute.

BANK BROADCASTS

(Continued from page 1)

out of the path of the Rike-Kumler (WFO) station located in Dayton, the plant was placed in operation on a farm 14 miles west of Dayton.

Every day between the hours of one and three in the afternoon and from 7:30 o'clock to 9:45 o'clock in the evening the broadcasting is done.

In order that musical programs of a pretentious nature might be put on, a leased wire has been hung from a Dayton studio of music to the station.

Monday night is known as bank night.

COCKROACH CLAIMED PIONEER RADIO BUG

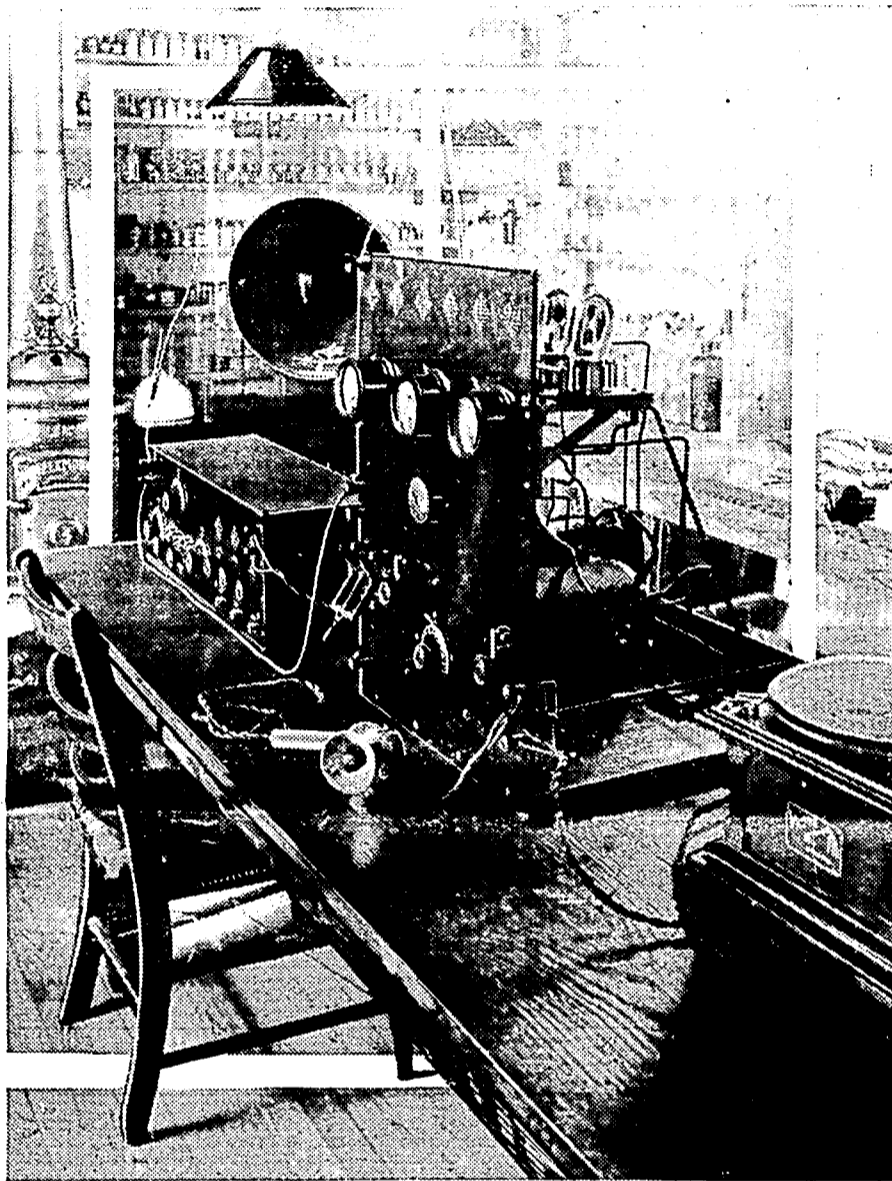
TALK about Radio bugs, here is a new species: "Lightning bugs are living Radio outfits," says Hamilton Bailey, U. S. Navy Radio operator. Each bug has its own aerial—the feelers—and its miniature audion bulbs of low Radio frequency and the parent bugs have Radio broadcasting apparatus. The cockroach communicates by Radio. He has a wave length of one-half inch with low frequency. These miniature living Radio outfits are being investigated to determine their sending and receiving ability.

LOUD SPEAKERS ARE MADE OF SEA SHELLS

A HORN-SHAPED sea shell makes the ideal amplifier or "loud speaker" for the Radiophone. The shells issue clearer tones and eliminate the metallic sound. The shells were used on private receivers owned by Vinton L. Cooley and Louis Scotford. Large shells were procured and they were cut off at the stem and these were attached to the receivers of the machines.

They served excellently as amplifiers and the inventors were astonished at the clearness of the reception.

SENDS BANK TALK AND MARKETS



Broadcasting station on farm, 14 miles west of Dayton. (See story, page 1)

On this evening some member of the official staff of the bank gives a talk on a financial matter which is of interest to the farmers.

One night of the week is devoted to the interests of the farm women. Talks dealing with the problems of the farm wife are broadcasted.

Another night is devoted to the boys and girls on the farm. Stories and lectures dealing with their work are flashed out over the country.

Receiving stations are to be established in all the township farm bureau meeting places in the near future in order that the members may gather there and listen to lectures on various subjects of interest.

The station is using at the present time six 5-watt tubes. A grid modulation radiating 1½ amperes is in use. The aerial is of the cage type, 100 feet long, stretched between two 75-foot towers. The call letters of the station are WPG.

PROVE PIONEERS

(Continued from page 6)

(Eastern Standard Time), is as follows: Music 10:00 to 10:20 A. M., 12:30 to 1:00 P. M., 2:00 to 2:20 P. M., and 4:00 to 4:20 P. M.; 3:30 P. M., major league baseball game reports by innings; 7:30 P. M., bedtime story for children; 7:45 P. M., special news, government market reports, summary of New York stock exchange, and weather report; 8:30 to 9:00 P. M., musical program; 9:00 P. M., United Press news bulletins; 9:05 to 9:30 P. M., musical program; 9:55 to 10:00 P. M., Arlington time signals. On Saturdays, 2:00 to 3:00 P. M., a special concert is broadcast.

An interesting incident of the use to which market reports are put is given in the report of one dealer who saved twenty-five cents a barrel on flour purchased on

advance information. The KDKA weather reports are believed to have saved thousands of dollars worth of hay by giving advance news of impending rain storms.

SHORT CUTS TOLD TO THE BEGINNER

PUBLISHERS OFFER BOOKS SOLVING ALL PROBLEMS

Subject Matter Ranges from Making a Set to Using It

The A. B. C. of Radio. By Waldemar Kaempffert. This little book contains more nourishing mental food for the Radio beginner than anything that has yet come to our attention. It starts one right by explaining just what that seemingly mythical thing is that we all would like to know.

Radio Time Signal Receiver. By Austin C. LesCarbours. This new book tells you how to build a simple outfit designed expressly for the beginner. You can build the outfit in your own workshop and install them for jewelers either on a one-payment or a rental basis. The apparatus is of such simple design that it may be made by the average amateur mechanic possessing a few ordinary tools. Price, 35 cents.

Construction of a Transatlantic Wireless Receiving Set. By L. G. Pacent and T. S. Curtis. A practical treatise for the advanced Radio amateur who desires to construct and operate apparatus that will permit of the reception of messages from the large stations in Europe with an aerial of amateur proportions. Incorporated in the text is a list of stations with their call letters, wave lengths, hours of operation and the system used in each. Price, 35 cents.

Radio Telephony. This complete text on Radio Telephony is used by Radio engineers, Radio electricians in the Navy, men in the Signal Corps and men in the Aviation Service who handle Radio equipment. It is fully illustrated with wiring diagrams and previously unpublished photographs of Radiophone apparatus. 247 pages. Price, \$2.50.

The Consolidated Radio Call Book. This is one book every Radio operator must have. Contents as follows: Cable rates; notes on foreign stations; high power Radio stations of the world; international abbreviations; stations transmitting press and schedules; Radio calls, including ships and stations, arranged alphabetically by letters, Radio calls arranged alphabetically by stations, Radio calls arranged alphabetically by vessels, also a list of licensed amateur Radio stations in the United States. Price, \$1.50.

IMMEDIATE DELIVERY

FROM FIRM ESTABLISHED SINCE 1893

CRYSTAL RECEIVING SET \$23 With Double Head Phone

COMPLETE

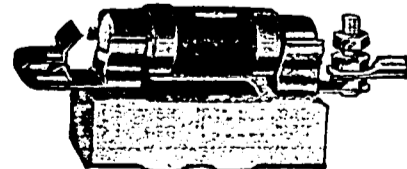
Well known universal set will receive broadcasts

Orders filled in the order received

ANTON A. FRANK

110 NORTH DEARBORN, CHICAGO, ILL.

You Needn't Throw a Switch to Guard Against Lightning When You Install a Brach Vacuum LIGHTNING ARRESTER



The most positive, the most sensitive safeguard for your radio against lightning and static. Operates automatically. Needs no attention.

Cannot become grounded. Cannot give trouble. No moisture, dirt or bugs can get into sealed chamber — No weak or lost signals.

Approved by National Board of Fire Underwriters. Electrical No. 3962

WARNING! Insurance Companies, Fire Underwriters and Local Inspectors demand that an approved type of Lightning Arrester be used. Insist on Approved Instruments Only That Bear Listing Number.

Carried in Stock by All Dealers and Distributed by Leading Radio and Electrical Jobbers

L. S. BRACH MFG. CO., Newark, N. J.

16 Years Specialists in Lightning Protective Apparatus

Radiophone Broadcasting Stations

Corrected Every Week. Form
Copyrighted by RADIO DIGEST, 1922

Explanatory—In the following tabulation, RADIO DIGEST will attempt each week to make it easy for the reader to hear all the broadcasting stations in his vicinity. Hence the alphabetical classification, by states and then by cities, is used. Stations whose schedules of operating hours are known (those having C, N, R, etc., under "Program" in the following tabulation), are listed at the end of the table, alphabetically by call letters, under the head "Station Schedules." Having picked a station, use the "Station Schedule" list to learn its operating hours and what you will hear during the various hours. The following abbreviations are used in the "Program" column of the tabulation: A—agricultural bulletins, etc.; C—concerts; E—educational; F—fire; H—health reports; I—instruction (radio); L—lectures or speeches; M—market reports; N—news; P—police; R—religious; T—time signals; V—vaudeville or entertainment; W—weather reports. An asterisk (*) designates code telegraphy.

State and City	Call	Wave Lengths	Miles Range	Program	By Whom Operated
Alabama: Montgomery	WGH	360	1,000	W; R; E; A; M; C	Montgomery Light & Water Power Co.
Arkansas: Pine Bluff	WOK	360	1,000	N; M; W; C; R	Arkansas Light & Power Co.
California: Berkeley	KRE	360		C	Maxwell Electric Co.
Fresno	KMJ	360		Not known	San Joaquin Light & Power Corp.
Gridley	KFU	360	500	C	The Precision Shop
Hollywood	KGC	360	300	C	Electric Lighting & Supply Co.
Long Beach	KSS	360		Not known	Prest & Dean Radio Research Lab.
Los Altos	KLP	360	1,500	C; N	Colin B. Kennedy Co.
Los Angeles	KJC	360		Not known	Standard Radio Co.
Los Angeles	KNR	360		Not known	Beacon Light Co.
Los Angeles	KNV	360		Not known	Radio Supply Co. of Calif.
Los Angeles	KON	360		Not known	Holzwasser, Inc.
Los Angeles	KUS	360		Not known	City Dye Works & Laundry Co.
Los Angeles	KWH	360		Not known	Los Angeles Examiner
Los Angeles	KXS	360		Not known	Braun Corporation
Los Angeles	KZI	360		Not known	Irving S. Cooper
Los Angeles	KJS	360		Not known	Bible Institute of Los Angeles, Inc.
Los Angeles	KOG	360		Not known	Western Radio Electric Co.
Los Angeles	KQL	360		Not known	Arno A. Kluge
Los Angeles	KYJ	360	1,000	C; M; W; N	Leo J. Meyberg Co.
Los Angeles	KZC	360		N; C	Western Radio Electric Co.
Modesto	KOQ	360		Not known	Herald Pub. Co.
Modesto	KXD	360		Not known	Modesto Evening News
Monterey	KLN	360	150	W; M; C	Noggle Electric Works
Oakland	KLS	360	150	C	Warner Bros. (also operate 6XAM)
Oakland	KZM	360	200	N; C; L; V	Hotel Oakland (Preston D. Allen)
Oakland	KZY	360	1,500	C; R; N	Atlantic-Pacific Radio Supplies Co.
Pasadena	KLB	360	300	C	J. J. Dunn & Co.
Pomona	KGF	360	150	C; N; M	Pomona Fixture & Wiring Co.
Sacramento	KVQ	360		C; N	J. C. Hobrecht (Sacramento Bee)
San Francisco	AG1	360; 1,450	50	C; I; L	Signal Corps, Presidio
San Francisco	KDN	360; 485	250	C; W	Leo J. Meyberg Co.
San Francisco	KGB	360		Not known	Edwin C. Lorden
San Francisco	KSL	360	50	C; N; L	The Emporium
San Francisco	KUO	360	1,500	N; L	The Examiner Printing Co.
San Jose	KQW	360		C	Chas. D. Herrold
Stockton	KIQ	360		C	C. O. Gould
Stockton	KWJ	360	1,000	N; M; C	Portable Wireless Telephone Co.
Sunnyvale	KJL	360		C	The Radio Shop
Colorado: Denver	9WD	235		C	W. D. Pyle
Denver	DD-5	340	1,500	C; N; W; L	Fitzsimmons Hospital
Denver	KLZ	360; 485	1,000	N; W; C; M; R	Reynolds Radio Co. (also operate 9ZAF)
Denver	KOA	485		T; W; N	T. M. C. A. (W. H. Smith)
Connecticut: Greenwich	WAAQ	360		Not known	New England Motor Sales Co.
New Haven	WCJ	360		Not known	A. C. Gilbert Co.
D. of C. Washington	WMV	360		Not known	Doubleday Hill Elec. Co.
Washington	WDM	360		R; L; C	Church of the Covenant
Washington	WDW	360		Not known	Radio Construction & Electric Co.
Washington	WJH	360	250	L; C; V	White & Boyer
Washington	WVX	1,160	600	W; M	Post Office Department
Washington	3YN	360		L	National Radio Institute
Georgia: Atlanta	WSB	360		Miscellaneous	Atlanta Journal Co.
Atlanta	4CD	200; 375		N; C; L	Carter Electric Co.
Illinois: Chicago	WGUR	360		Miscellaneous	Fair Store
Chicago	KYW	360; 485	800	C; L; N; M; R	Westinghouse Electric & Mfg. Co.
Chicago	WBUR	360	1,000	P; F	City of Chicago
Peoria	9YAN	360		Not known	Bradley Institute
Tuscola	WDZ	360		Not known	James L. Bush
Indiana: Indianapolis	WLK	360		C; V; N; L	Hamilton Mfg. Co.
Indianapolis	WOH	360	700	M; C	Hatfield Electric Co.
Richmond	WOZ	485	300	C; M; N; W; L	Palladium Printing Co.
West Lafayette	WBAA	370	100	Miscellaneous	Purdue University. (Also 9YB)
Iowa: Davenport	WOC	360; 485		E; C; W; M; R	Palmer School of Chiropractic
Des Moines	WGF	360		Not known	Register-Tribune
Iowa City	9YA	360		M; N	University of Iowa
Kansas: Emporia	WAAZ	360		Not known	Hollister Miller Motor Co.
Wichita	WEY	360		Not known	Cosradio Co.
Kentucky: Louisville	9ARU	200	200	N; I	Darrell A. Downard
Louisiana: Shreveport	WAAG	360		Not known	Elliot Elec. Co.
Maine: Auburn	WMB	360		Not known	Auburn Electrical Co.
Maryland: Baltimore	WKC	360		Not known	Jos. M. Zamorski Co.
Massachusetts: Boston	WAAJ	360		Not known	Eastern Radio Institute
Medford Hillside	WGI	360	500	N; C; L; I; H; R; M	Am. Radio & Research Corp. (also 1XE)
Springfield	WBZ	360	500	C; N; L; R; M; E	Westinghouse Elec. & Mfg. Co. (also 1XAB)
Michigan: Dearborn	WWI	360		Not known	Ford Motor Co.
Detroit	WWJ	360; 485	1,000	C; V; N; M; W; R; T	The Detroit News. (Was WBL)
East Lansing	WHW	485	150	M; W	Stuart W. Seeley
Minnesota: Minneapolis	WAL	360		Not known	Minnesota Tribune Co.
Minneapolis	WLB	360; 485		W; M; C; N	University of Minnesota
St. Paul	WAAH	360		Not known	Commonwealth Elec. Co.
Missouri: Columbia	WAAN	360		M; W; N	University of Missouri
Jefferson City	WOS	485		M	Missouri State Marketing Bureau
Kansas City	WOQ	360; 485	300	M; W; C; L; R	Western Radio Co. (Also operate 9XAB)
Kansas City	WPE	360		Not known	Central Radio Co., Inc.
St. Louis	KSD	360		Not known	Pulitzer Publishing Co.
St. Louis	WAAB	360		Not known	Chamber of Commerce
St. Louis	WCK	360		Not known	Stix-Baer-Fuller
St. Louis	WEB	360		Not known	Benwood Co., Inc.
St. Louis	WEW	360		W; M; C	St. Louis University

Your Directory—

To aid the beginner and to help him realize full benefits from his receiving station, RADIO DIGEST has compiled the accompanying list of radiophone broadcasting stations. To use the "radiophone directory" to its maximum advantage, the reader should note the broadcasting stations nearest, and attempt to tune them in at the wave lengths given.

Broadcasting stations with regular schedules of operating hours, are given below. Doubtless a few stations have been omitted inasmuch as their schedules have not been reported to RADIO DIGEST. These will be added as reported. The kind of program broadcast by a station during its various operating hours is also given.

In fact, the reader, by means of RADIO DIGEST'S radiophone directory, can pick out his favorite program, the station he desires, or the time which he prefers to listen in. Time, in the following list of stations having schedules, is always given in the time used in the city in which the station is located, as for example "KYW, Chicago, Illinois," indicates that the schedule of KYW is given in Central Standard time, the time which is in use in Chicago.

The stations are listed alphabetically by call letters. The list, therefore, acts as an index to the foregoing table:

Station Schedule

- A G 1, San Francisco, Calif.**
Mondays, 7:00-9:00 P. M., concert and instruction in radio.
- D D-5, Denver, Colo.**
Daily except Sundays, 8:15 P. M., weather, news and concert. Thursdays, 8:15-9:30 P. M., special concert, and speeches additional.
- K D E A, Pittsburgh, Pa.**
Daily except Sundays, 10:00-10:15 A. M., 12:30-1:00 P. M., 2:00-2:20 P. M., 4:00-4:20 P. M., music; 7:30 P. M., bedtime stories; 7:45, news; 8:30-9:30, music and news. Saturdays, 3:00-4:00 P. M., concert. Sundays, 10:15 A. M., 3:00 P. M., and 7:30 P. M., church service.
- K D N, San Francisco, Calif.**
Daily except Sundays, 4:30-5:30 P. M., markets, news and concert; 7:10-7:30 P. M., financial news and weather. Mondays, 8:30-9:30 P. M., concert. Thursdays, 7:30-8:30 P. M., concert. Saturdays and Sundays, 8:15-9:00 P. M., concert.
- K F C, Seattle, Wash.**
Every day, eight hours, news, music and entertainment.
- K F U, Gridley, Calif.**
Mondays and Thursdays, 8:00-9:00 P. M., concert. Sundays, 3:00-4:00 P. M., and 8:00-9:00 P. M., concert.
- K G C, Hollywood, Calif.**
Tuesdays, Thursdays and Saturdays, 7:30-8:30 P. M., concert.
- K G W, Portland, Ore.**
Mondays, Wednesdays, and Fridays, 7:30-8:30 P. M., concert. Sundays, 7:30-8:30 P. M., church service.
- K J J, Sunnyvale, Calif.**
Tuesdays, 8:15-9:00 P. M., concert. Fridays, 7:30-8:15 P. M., concert.
- K J Q, Stockton, Calif.**
Wednesdays, 7:00-8:00 P. M., concert.
- K J E, Seattle, Wash.**
Daily except Sundays, 8:00-9:00 P. M., miscellaneous.
- K L B, Pasadena, Calif.**
Mondays and Fridays, 7:30-8:15 P. M., concert. Sundays, 3:00-4:00 P. M. and 8:00-9:00 P. M., concert.
- K L N, Monterey, Calif.**
Daily, 12:00-1:00 P. M., weather, markets and news; 7:00-8:00 P. M., concert.
- K L P, Los Altos, Calif.**
Mondays, 7:30-8:30 P. M., industrial news and concert. Thursdays, 8:30-9:00 P. M., concert. Sundays, 4:00-5:00 P. M., concert.
- K L S, Oakland, Calif.**
Daily, 12:00-1:00 P. M., concert. Saturdays, 7:30-8:15 P. M., concert.
- K L Z, Denver, Colo.**
Daily except Sundays, 7:30 P. M. on news, markets, bedtime story, concert. Sundays, 8:00-9:30 P. M., church service and music.
- K N J, Roswell, N. M.**
Daily except Sundays, 7:00-9:00 P. M., weather, stock and news. Mondays, Wednesdays and Fridays, 7:00-9:00 P. M., music. Sundays, church service.
- K O A, Denver, Col.**
Daily, 9:55-10:25, time and weather reports.
- K Q V, Pittsburgh, Pa.**
Daily except Saturdays and Sundays, 4:30-5:00 P. M., concert. Mondays, Wednesdays and Fridays, 9:30-10:30 P. M., concert. Sundays, 1:00-1:30 P. M. and 4:00-5:00 P. M., concert.

X Q W, San Jose, Calif.
Wednesdays, 7:30-8:15 P. M., concert.
Sundays, 5:00-6:00 P. M., concert.

X R E, Berkeley, Calif.
Sundays, 1:00-2:00 P. M. and 6:00-7:00 P. M., concert.

X S L, San Francisco, Calif.
Daily except Sundays, 10:00-11:00 A. M., concert and news; 2:00-3:00 P. M., concert and educational talk. Sundays, 2:00-3:00 P. M., concert and educational talk.

X U O, San Francisco, Calif.
Daily except Sundays, 3:00-3:30 P. M. and 5:30-6:45 P. M., news, etc. Sundays, 5:00-6:30 P. M., news, etc.

X V Q, Sacramento, Calif.
Daily except Sundays, 5:30-6:30 P. M., concert and news. Wednesdays and Saturdays, 8:00-9:00 P. M., concert.

X W G, Stockton, Calif.
Daily except Sundays, 4:00-5:00 P. M., news, concert and markets. Tuesdays and Fridays, 8:00-9:00 P. M., concert. Sundays, 2:00-3:00 P. M., concert.

X Y J, Los Angeles, Calif.
Daily except Sundays, 4:00-5:00 P. M., concert, markets, news and weather. Mondays, Thursdays and Saturdays, 8:00-9:00 P. M., same program.

Who Hears Broadcasting Stations Farthest?

TO STIMULATE long distance receiving, RADIO DIGEST ILLUSTRATED has started a receiving record contest. If you can hear one of the broadcasting stations at a distance you consider remarkable, send in the evidence to this publication, care of the Broadcast Editor.

The receiving station hearing a given broadcasting station at the greatest distance, will, if ample evidence is submitted, be listed as the record holder. When another receiving station breaks the record listed, it will supersede the listing of the first station.

A number of amateurs have sent in their records already. Get yours in NOW for the listing will be started in the May 20 issue! Be sure to state the number of miles distance from your station to the station you have heard.

—Broadcast Editor.

X Y W, Chicago, Ill.
Daily except Sundays, 9:30 A. M., 10:00 A. M., 1:20 P. M. and 2:15 P. M., stock quotations and markets; 2:15 P. M., 3:00 P. M., baseball; 4:15 P. M. and 6:30 P. M., news and markets; stock report summary; 7:30 P. M., children's hour; 8:00-9:00 P. M., concert; 9:00 P. M., news. Sundays, 3:30 P. M., church service.

X E C, Los Angeles, Calif.
Daily except Sundays, 5:00-5:30 P. M., news and on Tuesdays, Wednesdays and Fridays, same hour, concert.

X Z M, Oakland, Calif.
Daily except Sundays, 7:15-7:30 P. M., news. Tuesdays, 7:30-8:15 P. M., concert. Fridays, 8:15-9:00 P. M., concert.

X Z Y, Oakland, Calif.
Daily except Sundays, 3:30-4:30 P. M., concert; 6:45-7:00 P. M., news; Wednesdays, 7:30-8:15 P. M., concert. Saturdays, 8:15-9:00 P. M., concert. Sundays, 11:00 A. M. to 12:15 P. M., church service; 3:00-4:00 P. M., concert.

W B Z, Springfield, Mass.
Daily except Sundays, 7:30 P. M., children's hour; 7:45 P. M., market, weather, lecture; 8:00-9:00 P. M., concert. Sundays, 3:00 P. M., and 8:00 P. M., church service.

W D M, Washington, D. C.
Sundays, 10:30 A. M., church service; 3:00 P. M., lecture; 7:30 P. M., church service.

W F O, Dayton, O.
Daily, 9:00-9:30 A. M., concert and news; 11:00-12:00 A. M., music, news, markets, weather; 4:00-5:00 P. M., music, news, markets, agriculture, weather. Mondays, Wednesdays and Fridays, 7:00-8:30 P. M., music and lecture. Sundays, 11:00-12:00 A. M., church.

W G H, Montgomery, Ala.
Daily, 11:05 A. M., weather; 4:05 agricultural. 8:30-9:30 P. M., educational, agricultural, stock quotations and concert. Sundays, 8:30-9:30 P. M., religious program.

W G I, Medford Hillside, Mass.
Daily except Sundays, 2:55 P. M., music; 3:00 P. M., news; 7:30 P. M., baseball scores, news; 7:45 P. M., police reports; on Tuesdays and Thursdays, 7:30 and 7:45 P. M., programs at 7:45 and 7:55 P. M. respectively. Sundays, 8:00 A. M., church service; 8:45 A. M., sacred music. Special features week nights, 7:30 to 9:00 P. M.

W G Y, Schenectady, N. Y.
Daily except Saturdays and Sundays, 7:00 P. M., markets. Tuesdays, Thursdays and Fridays, 7:45-9:00 P. M., concert. Fridays, 11:30 P. M., concert and speech.

W H A, Madison, Wis.
Daily except Sundays, 12:30-1:00 P. M., weather, markets; Tuesdays, Thursdays, Fridays and Saturdays, 12:00-1:00 P. M., weather, markets, time; Tuesdays only, 8:00-9:00 P. M., concert; Fridays, 8:00 P. M., news; 8:15 P. M., 9:00 P. M., concert; Saturdays, 1:05-1:20 P. M., lecture.

W H K, Cleveland, O.
Daily, 1:30-2:00, 3:30-4:00, 8:00-9:30 P. M., concert.

W H Q, Rochester, N. Y.
Daily except Sundays, 12:00-12:15 A. M., music and news; 7:30-8:00 P. M., markets, bedtime stories, lecture; 8:00-8:30 P. M., music. Sundays, 3:00 P. M. and 7:30 P. M., church service.

W H W, East Lansing, Mich.
Daily except Sundays, 11:30-12:30 A. M., weather and markets.

W I K, McKeesport, Pa.
Daily except Sundays, 6:30-7:00 P. M.

State and City	Call	Wave Lengths	Miles Range	Program	By Whom Operated
Nebraska:					
Lincoln	9YY	375	300	C; N; M; W	University of Nebraska
Omaha	WOU	360; 485		Not known	Metropolitan Utilities District
	WOV	360		Not known	R. E. Howell
New Jersey:					
Deal Beach	2XJ	380		Test	Am. T. & T. Co.
Jersey City	WNO	360	500	C; N; L	Wireless Tel. Co. of Hudson Cy.
Jersey City	2IA	200	70	L; C; R	Jersey Review
Newark	WAAM	360		Not known	I. R. Nelson Co.
Newark	WJK	360		Not known	DeForest Radio T. & T. Co.
Newark	2SAI	360		Test	Westinghouse E. & Mfg. Co.
Newark	WOR	360		Miscellaneous	L. Bamberger & Co.
Newark	WJZ	360	2,000	N; L; C; W; A; R.	Westinghouse Electric & Mfg. Co.
New Mexico:					
Roswell	KNJ	360	300	M; W; N; C	Roswell Public Service Co.
New York:					
Albany	WNJ	360		Not known	Shotton Radio Mfg. Co.
Buffalo	WWT	360		Not known	McCarthy Bros. & Ford
New York	KDOW	360	1,000	Not regular	S. S. America, N. Y. Harbor
New York	WVP	360; 1,450		I; C; V	Signal Corps, Fort Wood
New York	WWZ	360	200	C; N; L	Wanamaker's Dept. Store
New York	WDT	360		Not known	Ship Owners' Radio Service
New York	WYCB	1,450		N; C	Amateur Radio Reserve
Rochester	WHQ	360; 485	50	L; C; M; R	Rochester Times-Union
Ridgewood	WHN	360; 485		H; C; L; I	Ridgewood Times
Schenectady	WGY	360	1,000	M; C; L	General Electric Co.
Schenectady	WRL	360	800	C; R	Union College. (Also 2XQ.)
Tarrytown	WRW	360		C	Tarrytown Radio & Research Corp.
Utica	WSL	360		Not known	J. & M. Electric Co.
North Carolina:					
Charlotte	WBT	360		Not known	Southern Radio Corp.
Ohio:					
Canton	WWB	360		Not known	Daily News Printing Co.
Cincinnati	WLW	360	1,200	C; L; N; R	Crosley Mfg. Co.
Cincinnati	WMH	360; 485	1,000	C; N; L; W; V; M	Precision Equipment Co. (Also 8NB.)
Cleveland	WHK	360	130	C	Warren R. Cox
Columbus	8YO	275		T; M; L; N	Ohio State University
Dayton	WFO	360; 485	300	M; N; C; W; L; R; A	Rike-Kumler Co.
Dayton	WA-1	360		Not known	U. S. Army
Fairfield	WL-2	360		Not known	U. S. Army
Hamilton	WRK	360	1,000	C; R; T	Doron Bros. Electrical Co.
Lebanon	WPG	360		Not known	Nushawg Poultry Farm
Toledo	WHU	360		Not known	Wm. B. Duck Co.
Toledo	WJK	360	300	C; L; R	Service Radio Equipment Co.
Toledo	WDZ	360; 485		Not known	Marshall-Gerken Co.
Youngstown	WMC	360		Not known	Columbia Radio Co.
Oklahoma:					
Oklahoma City	WKY	360	500	W; V; M; N; L	Oklahoma Radio Shop
Oklahoma City	5XT	360		N	E. R. Hull
Oregon:					
Hood River	KQP	360		Not known	Blue Diamond Elec. Co.
Portland	KQY	360	50	Miscellaneous	Stubb's Electric Co.
Portland	KYG	360	500	Miscellaneous	Willard P. Hawley, Jr.
Portland	KGW	360	200	C; R	Ship Owners' Radio Service
Portland	KGG	360	500	N; M; L; I	Hallock & Watkins
Portland	KGN	360	50	Not known	Northwestern Radio Mfg. Co.
Pennsylvania:					
McKeesport	WIK	360	500	C; L; R	K. & L. Electric Co.
Philadelphia	WFI	360		N; C; I; L	Strawbridge & Clothier
Philadelphia	WIP	360		N; C; I; L	Gimbel Bros. Dept. Store
Philadelphia	WGL	360		Not known	Thos. F. J. Howlett. (Also 3AWL)
Pittsburgh	KDKA	360	1,000	N; C; L; R; V; T; M	Westinghouse Electric & Mfg. Co.
Pittsburgh	KQV	360	750	C	Doubleday-Hill Electric Co.
Rhode Island:					
Pawtucket	10J	200		Not known	Raymond F. Farnham
Pawtucket	1XAD	200		Not known	Thomas Gibline
Tennessee:					
Memphis	WKN	360; 485		M; W	Riechman-Crosby Co.
Memphis	WPO	360		N; C; L; T	News Scimitar
Texas:					
Austin	WCM	360		N; W; M	University of Texas
Dallas	WRR	360; 485	200	W; M; N; C; R	City of Dallas
Houston	WEV	360		M	Hurlburt-Still Elec. Co.
Washington:					
Seattle	KFC	360	700	N; C; V; H; L; R	Northern Radio & Electric Co.
Seattle	KHQ	360		Not known	Louis Wasmer
Seattle	KJR	360	200	C; L; N	Northwest Radio Service Co.
Spokane	KBZ	360		Not known	Doer-Mitchell Elec. Co.
Spokane	KOE	360		Not known	Spokane Chronicle
Tacoma	WAAG	360		Not known	Mullins Elec. Co.
Yakima	KFY	360		Not known	Foster-Bradbury Radio Store
Yakima	KQT	360		Not known	Electric Power & Appliance Co.
West Virginia:					
Charleston	WAAO	360		Not known	Radio Service Co.
Huntington	WAAR	360		Not known	Groves-Thornton Hdwe. Co.
Wisconsin:					
Milwaukee	WAAK	360	600	Not known	Gimbel Bros. Dept. Store
Madison	WHA	360; 485		W; C; N; M; L	University of Wisconsin
Canada:					
Montreal		1,200	200	C; N; L	Marconi Telegraph Co. of Canada, Ltd.
Toronto		450		Not known	Canadian Independent Telephone Co.
Toronto		1,200		Not known	Marconi Telegraph Co. of Canada, Ltd.

Tuesdays and Thursdays, 9:30-10:30 P. M. Sundays, 1:30-2:30 P. M. and 6:30-7:00 P. M.

W J H, Washington, D. C.
Tuesdays, 7:30-10:00 P. M., lecture and concert.

W J K, Toledo, O.
Daily except Sundays, 3:00-4:00 P. M., concert. Mondays, Wednesdays and Fridays, 7:30-9:00 P. M., concert, lecture, etc. Sundays, 7:30-9:00 P. M., sermon and concert.

W J Z, Newark, N. J.
Daily except Sundays, hourly from 11:00 A. M. to 6:00 P. M., music; 11:00 A. M., 12:00 M., 5:00 P. M. and 10:00 P. M., weather; 2:05 P. M. (except Saturdays), shipping news; 12:00 M. and 6:00 P. M., agricultural; 9:52 P. M., Arlington time signals. Tuesdays, 7:00 P. M., children's hour; 8:20-10:00 P. M., concert. Thursdays and Saturdays, 8:20-10:00 P. M., concert. Sundays, 3:00 P. M., church service; 8:20-10:00 P. M., concert.

W L B, Minneapolis, Minn.
Daily, 12:00 M., weather and stock quotations; 7:30 P. M., markets. Wednesdays, 8:00 P. M., concert.

W L K, Indianapolis, Ind.
Tuesdays, 8:00-8:55 P. M., concert; 9:00-10:00 P. M., vaudeville and news. Thursdays, 8:00-8:55 P. M., concert, lecture and news. Sundays, 8:00-8:55 P. M., concert, religious.

W L W, Cincinnati, O.
Tuesdays, Thursdays and Fridays, 8:00 P. M., music, news and lecture. Sundays, 8:00 P. M., church services.

W M H, Cincinnati, O.
Daily except Sundays, 11:00 A. M. and 4:00 P. M., weather and markets. Mon

day, Wednesday and Saturdays, 8:15-10:00 P. M., concert, lecture, vaudeville and news.

W N O, Jersey City, N. J.
Daily, 10:01 P. M., news, concert.

W O C, Davenport, Ia.
Daily except Sundays, 12:00-12:15 P. M., markets, weather and concert; 3:30-4:00 P. M., educational talks; 5:45-6:00 P. M., concert; 7:00-8:00 P. M., concert. Saturdays, 8:00-8:15 P. M., business review. Sundays, 9:00-10:00 A. M., and 5:30-6:00 P. M., sacred concert.

W O E, Indianapolis, Ind.
Daily except Sundays, 10:00-11:00 A. M., 4:00-5:00 P. M., stock reports and music; 8:30-10:00 P. M., music. Saturdays, 1:00-2:00 P. M., stock reports and music. Sundays, 10:00-11:00 A. M., music.

W O Q, Kansas City, Mo.
Daily except Sundays, 9:30 A. M., to 1:15 P. M., every half hour, markets; 11:30 A. M., 2:00 P. M. and 7:30 P. M., markets, weather and road conditions; 7:45-9:00 P. M., concert and vaudeville. Sundays, 7:00 P. M., church service.

W O R, Newark, N. J.
Daily except Sundays, 9:00 A. M., 5:00 P. M., hourly program.

W O Z, Richmond, Ind.
Daily except Sundays, 12:00-12:15 P. M., markets; 4:00-5:00 P. M., music, news, markets; 6:30-7:00 P. M., music, news weather and lecture.

W R K, Hamilton, O.
Mondays, Wednesdays and Saturdays, 8:30-10:30 P. M., music and news. Fridays, 7:30-9:30 P. M., music. Sundays, 10:45 A. M. and 7:30 P. M., church service.

W R L, Schenectady, N. Y.
Irregular programme.

W R E, Dallas, Texas.
Daily, 7:00 P. M., police news, sports, weather; 8:30-9:30 P. M., concert. Sundays, 11:00 A. M. and 7:30 P. M., church service.

W W J, Detroit, Mich.
Daily except Sundays, 11:30-11:55 A. M. and 3:30-4:00 P. M., music; 7:00-8:30 P. M., concert, etc.

W W X, Washington, D. C.
Daily, 10:00 A. M., weather; 10:30 A. M., markets; 5:00 P. M., markets 7:30 P. M. and 8:00 P. M., markets; 9:50 P. M., weather.

2 I A, Jersey City, N. J.
Wednesdays, 7:00-8:00 P. M., concert and lecture. Sundays, 7:00-8:00 P. M., church service and concert.

3 Y N, Washington, D. C.
Daily, 6:30-7:30 P. M., radio instruction (code and radiophone).

4 C D, Atlanta, Ga.
Tuesdays, Thursdays and Sundays, 7:30-8:00 P. M., news and concert.

8 Y O, Columbus, O.
Irregular, time signals, news, markets, etc.

9 A E U, Louisville, Ky.
Mondays, and Wednesdays, in evening, police news, balance of week irregular.

9 W D, Denver, Colo.
Saturdays, 8:00-9:30 P. M., concert. Sundays, 5:30-7:00 P. M., concert.

9 Y A, Iowa City.
Irregular, markets, news, etc.

9 Y Y, Lincoln, Neb.
Daily except Sundays, 10:10 A. M., markets and weather; 7:30 P. M., irregularly, music.

Montreal, Canada (Marconi Station).
Tuesdays, 8:00-9:30 P. M., concert, news.

Radio Digest Illustrated

TRADE-MARK

E. C. RAYNER, Publisher
123 WEST MADISON STREET
TELEPHONE STATE 4844-4845
CHICAGO, ILLINOIS

New York Office - - - - - 2126 Broadway
Detroit Office - - - - - 28 Rowland Building

58
PUBLISHED WEEKLY

SUBSCRIPTION RATES

Yearly.....\$5.00 | Foreign.....\$6.00
Single Copies, 10 Cents

Entry as second-class matter applied for at the postoffice at Chicago, Illinois, under Act of March 3, 1879.

In a new scientific field where many writers are contributing articles there will arise some controversy over the expressions of opinions and statements made from time to time. Some of these controversies may be taken into the courts for settlement. The priority of inventions may be claimed as well as the merits of some part entering into the construction of the radio apparatus. The Radio Digest is an outlet for these expressions and the publisher disclaims any responsibility for opinions or statements made in connection with radio apparatus. The news will be printed as it comes to us.

Vol. 1 Chicago, Saturday, May 13, 1922 No. 5

The Radiophone Conference at Washington

Laws Planned to Be Passed that Will Aid the Amateur

A CONFERENCE of seven civilians and seven government officials is held for the purpose of suggesting revisions to the existent Radio communication laws of the United States to care for the abnormal growth of the science during the past year. They formulate, after careful consideration, a report and submit it to Secretary of Commerce Hoover, who called the conference. It is a well planned report. It is one that will enable laws to be passed which will care for Radio communication in an entirely satisfactory manner.

The next step, before the report means anything definite, is the enactment by Congress of laws incorporating the essential, if not all, recommendations of the conference. How long it will take Congress to realize that speed is necessary in the passage of such laws is a problem which can only be answered by past performance of our highest legislative body. We hope, and we feel, that action will not be delayed. We feel that Congress will get busy on the new Radio laws because we have occasion to know Herbert Hoover and the splendid committee which has aided him in drawing up the report. We know that they won't let Congress forget about the needed legislation.

Herbert Hoover has shown himself to be a friend of the Radio "bug." He believes that under proper supervision, the "bug" can do the country no harm, and perhaps may accomplish much good. The report carefully provides for such supervision. It provides for much that is lacking about the present Radio communication laws.

Broadcasting is so much of a public interest that the order of consideration, or right-of-way if you please, assumed by the conference was government interests first, public interests second, private interests third, and last of all, toll interests. Who of the public can complain or say that the conference did not give him a square deal?

The recommendations are thorough. The men who sat in on the conference are all well acquainted with Radio and its complex problems. They have provided for a better allocation of wave lengths; established power limits; asked supervision of broadcasting station establishment, erection, and operation schedules; paved the way for logical geographical distribution of broadcasting stations; delved into and helped the amateur transmitting station problem; mapped out an extensive work for the Bureau of Standards in the development of the science. We can see no flaw in the completed report.

But we can see a multitude of advantages in a revised code of Radio communication laws incorporating every single one of the recommendations of the conference. We can see an even greater and faster development of Radio. We can see a future surpassing the scintillating past.

When Congress enacts the laws, the work will be completed. How long will it take?

Crooks Are Hunted by Radio

State Police of Pennsylvania Adopt New System

EACH day makes it harder for the thief to get away with his loot. Police departments of every city have been trying to find some way to reduce the holdups and burglaries, but the ease in which the common thug can get away without being caught has doubled and tripled the amount of crime. With great hopes the state police are looking toward Radio as a means that will help them to a great extent.

The state police of Pennsylvania have adopted a Radio system by which daily bulletins of crimes will be flashed to city and borough police. A Federal charter for the system has been issued in Washington.

Police of thirty-five cities and boroughs will establish stations. The state police will be informed by telephone or telegraph of crimes committed and will flash to cities and boroughs descriptions of the persons wanted.

Radiophones and the Schools

Another New Study for the Youngsters

THERE was a time when the three "R's" were the only studies taught in the schools, but now we have modern languages, business courses, domestic science, manual training and many others, which seem to crowd the time limit for study. Now Radio is wedging itself in and the interest the youth takes in it puts all other text books in the shadow. There appears to be little time for recess and Babe Ruth home runs on the ball grounds. The Observer (Hoboken, N. J.), says:

"Youths who pine for college life, their elders who wish the college days were back again and others who long to peek behind the scenes of a college now get glimpses via Radio from their broadcasting station WRL."

The entertainments given by students at night bring back college days for the older folks. The Radiophone is, without a doubt, the best means of carrying home instruction to all who are not able financially or lack the time to attend school or college in person. The Gazette (Houghton and Calumet, Mich.) speaks of education by Radiophone as follows:

"Education of the middle western people by Radiophone is to be undertaken by some colleges. Each day ten minute talks on subjects of general interest will be delivered by university professors to persons within a radius of the university sending station. The lectures are to be supplemented by Tuesday evening Radio classes, which will be enlivened by musical selections."

Graduations will take place in many colleges throughout the nation in a few weeks' time. There are many relatives of the graduates who would like to attend in person, but for some reason or other they cannot make the trip. Then, too, the attendance is usually large and the place in which the exercises are held is small and all of the visitors cannot get in to hear the addresses. Here is where the Radiophone shines again. The Journal (Lansing, Mich.) tells of how the U. of M. will broadcast the exercises to a large auditorium or stadium where thousands can hear by Radio:

"If plans now being considered on the University of Michigan campus materialize, the entire state of Michigan and alumni all over the country may participate in the 1922 commencement and listen to the address to be given to the graduates by Charles Evans Hughes, secretary of state, with the magical assistance of modern electrical devices.

Radiophone wizards in the engineering department of the university are studying the problem, which has arisen from the inadequacy of the Hill auditorium to seat the increasing numbers who return annually for the graduation. With the classes grown so greatly, it has even become impossible to provide for the immediate relatives of those about to receive diplomas. The desire to increase these facilities has given rise to the consideration of several ambitious plans.

The most extensive arrangement yet suggested comes from Arthur J. Stock, Jr., of the engineering department, who urges that Ferry field be the place for holding the exercises, with powerful tone amplifiers to carry the message of the speakers to all parts of the stands."

Lectures are the best means to education. Subjects that have taken considerable thought and time to prepare, subject matter to collect, data to gather is quite a task that is not well repaid when the one delivering the message has only a few for an audience. Now, the Radiophone gives him a chance to increase his audience to the limits of all who care to listen in and have a receiving set. The Herald (Boston, Mass.) expresses its opinion as follows:

"Speaking to an audience of probably 50,000 persons stretching all the way from Maine to the Carolinas and even as far south as Florida and Georgia, and west to Wisconsin, Dr. Owen B. Ames, noted psychologist, recently told in a few simple words and phrases of the psychology of fear. He reached his audience through the medium of the Radiophone sending station installed at the Medford Hillside plant of the American Radio and Research Corporation."

The tedious routine of school life has been much reduced as the time passes. The little "red schoolhouse" of bygone days never saw anywhere near the like of today's educational means. To the three "R's" strenuously taught to the tune of hickory sticks and 12-inch rules in the days of our forefathers have been added another "R" and this "R" is the Radiophone.

"With the passing of the little red schoolhouse, academic instruction ceased to be a simple matter of conning facts from blue back spelling books and dog eared readers. Using Radio to supplement his classroom work, the bright scholar today draws upon the universe for his knowledge.

"In a less complex period a student could boast of having a head full of facts if he were well grounded in the three "R's". But the ambitious pupil nowadays curious to know what is happening in the world beyond the classroom, hooks up a well grounded aerial and gets an earful of whatever is passing in the ether."

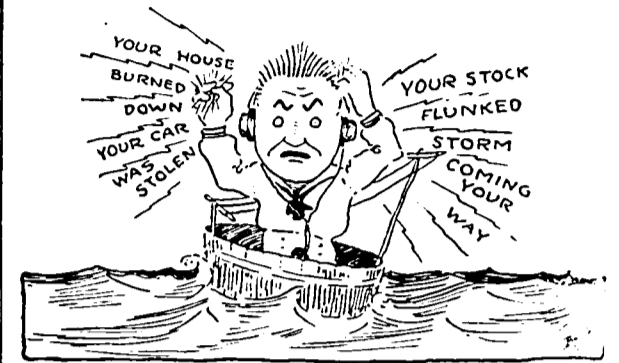
Not only have colleges taken up Radio but high schools as well. They are using receiving sets to listen in on weather and market reports. No doubt the Radiophone will develop into something more useful than just reports and concerts. The Sun (Springfield, Ohio) speaks of Radiophones in high schools as follows:

"Lawrenceville high school has heard and read enough about receiving weather reports, concerts, sermons and after dinner speeches over the Radiophone. From now on the school is to get all the Radio 'dope' first hand."

RADIO INDI-GEST

Rocked in the Cradle of the Deep

"Rocked in the cradle of the deep,
I lay me down in peace to sleep."
In peace to sleep? Alas, not so,
For science brings the Radio,
And telephoned o'er leagues of foam
Come messages from "friends" at home.
"Hello there, Bill! Been seasick yet?
We phone you to decide a bet."
"Say, Bill, they've raised your office rent
And swear they won't come down a cent."
"Hey, Bill, a storm is on the way;
It's due to hit your ship today."



"Say, Bill, we thought you'd like to know;
Your stocks have struck a record low."
"Say, Bill, we hear the plague's in Rome;
Your wife is worried; says come home."
"Oh, Bill, your house caught fire tonight;
Loss as yet unknown. Will write."
"And, Bill, they pinched your Scotch and rye.
Don't know. . . Perhaps the firemen did.
Goodby."

Rocked in the cradle of the deep,
I lay me down in peace to sleep,
In peace to sleep? Alas, not so,
For science brings the Radio.

—Leslie's Weekly.

Something Else Can Talk Besides the Parrot

Blackstone—"I think Brown was foolish in spending \$100 for a Radio 'phone outfit just because his wife wanted to listen to the free air concerts."

Webster—"Foolish nothing! He says the extra hours of quiet he gets every evening now are worth ten times the price he paid."

And the Grandmas Take to Radiophones

Willie—What's the matter with Grandma; she never gives us any nickels any more?

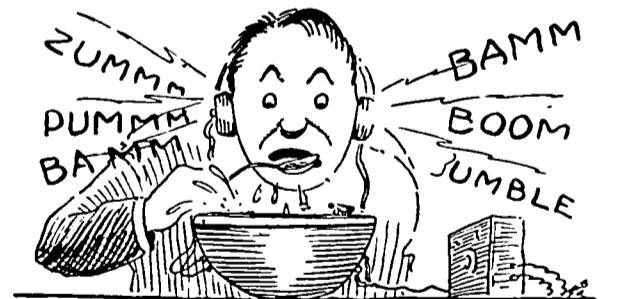
Jimmie—Oh, I know; she's saving up her money to buy a radiophone set so she can lie in bed at night, close her eyes and hear stories told.—The Pathfinder.

The Flies that Walk and the Ants that Talk

"Tests conducted by the Westinghouse people the other day showed that the movements of a flock of flies across a sheet of brown paper sounded, by radio, 'like the booming of thunder'.

"But flies' footsteps aren't the half of it. Thomas Edison announces it soon will be possible to hear the conversation of ants. The question, 'What are the red ants saying?' has agitated scientists for years.

"Henry Ford, Mr. Edison's close chum is following his experiments with keen interest. 'I have always wondered what the ants were saying,' said Mr. Ford today. 'If they are saying what I think they have, it may go hard with them.'



"The Westinghouse people have gone Mr. Edison one better by declaring that by means of a powerful radio amplifier the sound of a molecule turning over can be heard, which brings to mind the old song:

"I love to sit and listen most obtusely,
Throughout the fading hours of the day,
To all the little atoms running loosely,
And all the little molecules at play."

What to Hear Today

F O B (Detroit)—8:00 A. M., fight returns from Chicago Grand Opera company. 8:30 A. M., sermon, "Where Do Buttons Come From?" by Rev. Jasper G. Hoodick of Ocean View. 8:45 A. M., bedtime story for night watchman, "The Welsh Rabbit and the Poker Kitty," furnished by Police Gazette. 9:30 A. M., clog dancing by M. Tavish and Epstein. 10:30 A. M., hooch formulas by International Casket company. 11:30 A. M., Wall Street concert, "The Old Oaken Bucketshop." 12 M., official time from Elgin, Ill. 12:30 P. M., Philadelphia official time.

K Q W, San Jose, Calif.
Wednesdays, 7:30-8:15 P. M., concert.
Sundays, 5:00-6:00 P. M., concert.

K E E, Berkeley, Calif.
Sundays, 1:00-2:00 P. M. and 6:00-7:00 P. M., concert.

K S L, San Francisco, Calif.
Daily except Sundays, 10:00-11:00 A. M., concert and news; 2:00-3:00 P. M., concert and educational talk. **Sundays**, 2:00-3:00 P. M., concert and educational talk.

K U O, San Francisco, Calif.
Daily except Sundays, 3:00-3:30 P. M. and 5:30-6:45 P. M., news, etc. **Sundays**, 5:00-6:00 P. M., news, etc.

K Y Q, Sacramento, Calif.
Daily except Sundays, 5:30-6:30 P. M., concert and news. **Wednesdays and Saturdays**, 8:00-9:00 P. M., concert.

K W G, Stockton, Calif.
Daily except Sundays, 4:00-5:00 P. M., news, concert and markets. **Tuesdays and Fridays**, 8:00-9:00 P. M., concert. **Sundays**, 2:00-3:00 P. M., concert.

K Y J, Los Angeles, Calif.
Daily except Sundays, 4:00-5:00 P. M., concert, markets, news and weather. **Mondays, Thursdays and Saturdays**, 8:00-9:00 P. M., same program.

Who Hears Broadcasting Stations Farthest?

TO STIMULATE long distance receiving, RADIO DIGEST ILLUSTRATED has started a receiving record contest. If you can hear one of the broadcasting stations at a distance you consider remarkable, send in the evidence to this publication, care of the Broadcast Editor.

The receiving station hearing a given broadcasting station at the greatest distance, will, if ample evidence is submitted, be listed as the record holder. When another receiving station breaks the record listed, it will supersede the listing of the first station.

A number of amateurs have sent in their records already. Get yours in NOW for the listing will be started in the May 20 issue! Be sure to state the number of miles distance from your station to the station you have heard.

—Broadcast Editor.

State and City	Call	Wave Lengths	Miles Range	Program	By Whom Operated
Nebraska:					
Lincoln	9YY	375	300	C; N; M; W	University of Nebraska
Omaha	WOU	360; 485		Not known	Metropolitan Utilities District
Omaha	WOW	360		Not known	R. B. Howell
New Jersey:					
Deal Beach	2XJ	380		Test	Am. T. & T. Co.
Jersey City	WNO	360	500	C; N; L	Wireless Tel. Co. of Hudson Cy.
Jersey City	2IA	200	70	L; C; R	Jersey Review
Newark	WAAM	360		Not known	I. R. Nelson Co.
Newark	WJK	360		Not known	DeForest Radio T. & T. Co.
Newark	2SAI	360		Test	Westinghouse E. & Mfg. Co.
Newark	WOR	360		Miscellaneous	L. Bamberger & Co.
Newark	WJZ	360	2,000	N; L; C; W; A; R	Westinghouse Electric & Mfg. Co.
New Mexico:					
Roswell	KNJ	360	300	M; W; N; C	Roswell Public Service Co.
New York:					
Albany	WNJ	360		Not known	Shotton Radio Mfg. Co.
Buffalo	WWT	360		Not known	McCarthy Bros. & Ford
New York	KDOW	360	1,000	Not regular	S. S. America, N. Y. Harbor
New York	WVP	360; 1,450		I; C; V	Signal Corps, Fort Wood
New York	WWZ	360	200	C; N; L	Wanamaker's Dept. Store
New York	WDT	360		Not known	Ship Owners' Radio Service
New York	WYCB	1,450		N; C	Amateur Radio Reserve
Rochester	WHQ	360; 485	50	L; C; M; R	Rochester Times-Union
Ridgewood	WHN	360; 485		H; C; L; I	Ridgewood Times
Schenectady	WGY	360	1,000	M; C; L	General Electric Co.
Schenectady	WRL	360	800	C; R	Union College. (Also 2XQ.)
Tarrytown	WRW	360		C	Tarrytown Radio & Research Corp.
Utica	WSL	360		Not known	J. & M. Electric Co.
North Carolina:					
Charlotte	WBT	360		Not known	Southern Radio Corp.
Ohio:					
Canton	WWB	360		Not known	Daily News Printing Co.
Cincinnati	WLW	360	1,200	C; L; N; R	Crosley Mfg. Co.
Cincinnati	WMH	360; 485	1,000	C; N; L; W; V; M	Precision Equipment Co. (Also 8XB.)
Cleveland	WHK	360	100	C	Warren R. Cox
Columbus	8YO	275		T; M; L; N	Ohio State University
Dayton	WFO	360; 485	300	M; N; C; W; L; R; A	Rike-Kumler Co.
Dayton	WA-1	360		Not known	U. S. Army
Fairfield	WL-2	360		Not known	U. S. Army
Hamilton	WRK	360	1,000	C; R; T	Doron Bros. Electrical Co.
Lebanon	WPG	360		Not known	Nushawg Poultry Farm
Toledo	WHU	360		Not known	Wm. B. Duck Co.
Toledo	WJK	360	300	C; L; R	Service Radio Equipment Co.
Toledo	WDZ	360; 485		Not known	Marshall-Gerken Co.
Youngstown	WMC	360		Not known	Columbia Radio Co.
Oklahoma:					
Oklahoma City	WKY	360	500	W; V; M; N; L	Oklahoma Radio Shop
Oklahoma City	5XT	360		N	E. R. Hull
Oregon:					
Hood River	KQP	360		Not known	Blue Diamond Elec. Co.
Portland	KQY	360	50	Miscellaneous	Stubb's Electric Co.
Portland	KYG	360	500	Miscellaneous	Willard P. Hawley, Jr.
Portland	KGW	360	200	C; R	Ship Owners' Radio Service
Portland	KGG	360	500	N; M; L; I	Hallock & Watkins
Portland	KGN	360	50	Not known	Northwestern Radio Mfg. Co.
Pennsylvania:					
McKeesport	WIK	360	500	C; L; R	K. & L. Electric Co.
Philadelphia	WFI	360		N; C; I; L	Strawbridge & Clothier
Philadelphia	WIP	360		N; C; I; L	Gimbel Bros. Dept. Store
Philadelphia	WGL	360		Not known	Thos. F. J. Howlett. (Also 3AWL.)
Pittsburgh	KDKA	360	1,000	N; C; L; R; V; T; M	Westinghouse Electric & Mfg. Co.
Pittsburgh	KQV	360	750	C	Doubleday-Hill Electric Co.
Rhode Island:					
Pawtucket	10J	200		Not known	Raymond F. Farnham
Pawtucket	1XAD	200		Not known	Thomas Gihline
Tennessee:					
Memphis	WKN	360; 485		M; W	Riechman-Crosby Co.
Memphis	WPO	360		N; C; L; T	News Scimitar
Texas:					
Austin	WCM	360		N; W; M	University of Texas
Dallas	WRR	360; 485	200	W; M; N; C; R	City of Dallas
Houston	WEV	360		M	Hurlburt-Still Elec. Co.
Washington:					
Seattle	KFC	360	700	N; C; V; H; L; R	Northern Radio & Electric Co.
Seattle	KHQ	360		Not known	Louis Wasmer
Seattle	KJR	360	200	C; L; N	Northwest Radio Service Co.
Spokane	KPZ	360		Not known	Doer-Mitchell Elec. Co.
Spokane	KOE	360		Not known	Spokane Chronicle
Tacoma	WAAG	360		Not known	Mullins Elec. Co.
Yakima	KFV	360		Not known	Foster-Bradbury Radio Store
Yakima	KQT	360		Not known	Electric Power & Appliance Co.
West-Virginia:					
Charleston	WAAO	360		Not known	Radio Service Co.
Huntington	WAAR	360		Not known	Groves-Thornton Hdwe. Co.
Wisconsin:					
Milwaukee	WAAK	360	600	Not known	Gimbel Bros. Dept. Store
Madison	WHA	360; 485		W; C; N; M; L	University of Wisconsin
Canada:					
Montreal		1,200	200	C; N; L	Marconi Telegraph Co. of Canada, Ltd.
Toronto		450		Not known	Canadian Independent Telephone Co.
Toronto		1,200		Not known	Marconi Telegraph Co. of Canada, Ltd.

K Y W, Chicago, Ill.
Daily except Sundays, 9:30 A. M., 10:00 A. M., 1:20 P. M. and 2:15 P. M., stock quotations and markets; 2:15 P. M., 3:00 P. M., baseball; 4:15 P. M. and 6:30 P. M., news and markets; stock report summary; 7:30 P. M., children's hour; 8:00-9:00 P. M., concert; 9:00 P. M., news. **Sundays**, 3:30 P. M., church service.

K E C, Los Angeles, Calif.
Daily except Sundays, 5:00-5:30 P. M., news and on Tuesdays, Wednesdays and Fridays, same hour, concert.

K Z M, Oakland, Calif.
Daily except Sundays, 7:15-7:30 P. M., news. **Tuesdays**, 7:30-8:15 P. M., concert. **Fridays**, 8:15-9:00 P. M., concert.

K Z Y, Oakland, Calif.
Daily except Sundays, 3:30-4:30 P. M., concert; 6:45-7:00 P. M., news; **Wednesdays**, 7:30-8:15 P. M., concert. **Saturdays**, 8:15-9:00 P. M., concert. **Sundays**, 11:00 A. M. to 12:15 P. M., church service; 3:00-4:00 P. M., concert.

W E Z, Springfield, Mass.
Daily except Sundays, 7:30 P. M., children's hour; 7:45 P. M., market, weather, lecture; 8:00-9:00 P. M., concert. **Sundays**, 3:00 P. M., and 8:00 P. M., church service.

W D M, Washington, D. C.
Sundays, 10:30 A. M., church service; 3:00 P. M., lecture; 7:30 P. M., church service.

W F O, Dayton, O.
Daily, 9:00-9:30 A. M., concert and news; 11:00-12:00 A. M., music, news, markets, weather; 4:00-5:00 P. M., music, news, markets, agriculture, weather. **Mondays, Wednesdays and Fridays**, 7:00-8:30 P. M., music and lecture. **Sundays**, 11:00-12:00 A. M., church.

W G H, Montgomery, Ala.
Daily, 11:05 A. M., weather; 4:05 agricultural. 8:30-9:30 P. M., educational, agricultural, stock quotations and concert. **Sundays**, 8:30-9:30 P. M., religious program.

W G I, Medford Hillside, Mass.
Daily except Sundays, 2:55 P. M., music; 3:00 P. M., news; 7:30 P. M., baseball scores, news; 7:45 P. M., police reports; on Tuesdays and Thursdays, 7:30 and 7:45 P. M., programs at 7:45 and 7:55 P. M. respectively. **Sundays**, 8:00 A. M., church service; 8:45 A. M., sacred music. Special features week nights, 7:30 to 9:00 P. M.

W G Y, Schenectady, N. Y.
Daily except Saturdays and Sundays, 7:00 P. M., markets. **Tuesdays, Thursdays and Fridays**, 7:45-9:00 P. M., concert. **Fridays**, 11:30 P. M., concert and speech.

W H A, Madison, Wis.
Daily except Sundays, 12:30-1:00 P. M., weather, markets; **Tuesdays, Thursdays, Fridays and Saturdays**, 12:00-1:00 P. M., weather, markets, time; **Tuesdays only**, 8:00-9:00 P. M., concert; **Fridays**, 8:00 P. M., news; 8:15 P. M., 9:00 P. M., concert; **Saturdays**, 1:05-1:20 P. M., lecture.

W H K, Cleveland, O.
Daily, 1:30-2:00, 3:30-4:00, 8:00-9:30 P. M., concert.

W H Q, Rochester, N. Y.
Daily except Sundays, 12:00-12:15 A. M., music and news; 7:30-8:00 P. M., markets, bedtime stories, lecture; 8:00-8:30 P. M., music. **Sundays**, 3:00 P. M. and 7:30 P. M., church service.

W H W, East Lansing, Mich.
Daily except Sundays, 11:30-12:30 A. M., weather and markets.

W I K, McKeesport, Pa.
Daily except Sundays, 6:30-7:00 P. M.

Tuesdays and Thursdays, 9:30-10:30 P. M. **Sundays**, 1:30-2:30 P. M. and 6:30-7:00 P. M.

W J H, Washington, D. C.
Tuesdays, 7:30-10:00 P. M., lecture and concert.

W J K, Toledo, O.
Daily except Sundays, 3:00-4:00 P. M., concert. **Mondays, Wednesdays and Fridays**, 7:30-9:00 P. M., concert, lecture, etc. **Sundays**, 7:30-9:00 P. M., sermon and concert.

W J Z, Newark, N. J.
Daily except Sundays, hourly from 11:00 A. M. to 6:00 P. M., music; 11:00 A. M., 12:00 M., 5:00 P. M. and 10:00 P. M., weather; 2:05 P. M. (except Saturdays), shipping news; 12:00 M. and 6:00 P. M., agricultural; 9:52 P. M., Arlington time signals. **Tuesdays**, 7:00 P. M., children's hour; 8:20-10:00 P. M., concert. **Thursdays and Saturdays**, 8:20-10:00 P. M., concert. **Sundays**, 3:00 P. M., church service; 8:20-10:00 P. M., concert.

W L B, Minneapolis, Minn.
Daily, 12:00 M., weather and stock quotations; 7:30 P. M., markets. **Wednesdays**, 8:00 P. M., concert.

W L K, Indianapolis, Ind.
Tuesdays, 8:00-8:55 P. M., concert; 9:00-10:00 P. M., vaudeville and news. **Thursdays**, 8:00-8:55 P. M., concert, lecture and news. **Sundays**, 8:00-8:55 P. M., concert, religious.

W L W, Cincinnati, O.
Tuesdays, Thursdays and Fridays, 8:00 P. M., music, news and lecture. **Sundays**, 8:00 P. M., church services.

W M H, Cincinnati, O.
Daily except Sundays, 11:00 A. M. and 4:00 P. M., weather and markets. **Mon-**

day, Wednesday and Saturdays, 8:15-10:00 P. M., concert, lecture, vaudeville and news.

W N O, Jersey City, N. J.
Daily, 10:01 P. M., news, concert.

W O C, Davenport, Ia.
Daily except Sundays, 12:00-12:15 P. M., markets, weather and concert; 3:30-4:00 P. M., educational talks; 5:45-6:00 P. M., concert; 7:00-8:00 P. M., concert. **Saturdays**, 8:00-8:15 P. M., business review. **Sundays**, 9:00-10:00 A. M., and 5:30-6:00 P. M., sacred concert.

W O H, Indianapolis, Ind.
Daily except Sundays, 10:00-11:00 A. M., 4:00-5:00 P. M., stock reports and music; 8:30-10:00 P. M., music. **Saturdays**, 1:00-2:00 P. M., stock reports and music. **Sundays**, 10:00-11:00 A. M., music.

W O Q, Kansas City, Mo.
Daily except Sundays, 9:30 A. M., to 1:15 P. M., every half hour, markets; 11:30 A. M., 2:00 P. M. and 7:30 P. M., markets, weather and road conditions; 7:45-9:00 P. M., concert and vaudeville. **Sundays**, 7:00 P. M., church service.

W O R, Newark, N. J.
Daily except Sundays, 9:00 A. M., 5:00 P. M., hourly program.

W O Z, Richmond, Ind.
Daily except Sundays, 12:00-12:15 P. M., markets; 4:00-5:00 P. M., music, news, markets; 6:30-7:00 P. M., music, news, weather and lecture.

W R K, Hamilton, O.
Mondays, Wednesdays and Saturdays, 8:30-10:30 P. M., music and news. **Fridays**, 7:30-9:30 P. M., music. **Sundays**, 10:45 A. M. and 7:30 P. M., church service.

W R L, Schenectady, N. Y.
Irregular programme.

W R E, Dallas, Texas.
Daily, 7:00 P. M., police news, sports, weather; 8:30-9:30 P. M., concert. **Sundays**, 11:00 A. M. and 7:30 P. M., church service.

W W J, Detroit, Mich.
Daily except Sundays, 11:30-11:55 A. M. and 3:30-4:00 P. M., music; 7:00-8:30 P. M., concert, etc.

W W X, Washington, D. C.
Daily, 10:00 A. M., weather; 10:30 A. M., markets; 5:00 P. M., markets; 7:30 P. M. and 8:00 P. M., markets; 9:50 P. M., weather.

2 I A, Jersey City, N. J.
Wednesdays, 7:00-8:00 P. M., concert and lecture. **Sundays**, 7:00-8:00 P. M., church service and concert.

3 Y N, Washington, D. C.
Daily, 6:30-7:30 P. M., radio instruction (code and radiophone).

4 C D, Atlanta, Ga.
Tuesdays, Thursdays and Sundays, 7:30-8:00 P. M., news and concert.

8 Y O, Columbus, O.
Irregular, time signals, news, markets, etc.

9 A E U, Louisville, Ky.
Mondays, and Wednesdays, in evening, police news, balance of week irregular.

9 W D, Denver, Colo.
Saturdays, 8:00-9:30 P. M., concert. **Sundays**, 5:30-7:00 P. M., concert.

9 Y A, Iowa City.
Irregular, markets, news, etc.

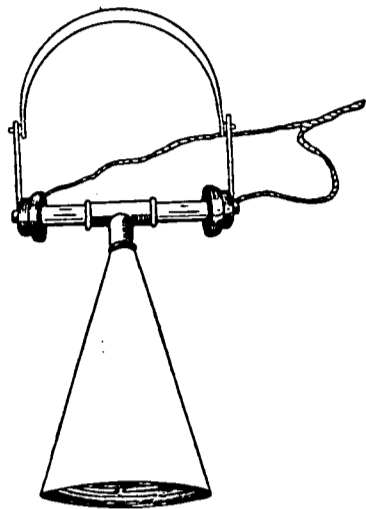
9 Y Y, Lincoln, Neb.
Daily except Sundays, 10:10 A. M., markets and weather; 7:30 P. M., irregularly, music.

Montreal, Canada (Marconi Station).
Tuesdays, 8:00-9:30 P. M., concert, news.

How to Make Gas Pipe Loud Speaker

Home-Made Amplifier Easy to Make

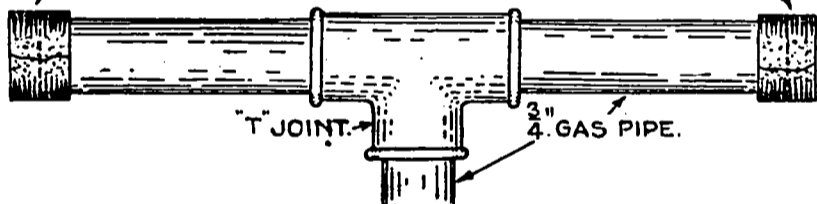
We are in receipt of a number of queries on "How to Make Loud Speakers." The diagram shown illustrates one that is easy to make and will not flatten the Radio fan's pocketbook. A 3/4" pipe TEE and three short pieces of gas pipe, a piece of 1/32" fibre 16"x16", some brass clips and some friction tape is all that is required. The natural spring of the head band on the receiver will hold them in position on the two pipe terminals.



In making the horn the fibre is layed out as shown, the holes are punched, the horn is then shaped up and held together with brass clips or rivets. The slit ends are pushed over the small projection of pipe in the TEE joint and friction tape is wound around to hold the horn rigid.

The friction tape at the two pipe ends should be wound overlapping, to act as a cushion. Of course it must be realized that this loud speaker magnifies the sound as it comes from the receiver. If your reception is not strong and clear from your set, the loud speaker cannot remedy that condition.

FRICITION TAPE WOUND ON END.



MAKE USE OF YOUR TIN ROOF

Why not make use of the tin roof of the house over which the aerial is strung as a ground, using no other ground than this? Connect to the tin by soldered No. 4 wire to both front and back. Many have used the roof solely as ground, getting more amperes into the circuit than when using the water pipe or gas pipe system. The flat-top aerial might well be parallel with the roof and not slanting as is common.

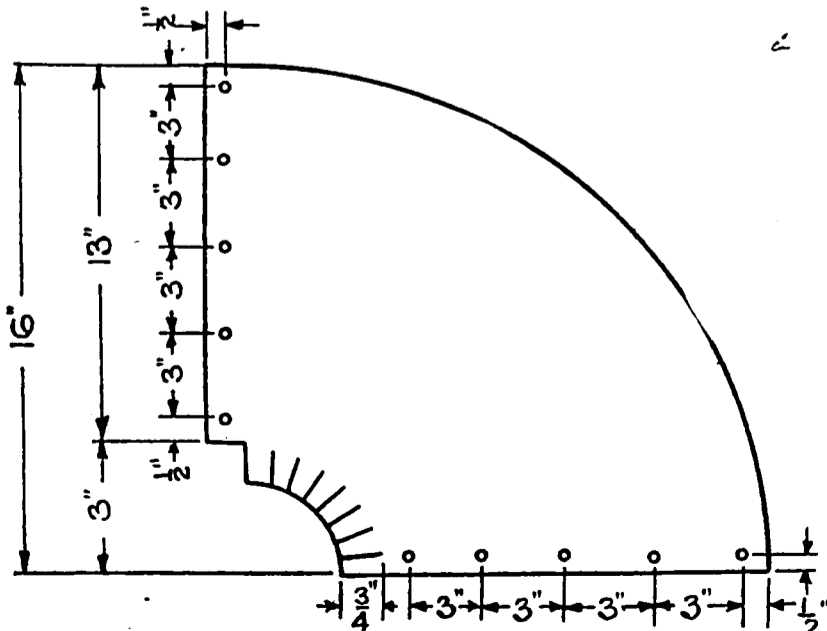
When the roof is used as a ground, the length of the lead-in is considered from the

aerial to the set and from the set to the roof and not to the actual ground itself.

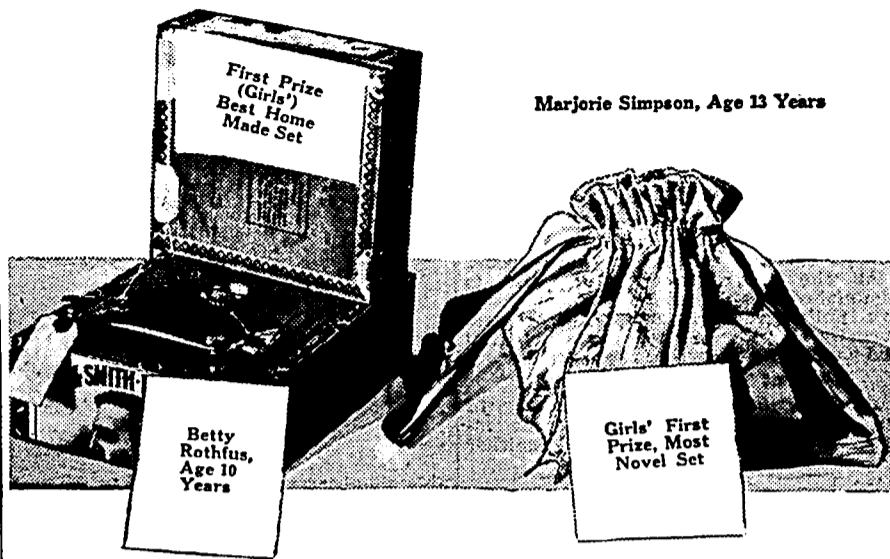
BUZZER TEST SET

If a buzzer and battery are available they can be used in testing for an open circuit. By connecting the battery and buzzer in series with the test clips or tips any low resistance circuit can be tested.

The ground connections can be tested with a buzzer and battery, but do not use the house-lighting circuit to test for grounds because one side of the lighting circuit is already grounded and if the other wire were connected to the ground a short



WINNING SETS DETROIT SHOW



Radio Kinks

RADIO DIGEST is interested in any of those little kinks that every amateur discovers in his workshop. Sometimes it's a How to Make Article, or a little tip in operation of the set, how to use parts that are not thought of, perhaps some new hook-ups that haven't been published yet.

Send them in, with full details, sketches and diagrams if necessary. One Dollar will be paid for every one published. If a self-addressed, stamped envelope is included, rejected copy will be returned. Work must be original, however, and not copy from others.

RADIO KINKS DEPARTMENT, RADIO DIGEST
123 West Madison St., Chicago, Ill.

circuit would exist and a fuse will be blown, possibly the hands may be burnt.

If the ground wire is connected to a water pipe, connect one tip to the ground and the other to the gas pipe, which is also grounded. The buzzer should operate if one has a low resistance ground.

Leakage sometimes exists between the aerial and the ground. An aerial should

To Make and Use a Crystal Detector

In making a crystal detector the following materials will be required.

List of Materials

- One Silicon or Galena Crystal Molded in a Metal Button or Cup.
- Two Binding Posts.
- One Piece of Stained Wood 3 by 3 1/2 inches.
- One Piece of Thin Strip Copper 3/4-inch wide and 2 inches long.
- One Catwhisker Wire.

The two binding posts are mounted on the block of wood, which should be well coated with shellac, one post at each corner of one edge, as shown in the illustration. One end of the sheet of copper is fastened under one of the binding posts and the crystal of silicon or galena in the button or cup is fastened to the other end of the copper strip, and is located in the center of the base. A piece of fine wire, coiled catwhisker, is fastened beneath the other binding post. This wire should be of a fine springy brass or copper metal. The loose end of the spring is allowed to just touch or make contact with the surface of the crystal. When this is complete the detector is ready for use.

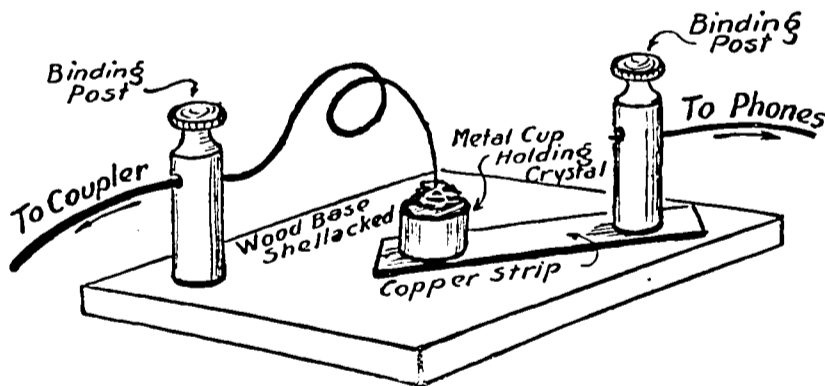
The two other parts of the apparatus necessary are the telephone condenser and receiver. These cannot be constructed readily by the amateur. A condenser for connecting across the phones can be purchased for thirty-five cents. The phones recommended for use with a receiver of this kind should be of the 2000-ohm type. These are all the parts necessary for use with this receiver.

To increase the value of the set a simple tuning coil can be added. This will be described in the next issue.

Care in Use

When using a crystal detector it is advisable when using more than a single pair of phones, to connect each set of phones in series. This is done because there usually is little current but a relatively greater voltage available at the receiving set output terminals. The available voltage will operate more receivers in series as readily as it will one.

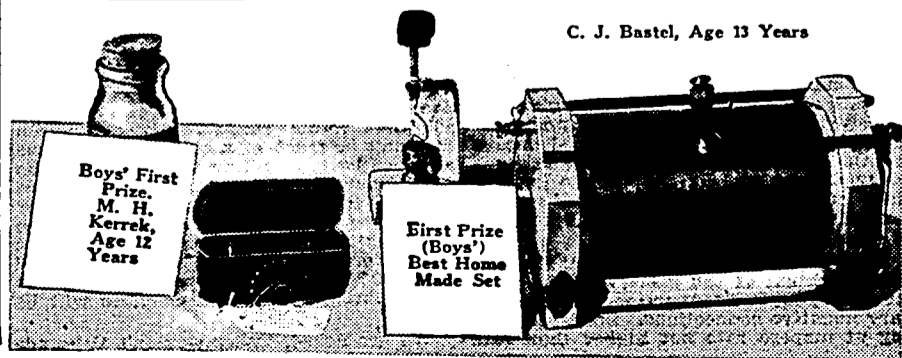
If the phones were connected in parallel, the additional amperage required by this arrangement would be more than the circuit supplied. In many cases, when multiple stage vacuum tube amplifiers are in use, a number of phones or head sets can be connected in parallel, owing to the reverse conditions in this case, there being a greater available amperage meeting the demands of the successive phones con-



be well insulated from the supports. The lead-in should be brought down to the point where it enters the wall in such a manner that when the wind causes it to swing it cannot touch any place, and that rain and snow cannot cause a path along which the current can ground. In bringing the lead-in through the wall, insulate it well, and use a short piece of insulated wire to make good connection with the set.

needed in parallel. A question frequently asked is, "Will the signals be of the same strength if two receivers or head sets are connected in series instead of using the single receiver or head set?" Usually the strength of a single is but slightly affected and where vacuum tube amplifiers are used invariably there is sufficient energy in the output circuit to operate from six phones or more.

DETROIT BOYS MAKE 'EM HOME



Characteristics of Vacuum Tube Amplifiers

By Benjamin F. Miessner

Part III The Three Electrode Tube

The three electrode tube has exactly the same construction as the two electrode tube, but has in addition another electrode called the grid, which is interposed between the filament and plate. This grid, which was introduced by De Forest in 1907, gave to the Fleming Valve some new and very remarkable characteristics.

The most important of these was found to be the ability of the grid, by the mere presence of slight electric charges upon it, to control with the greatest delicacy the stream of electrons flowing from filament to plate. Its action, it was found, was like that of the throttle of a locomotive or the trigger of a gun, which by means of a very slight force could control large amounts of power.

The grid has proven a revolutionary power in the Radio art. It has made it possible not only to detect, by rectification, the effects of high frequency currents, but to amplify their power millions of times and to generate alternating currents of practically any frequency.

Experimental Circuit Explained

In order fully to understand the action of the grid, and the additional powers it gives to a two electrode tube, we must again take recourse to characteristic curves.

In Figure 12 we have such a tube connected to allow voltage battery, say 6 volts, for testing the filament; to a high voltage battery, say 50 volts, for proper plate potential; and to a third battery connected between the grid and filament for variation of grid potential. It will be noted that the grid battery is arranged with a potentiometer for obtaining either positive or negative potential of variable degree upon the grid. The voltmeter (V) indicates the grid voltage with respect to the negative filament terminal, and the galvanometer (G) measures the plate current. If this apparatus be set in operation, the filament will liberate electrons and these electrons will undergo a definite kind of behavior depending on the operating conditions respecting grid potential and plate potential.

Grid Control of Plate Current

Suppose we start with 20 volts plate

potential and 5 volts grid potential, gradually decrease this grid potential to zero, and then increase it to +5 volts. If we note the plate current readings for each grid potential adjustment and plot the former as ordinates and the latter as abscissae, we will obtain a curve similar to A-B-C-D in Figure 13.

Here we see that even though the plate be kept charged to a positive potential of 20 volts, the amount of current flowing is regulated very largely by the grid potential. We see that the repulsive effect of 5 volts negative potential on the grid completely neutralizes the attractive force of the 20 volts potential on the plate so that no electrons reach the plate at all and no current flows in the plate circuit.

As the grid's negative potential is diminished, however, some of the electrons are pulled through the repelling grid zone by the now superior plate potential and a small plate current begins to flow.

Effect of Varying Grid Potential

As the grid potential is decreased still further to zero, the plate current increases, and at zero the grid neither

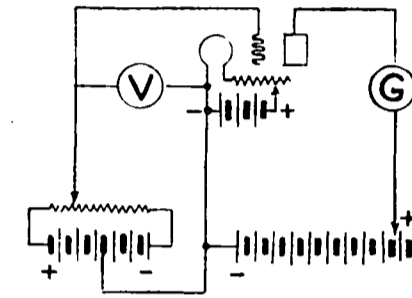


Figure 12

hinders nor helps the flow of electrons. The plate current with zero grid potential is practically the same as it would be if the grid were completely withdrawn.

But now as the grid becomes positive, it begins to attract the negative electrons, and this attraction is added to the attraction of the plate so that both the electrons' velocity and their number is in-

creased, and the plate current increased accordingly.

While at low positive voltages only a few of the electrons actually strike and enter the grid because of its small exposed area, with higher potentials the electrons do begin to enter it in consider-

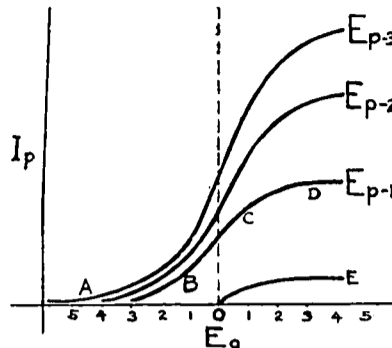


Figure 13

able numbers and to establish a current in the grid filament circuit, because the grid now acts like a second plate.

Grid Potential Very Effective

While its potential is lower than that of the plate, it must be remembered that it is considerably nearer the filament and for this reason, its lower potential may be as effective as the higher potential on the more distant plate.

As the grid potential increases then, the grid begins to attract the electrons and the grid current increases while the plate current remains the same. If the grid's potential is made considerably higher, it may actually rob the plate of some of its electrons and cause the plate current to decrease. This effect is made use of in some special types of tubes called dynatrons. The above described effects are shown in curve A-B-C-D of Figure 13.

Curves from Greater Plate Potential

If now the plate potential be increased to say 40 volts and a new set of data obtained, a higher curve like A-Ep-2 (Figure 13) will result. For a still higher plate potential of say 60 volts, a curve like A-

Ep-3 will be obtained. The grid current is shown by curve O-E.

In this family of curves we have before us for inspection the chief characteristics of the three electrode tube. By means of these curves we can predestine just what will happen under a given set of conditions.

One of the most interesting traits is shown in the region of negative grid potential, where a mere change of potential controls the energy in the plate circuit.

Comparison to Two Electrode Curves

By comparison with the curves already developed for the two electrode tube, it will be seen that the general shapes are similar although the actual operation is very different. We notice a flat lower region, a steep upper region, and a flat upper region. In this respect they are similar. The two bends in the curve at the upper and lower ends of the steep middle portion are also called the rectifying bends, and may be used for that purpose in much the same way that the two electrode tube is used.

But this type of tube can be made more sensitive because it consumes no energy, and because the low grid voltages impressed by a receiving circuit can be made to control a relatively large electron current supplied by the plate battery and thus produce current effects greater than those obtainable with the control energy alone. This results both in greater sensitivity and higher selectivity.

Operation in Amplification

You will note that the middle region of the curve increases in steepness with the plate voltage. This indicates, obviously, that when it is desired to use such a tube for amplification, it should be operated in the region of grid potential and that for maximum amplification, the highest plate voltage permissible should be used. It is plain, of course, that where the curve is steepest, at that point a small variation about the normal grid potential will cause the greatest change in plate current, which constitutes the effect desired.

Editor's Note.—In his next installment, Mr. Miessner will discuss the application of the three electrode tube to receiving and amplifying circuits.

Explaining Care of Apparatus to Beginners

STORAGE BATTERY NEEDS ATTENTION

Careful Treatment Should Be Given to This Important Part of Set

Storage batteries like everything else respond favorably to careful treatment. Their operating life is prolonged when accorded proper treatment. Many articles have dealt extensively with the various types of storage batteries, their construction, operation and uses but not enough is devoted to the maintenance and care of the storage battery used for filament lighting.

The main item of attention is the addition of a small quantity of distilled water once every two weeks. Remove the vent cap and pour in just enough distilled water to cover the plates, but don't over fill the cells as it will lead to trouble. First it will cause the acid to run out and destroy whatever the battery is resting on. Second, it will damage the battery itself by causing short circuits.

Be sure to use distilled water only. Drinking water should not be used as it contains mineral salts and other matter that are injurious to the battery. Don't add acid and don't probe down into the battery with metallic tools. There is no need for pushing a screw driver down the vent hole as it will result in injury to the plates.

Use nonmetallic vessels for storing the distilled water. Mason jars or milk bottles, which are inexpensive, can be used for this purpose with the best results. While on the subject of filling it should be remembered that the electrolyte must never drop below the top of the plates.

The next adjustment necessary on the six-volt storage battery is "charging" or rather "recharging." A battery under ordinary usage should be recharged once a month. Hydrometer tests should be made every day or so. If the specific gravity falls off to 1.100 or when the voltage per cell on discharge falls to 1.7 volts, it is time to recharge.

With a charging device, connect the positive terminal of the battery to the positive charging terminal and make the necessary negative connections. Start recharging at amperage rate not higher than rate

even on the lead name plate which is attached to all batteries. When the battery is bubbling freely and the hydrometer reading is about 1.215 or the voltmeter reading in the neighborhood of the 2½ volts per cell the current should be reduced to finish rate and battery disconnected. All three cells should show uniform bubbling. A close watch should be kept on the recharging operations, the reduction to finish current should be made just before the hydrometer shows 1.215 or the voltmeter reads 2.5 volts per cell and the charging over the rest of the route be just a slow gradual process until the proper readings are obtained. Never permit a battery in the course of recharging to become overheated, if necessary decrease the charging rate.

Don't allow a storage battery to become excessively cold. A battery when discharged will freeze much quicker than when fully charged battery. The freezing point of a discharged battery is about 10 degrees above zero and that of a fully charged one about 35 Fahrenheit below zero. Freezing will burst the jars and split the battery apart.

Wavelength and Range Two Distinct Values

So many people get wavelength and distance confused. They are two entirely different values. For reception you must put approximately the same amount of wire in circuit of your receiving set as the sender is using in the aerial. This is not affected by the distance from the sending to the receiving station.

We are asked, "My set's range is from 200 to 600 meters. Is that the distance the set will receive?"

"No, it indicates the set will receive from stations using aerials with a wavelength of 200 to 600 meters. A meter is about 39 inches or about one yard, so a set that would receive only 200 yards wouldn't be much of a set. Amateurs are required by law to limit their wavelengths to 200 meters and commercial stations are required to work on 600 meters or in other words use aerials three times as big. The broadcasting stations nearly all operate at 360 meters so that a set with a range of from 200 to 600 meters will take in 360 meters broadcasting and concerts will be heard."

We are asked, "Why wouldn't it be ad-

visible to build a set that tunes from 200 to 3,000 meters or even 24,000 meters so I could get all the stations of every kind?"

"The sets would be fine on the longer waves but they would be inefficient on the short waves because all that extra wire on the coils would act as a false capacity that would weaken the signals from shorter wavelengths. Therefore most everyone is content with a set that operates 400 or 600 meters. A long wave set should be a separate instrument and be entirely disconnected while using the short wave hook-ups.

All Telephone Receivers Delicate as Fine Watch

Why not treat your telephone receivers as carefully as you would your watch? If visitors are frequent at the station, a sign calling attention to the need for care might be posted to advantage.

Don't let them unscrew the caps from the telephone receivers. Don't let them poke their fingers into the opening in the receivers' caps. Injury can be done to the diaphragm in this way.

Great care should be taken that receivers are not dropped to the floor.

In all receivers there are small permanent magnets on which the windings are wound. A sharp jolt such as dropping the receivers knocks the magnetism out of these magnets. Therefore, every time the receivers are dropped their sensitivity is affected.

To Compute Natural Wave Length

The natural period of vibration, or wave length, can be approximated by adding the length of the aerial, the length of the lead-in and the ground connection and multiplying the total length of all three by 1½.

For instance, an aerial 80 feet long with a lead-in of 40 feet and a ground of 20 feet has a total length of 140 feet. To find the natural wave length multiply 140 by 1½ which gives a total of 210 which is the natural wave period in meters.

This holds true for single or double wire horizontals or vertically swung aerials of the inverted "L" type. In computing the wave of the T or umbrella type multiply by 1.67.

A Variable Condenser Used as Good By-Pass

Eliminates Choking High Frequency Current by B Batteries

Have you ever tried using an .001 mfd. variable condenser across the phone and B batteries in a detector tube circuit? This condenser works especially good as a by-pass condenser when turning in the reception.

The high frequency current in the plate circuit is choked by the high resistance of the B batteries and phones, making it advisable to use a condenser across them. While a fixed condenser of .001 mfd. capacity works very well, a variable condenser is an improvement.

After using your ground connection to a water pipe longer than six or eight months examine it. You might find that the copper or the pipe has corroded and that a poor connection is the result. Take a piece of emery cloth and clean off the pipe and the inside of the ground clamp until they are bright once more, then fasten the ground clamp.

Radio Locates Power Leaks

Throughout the west there are many hydro-electric plants furnishing electric power at great distances. There is a great loss of current through leakage caused by faulty insulation which allows the current to leak back to the earth. The Radio receiver has been the means of locating these leaks.

A line walker has a portable Radio receiving outfit and as he passes a leak in the transmitting line, the escaping electricity sets up a current in the Radio making the hiss of the leaking current audible to the human ear. The line walker then easily locates the leak and the break in the insulation is repaired.

What Is a Tickler Coil?

Will you please let me know what a "tickler coil" is? A tickler coil is simply a coil of wire that is used to feed the plate circuit of a three-coil hook-up. It can only be used with a set using a vacuum tube detector. Several sets using this coil will be illustrated in the loose leaf sheets of hook-ups.

Simple Instructions for the Beginner

By Harry J. Marx

Fixed and Variable Condensers

One of the most important parts used in a Radio receiving or transmitting set is the condenser. In spite of its simplicity, its theory and operation is a mystery to most of the operators of Radio sets. The conventional symbols as seen in hook-ups and diagrams are shown in Figures 1 and 2. Figure 1 represents what is called the fixed condenser, in other words it has a certain capacity. Figure 2 represents the convention for a variable condenser. The purpose of the variable condenser is to permit a gradual change in capacity of the condenser. Figures 3 and 4 show photo views of the commercial article. Figure 4 is the popular rotary type of variable condenser. In addition to this rotary type of variable condenser, we have the oil immersed sliding plate, sliding tubular and other methods of variation.

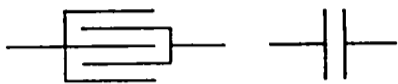


FIG-1

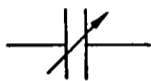


FIG-2

Condensers primarily store up electrical energy and it is its capacity for storage that we consider, in defining the measurement of the condenser. After the limit of capacity is reached, additional current overcomes the resistance. This resistance has a set measurement which, when overcome, releases the energy, which rushes out creating oscillation, which will produce electro-magnetic waves. The condenser capacity is measured in microfarads, which can be controlled by variation of the number of units in assembling the plates and dielectrics. In the fixed condenser we simply have a few sheets of tin foil and thin paper, these are sealed in an insulating element. Mica is the very good substitute for the paper.



Fig. 3

The Variable Condenser

The variable condenser, as seen, is made up of fixed and movable plates. The fixed plates are shown in Figure 6. These are mounted and spaced about 1/4 of an inch apart.

The movable plates are shown in Figure 5 and are mounted on a rod also spaced 1/4 of an inch apart, but are so set that they rotate between the fixed plates without touching. When the movable plates are fully outside of the fixed plates as shown in Figure 7, the condenser capacity is at its minimum, when the movable plates are turned around and all are inside of the fixed plates as shown in Figure 8, we have the full capacity of the condenser. The air gaps between the plates form the dielectric.

The revolving plates are rotated so that a greater or lesser area is placed between the stationary plates. This has the same effect as increasing and decreasing the area of the plates and therefore varies the capacity. The variable condenser shown in Figure 4 has what is called a Vernier Adjustment. It will be noticed that the last plate revolves independent of the remainder. This single plate is turned by means of the small knob in front of the large knob turning all of the revolving plates. This is called a Vernier Control and permits fine adjustments for capacity. We often get complaints of amateurs telling us that their condenser is too sensitive because the tuning point permits little variation. The Vernier Control overcomes this trouble, as only one plate can be adjusted making it a simple matter to tune down to the point where the reception comes in the strongest. This type of condenser has very little loss of energy due to brush discharges and other losses. It will be noticed that the knobs are mounted on a shaft projecting out a considerable distance; this is done to eliminate the trouble called "body capacity." The metal shaft is covered with a composition tube that prevents the carriage of the body charge to the condenser itself. The extra expense of a variable condenser of this

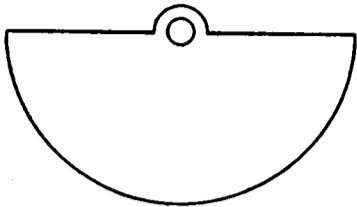


FIG-5

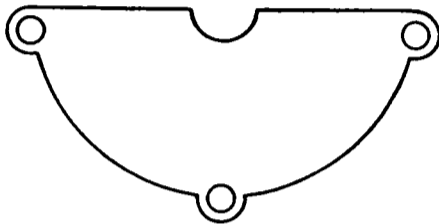


FIG-6

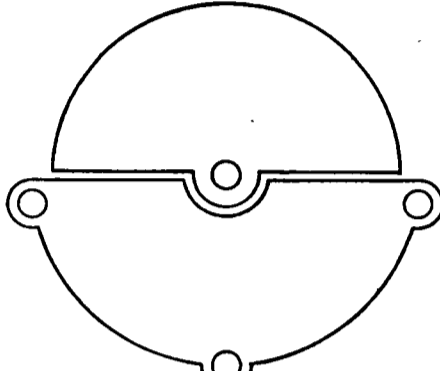


FIG-7

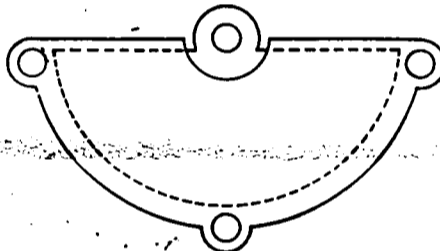


FIG-8

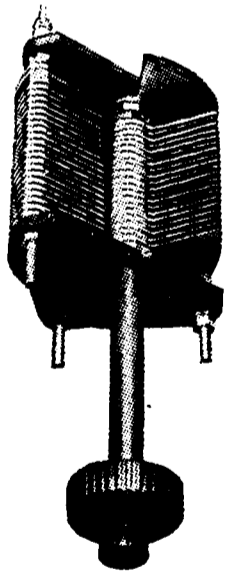


Fig. 4

Capacity

The capacity of a condenser will vary also with the size and the number of plates used. If a large condenser is desired many plates should be connected in "parallel." In that case every alternate plate is connected together for one side.

The unit of capacity is the FARAD but this unit is so large that the microfarad has been adopted as the practical unit. The microfarad is one-millionth part of a farad.

$$C = \frac{KA}{4\pi dx} \times 10^5 \quad 10^{10}d$$

A=Area of dielectric sheets in sq. cms.
d=Average thickness of dielectric in cms.
K=dielectric power.

Table of "K" Values

K of Air.....	1.00
Manila Paper.....	1.50

Ebonite	2.05 to 3.15
India Rubber.....	2.22 to 2.495
Gutta Percha	2.45 to 4.2
Shellac	2.74 to 3.60
Glass	3.013 to 3.258
Mica	4.00 to 8.00
Flint Glass	6.85

Occasionally we have a sealed fixed condenser, the capacity of which we want to measure. In that case we make use of a system very similar to the Wheatstone Bridge Method for Resistance. In Figure 9 R₁ and R₂ are two variable resistances. C₁ is a fixed condenser, the capacity of which is known. C₂ is the unknown capacity condenser. The receivers are connected across as shown. If the circuit is unbalanced the alternating current will flow through the receivers and a buzz will be heard. If, however, we vary

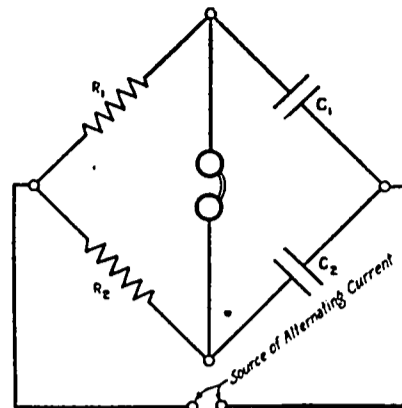


FIG-9

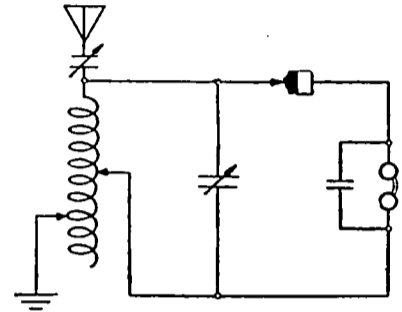


FIG-10

Body Capacity

Every amateur comes in contact with the trouble called "body capacity" usually when he is tuning in a station which calls for rather close tuning.

Just as soon as he gets the station tuned in he removes his hands from the variometer knobs, and as he does so the reception "fades out" of his receivers.

Some stations are seldom bothered by this trouble. Some always experience the difficulty. Occasionally it works the other way. The amateur will be listening in and when he puts his hands to the dials the reception "fades out."

Using metal dials for the variocoupler and variometers usually helps to overcome the difficulty. But the best thing to do is to shield the panel by lining the back of it with tin or aluminum foil and grounding it.

The tin foil is cut out wherever there is a switch point or binding post or rod to avoid a short circuit.

The tin foil is not cut out under the ground binding post, as here it automatically grounds the shield.

Use shellac to fasten the tin foil to the panel.

Don't dismantle your set to shield it, as the foil can be put into place in small sections.

Because the variometers are too close to each other, sometimes causes trouble on account of inductance between them. This can be remedied by inserting a plate of any nonmagnetic metal between them and grounding it. A piece of glass, such as an old photographic plate, covered with tin foil on one side can be used.

the resistances of R₁ and R₂ until the bridge is balanced and no sound is heard in the receivers, then under these conditions

$$\frac{R_1 C_2}{R_2 C_1} \text{ or } C_2 = \frac{R_1 C_1}{R_2}$$

where R₁ and R₂ are the resistance in ohms and C₁ and C₂ are the capacity in microfarads.

Using Condensers in Hook-Ups

The use of condensers in hook-up is often belittled and neglected. They are a valuable adjunct to tuning and greatly improve the efficiency of a set.

Figures 10 and 11 illustrate two hook-ups using condensers to the best advantage for both a crystal and also a vacuum tube set.

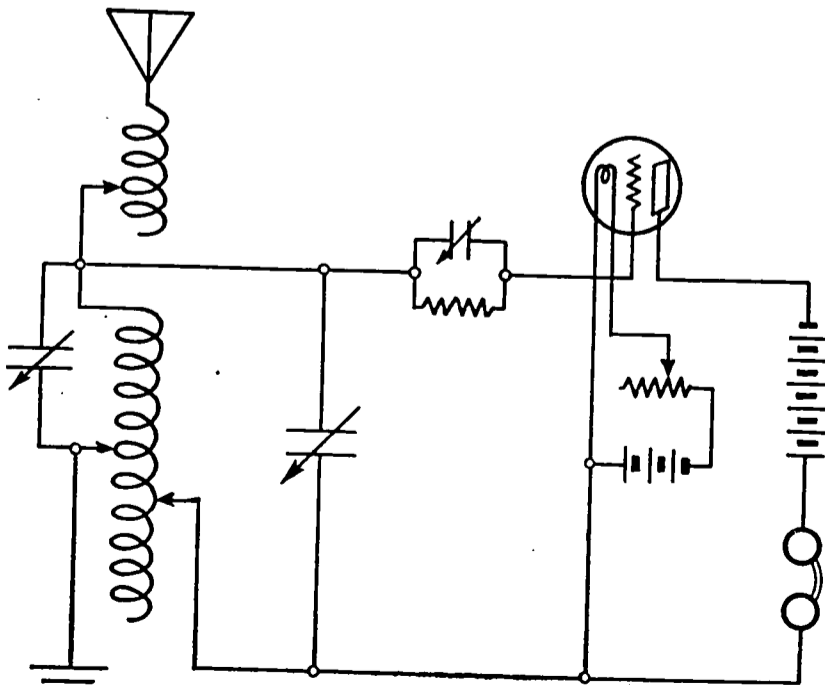
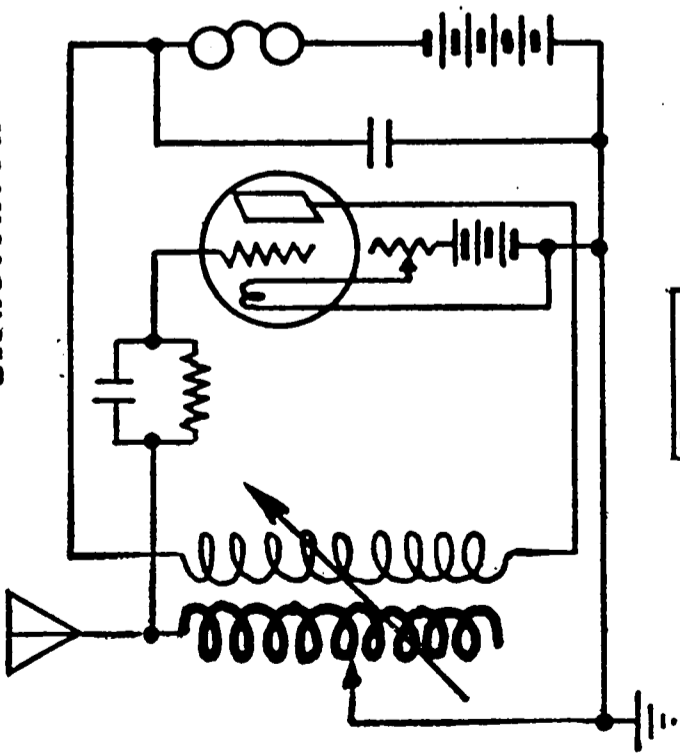


FIG-11

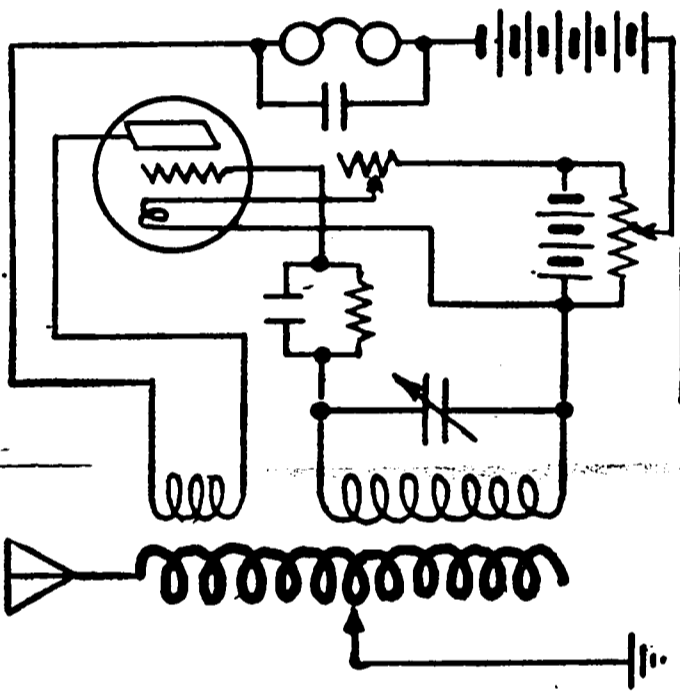
Radio Digest
Illustrated

No 5

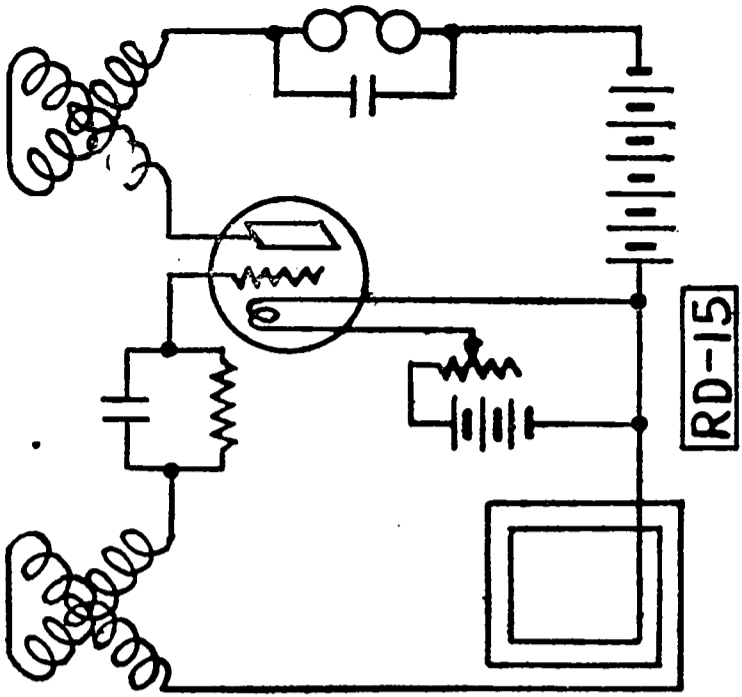
Harry J. Marx.



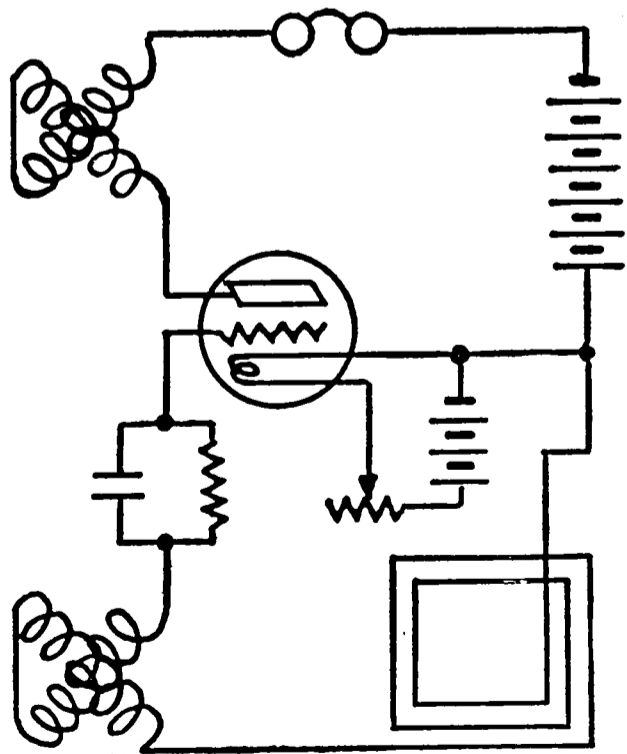
RD-12



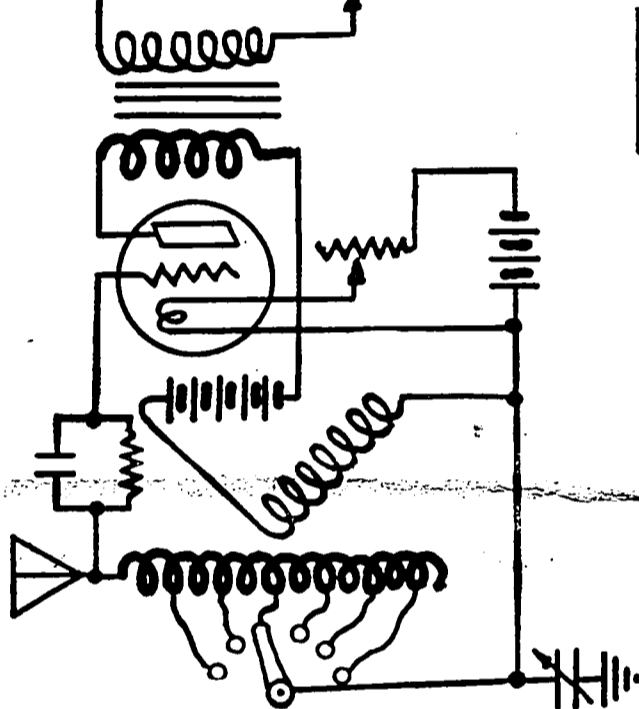
RD-14



RD-15



RD-13



RD-16

Hook-Ups

Questions and Answers

One Step of Radio Frequency Amplification (105) WHC

I am accepting your invitation to ask a few questions. I have been a Radio fan for some time, using De Forrest duo-lateral coils and two steps of amplification.

I have now secured one of the Radio frequency transformers of the R. C. of A. No. 1714. I have considerable trouble from static and other interferences.

Would you please give a hook-up using one or two steps of Radio Frequency Amplification with my three duo-lateral coils.

I have an outdoor aerial 60 ft. high of four wires about 100 ft. long. I thank you.

Ans.—No wonder you are troubled with static. Why add the three extra wires to your aerial? They are fine for catching static interference. Make it a single wire and see if you don't eliminate more than half of your trouble. Of course, if you can increase the straight length of your aerial, do so by all means.

Hook-up for One Step of Radio Frequency Amplification is given. Another step can be added if desired by following the same steps of parallel connections.

See Hook-up Q. A. 105.

Variometers and Radio Frequency (107) JMM

In your magazine I note that you invite Radio fans to send you their problems. I would appreciate it if you would answer the following questions:

Is it possible to use both the plate and grid variometer in connection with a two-step Radio frequency amplification? If it is possible I would like a diagram showing the hook-up of same.

Ans.—Yes; it is possible to use both the plate and grid variometer with the two-step Radio frequency amplification diagram as given.

See Hook-up Q. A. 107.

Frying and Squawking (109) ESM

I live at Brownsville, Pa., 50 miles south of Pittsburgh.

I have a CR 9 Grebe machine. Will you kindly advise me as to the following: Does it make any difference in which direction the aerial wire is stretched to receive New York, Chicago, Detroit, Washington, etc.?

Would a 100-ft. long aerial placed 75 to 100 ft. high be better than one 40 ft. high where there are no buildings or trees to shield it?

There is considerable "frying and squawking" at times on my machine. I understand there is a device on the market that is placed between the battery and "detector" which eliminates these noises. Can you inform me in regard to this—its efficiency, etc.?

Ans.—No, it will make little difference as to the direction of your aerial since you want to cover so many stations.

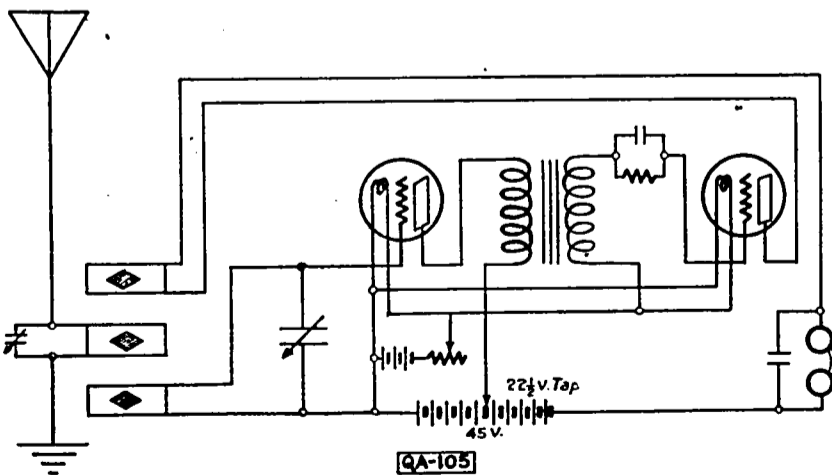
Naturally the aerial 75 to 100 ft. high will give you better results, unless you mean the higher aerial is handicapped with the surrounding buildings, where the lower isn't. We would say take the higher.

Maybe you have loose connections in your hook-ups, or too much slack wire. Is your aerial clear at present? Are you possibly forcing too much current to your filament? We don't know of the device you mention, there are so many new ones on the market.

Battery with Crystal Set (115) RRM

1. Is there any way to connect a loose coupler, crystal detector, and stationary condenser in a battery circuit to increase the receiving range?

2. Can a tuning coil also be used in a circuit?



3. Is it best to learn the code with a straight key or any key?

4. Is a set using a loose coupler and three 32-inch loading coils (primary, secondary and tickler) and a detector tube suitable for receiving music? The tube is in a cabinet complete with condensers, etc. If this will not receive music, what additional equipment is necessary?

Ans.—A battery circuit on a crystal set was given in the third issue, but you will not find this sufficient to receive in your

location. I believe you are under the impression that by adding extra coil length, such as the tuning coil, that you will increase the range in miles. If so, you are making a common mistake. The addition of loading coils increases the range in wave length, but this is not distance. For example, broadcasting is usually sent out on a wave length of 360 meters, but if you want to receive a government station operating at 1,450 meters you must add to the range of your set by increasing your wave length, which is done by the addition of loading coils; but you will not find that you are receiving any greater distance except where the output of the broadcasting station is greater, in which the waves sent out are of greater strength and intensity.

If your reception is not satisfactory with the tube set, I would suggest that you add on one step of amplification, in which case you will need a tube, socket, battery, transformer and rheostat.

Howling and Squealing (116) JOY

The Radio Digest is one of the best Radio magazines I have yet seen, irrespec-

tion of price, especially for the beginner, which includes pretty nearly everybody.

I should like to take advantage of your invitation to make use of your Question Department. I have a regenerative receiver, VT detector and two stages of amplification, built according to the plans of the Consolidated Radio Call Book Company. In tuning in with this outfit on distant stations I get such a howling and squealing as to make the reception of music or voice almost impossible. Occasionally, by placing my fingers on the condenser dial in various positions, I am able to control this howling to a certain extent and still bring in the voice or music fairly good. But it seems to me that perhaps I need some other piece of apparatus which would take the place of my fingers, or that

your aerial? If so, try it with but one strand. Have you a condenser on your primary circuit? Would suggest inserting one there.

Coils (118) REW

Permit me to take advantage of your Question Department. In your No. 1 issue, page 13, you describe a hook-up, figure No. 3. What is the resistance of the coil illustrated and what is the name of it?

In the description of this circuit, as follows: "The more coils we add the more we increase the range of our aerial. If you are limited in the length of your aerials, add one or more coils or to the coil length."

Please explain the above; that is, how the coils would be hooked up and what coils are meant. I am a rank amateur in the Radio game but have been in the telephone business for many years and am familiar with circuits.

Could a one or two M. F. condenser be used in connection with Radio work?

Ans.—The coil you mention is a standard make of tuning coil. We are not wor-

ried by the resistance in the copper wire tuning coil. It's the wire length and the number of turns that we are interested in. In reply to the second paragraph of your letter we would suggest that you read over the answer to No. 115 RRM. The coils are hooked up in series in the antenna circuit. The telephone condensers that you men-

tion are of no use for Radio work, as their capacity is about one thousand times greater than necessary.

Automobile Radio (123) DJP

I would like to know if there is any way to install a radiophone in automobile and using a crystal detector listening to the local broadcasting stations. Also I would like you to give me full details as to how to install it to have considerable results.

Thanking you in advance for your attention and prompt reply.

Ans.—In installing an antenna on an automobile a short pole is erected in the front and another in the rear, and two spreaders with four strands are used. The ground is fastened to any convenient water hydrant. The hook-up is the same as otherwise. An outfit of this type can only be relied upon to receive local broadcast-

ing.

pending upon the aerial and the local and atmospheric conditions.

Galena is best.

Loop aerial will not give very good results with a crystal detector.

You will need a vacuum tube set, a good aerial and probably two steps of amplification.

Aerial (143) THB

Have you a blueprint of how to put up an aerial or could you tell me how many and what kind of wire to use, how high must they be and how long? Would it be all right to fasten one end of the wires to a metal water tank or use iron pipes for post?

Any information you can give me will be appreciated.

Ans.—Use No. 14 copper wire, either bare, covered or stranded, 100 feet long and at least 10 feet above all objects underneath. Yes, provided you don't forget your insulators.

Hook-up Questions (125) SBH

An enclosing diagram of hook-up and would like to know what your opinion of this hook-up is. Is this a regenerative set? About what range? Would it be any advantage to receive the output of this valve on a crystal detector and how would it be possible? Of what advantage is the two-way switch to ground? Of what value is the potentiometer? Is an inside loop aerial satisfactory?

Ans.—Your hook-up is O. K. The range would be about 75 more or less, depending upon your aerial and other conditions. Yes, this circuit is regenerative. What's the use of adding the crystal detector? That won't help any.

The two-way switch to the ground is unnecessary. It only cuts out the slider on your tuning coil and prevents any adjustment on the coil for tuning. The potentiometer gives you better control of the current in the plate circuit.

The inside loop aerial is satisfactory, provided you don't expect too much. There is no question but what you will want the outside aerial in the end.

Directions for Building Set (127) WMcG

Will you please tell me what is the best aerial for a receiving set? Would a loop aerial be good enough to hear 300 miles? Can one vary the range of his receiving set by adding coils? If so, how many coils would be needed to get a range of 1,000 miles with a suitable aerial? Could an amateur build a homemade set which would receive from 200 to 300 miles using a vacuum tube? If so, where can I get directions for building such a set? Can a homemade tuning coil be made so that it will be as good as a honeycomb coil?

Ans.—The best aerial for a receiving set would be a single wire about one hundred feet long placed at least ten feet above the roof or anything under it. No; a loop aerial would not give very satisfactory results for that distance.

The same answer that has been given on this page for No. 115 RRM covers your question on the range. The coils will not increase your mileage receiving range. You need steps of radio and audio frequency amplification.

You could build a great many of the parts and save considerable money. The articles on How to Make that we are running will help you in building your set.

A single or double slide tuner can easily be made, but it will not be as good as a triple tuning coil set.

How Far Can I Receive? (138) ES

Tell me through your paper Radio Digest the following: How far can I receive radiophone concerts with the following?

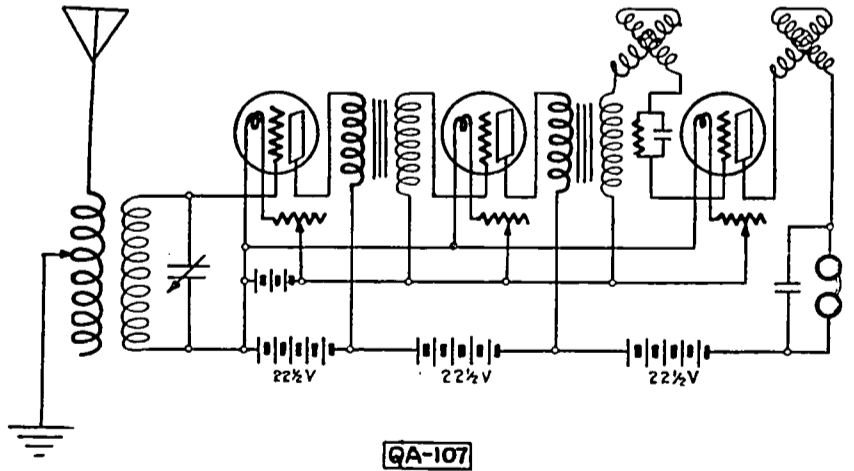
A two-slide tuner, one eleven-plate variable condenser, a galena detector, loading coil and a single 2,000-ohm receiver.

Which is the best, a galena or electrolyte detector?

Also, if I can use a large loop aerial with the above.

What will I need to receive radiophone concerts 200 miles?

Ans.—Anywhere from 25 to 75 miles, de-



pending upon the aerial and the local and atmospheric conditions.

Galena is best.

Loop aerial will not give very good results with a crystal detector.

You will need a vacuum tube set, a good aerial and probably two steps of amplification.

Aerial (143) THB

Have you a blueprint of how to put up an aerial or could you tell me how many and what kind of wire to use, how high must they be and how long? Would it be all right to fasten one end of the wires to a metal water tank or use iron pipes for post?

Any information you can give me will be appreciated.

Ans.—Use No. 14 copper wire, either bare, covered or stranded, 100 feet long and at least 10 feet above all objects underneath. Yes, provided you don't forget your insulators.

An Invitation—

WHEN "stumped" write the Question and Answer Department, RADIO DIGEST, 123 West Madison Street, Chicago, Ill. A self-addressed envelope should be enclosed ALWAYS, as not all answers can be published. Only those of general interest will be printed in these columns. Other questions will be answered by mail.

When your question is of a highly technical nature and cannot be readily explained, send sketches and diagrams with it. Don't hesitate to give us full details and information, as many questions cannot be answered simply because of insufficient data. All letters should be addressed to the Question and Answer Department and should pertain to nothing but questions on RADIO. HAVE PATIENCE, your letter will be answered in the order that it is received, unless it requires special research on the part of our engineers.

The services of a trained staff of Radio Engineers are at the command of every reader of RADIO DIGEST. Don't hesitate to send in your troubles and let RADIO DIGEST worry about them. RADIO DIGEST, however, reserves the right to refuse to answer any question which might lead to litigation.

Radio Illustrated



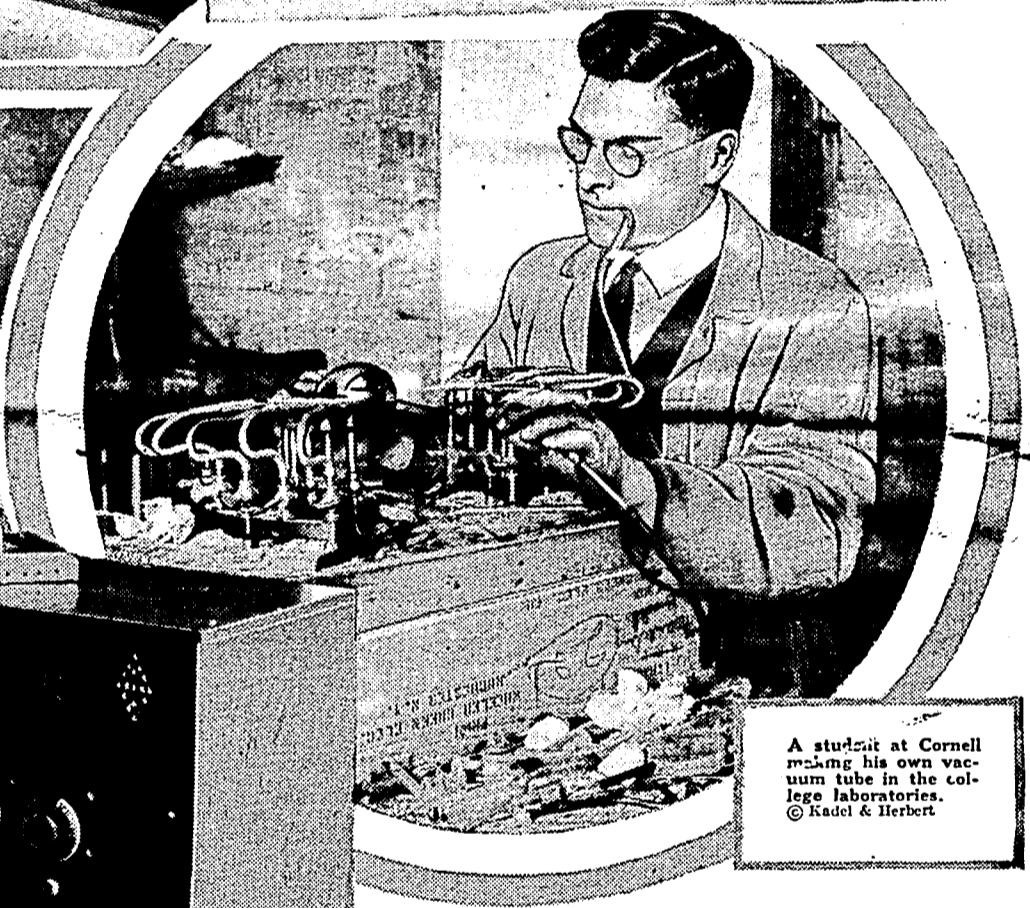
Just the ideal place for a Radiophone, in a canoe on a moonlit summer evening. The parasol forms the aerial.
© Keystone



An interested listener. The youngest Radio fan on record. She gurgles, but listens.
© International



Walter Hiers seems to be having some trouble tuning in his instrument.
© U. & U.



A student at Cornell making his own vacuum tube in the college laboratories.
© Kadel & Herbert



A Pacific Coast enthusiast takes his receiving set to "Lands End" on a hike and listens in on concerts while enjoying the all outdoors.
© Keystone



The movie stars have fallen in line with all Radio fans. Jack Holt seems to be entertained in a most pleasing manner with his Radiophone.
© U. & U.