

THIS IS A RADIO CHRISTMAS

# RADIO AGE

The Magazine of the Hour

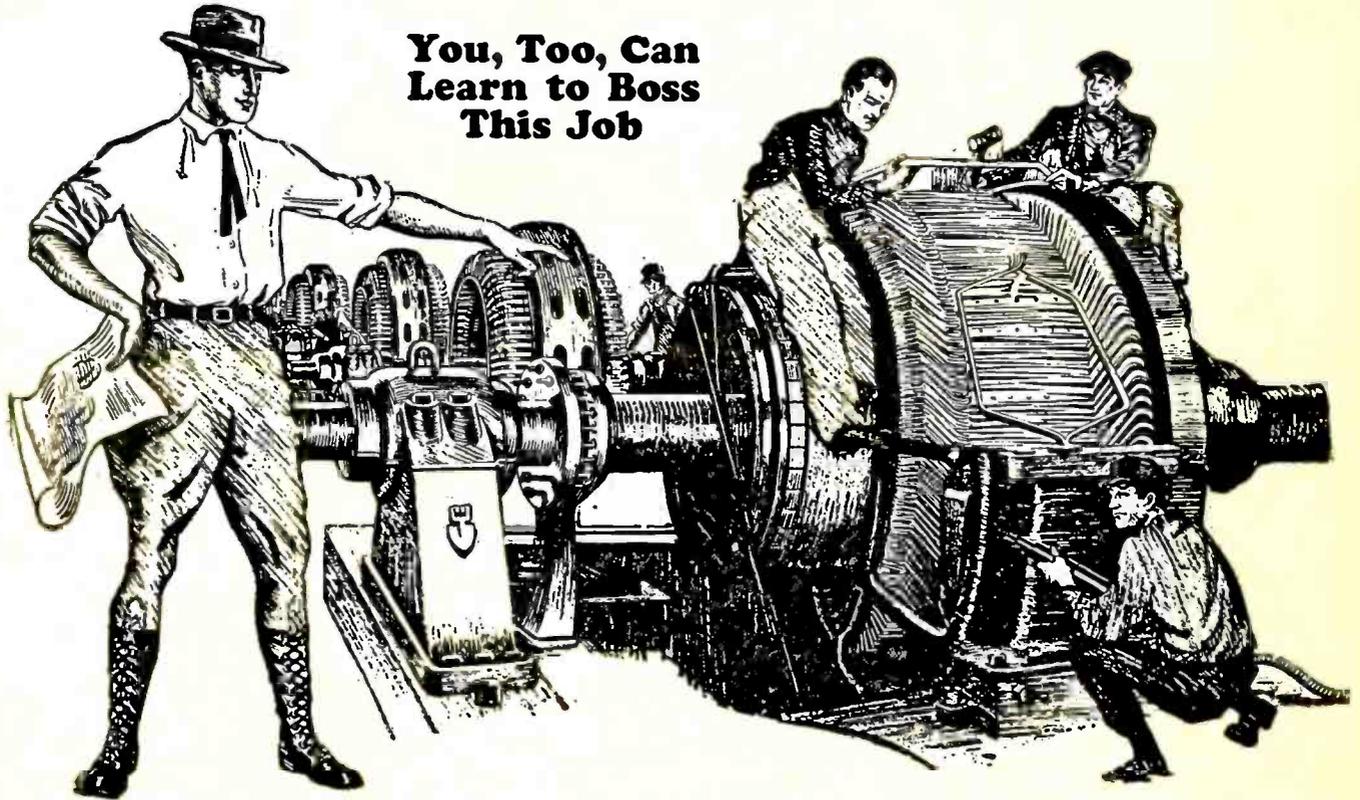
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# RADIO AGE

*The Magazine of the Hour*

Volume 1

Number 7

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RADIO AGE is published monthly by  
RADIO AGE, Inc.

Publication office, Mount Morris, Ill.  
Editorial and Advertising Offices, Garrick Building, 64 W.  
Randolph St., Chicago.

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YOUNG & WARD  
308 North Michigan Avenue, Chicago, Ill.

*Eastern Representative:*  
GEO. W. STEARNS  
Flatiron Building, New York City, N. Y.

Advertising Forms Close on 19th of the Month  
Preceding Date of Issue.

Issued monthly. Vol. 1, No. 7 Subscription price \$2.50 a year.  
Entered as second-class matter September 15, 1922, at the post office at Mount  
Morris, Illinois, under the Act of March 3, 1879.

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## Famous as Teacher



"SEND me Radio Age for one year," writes a Davenport, Ia., fan. "If Frank D. Pearne is technical editor of your magazine that's all I need to know."

The Davenport subscriber is one of many who instinctively links radio with "Pearne." Mr. Pearne has been chief instructor in electricity at Lane Technical High School, Chicago, for twelve years. He has won thousands of friends also among readers of radio articles showing how to make and operate radio apparatus.

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Send \$2.00 in currency, check or money order to Radio Age and get this progressive, helpful magazine for one year. Keeping up with radio is easy when you follow Frank D. Pearne. Address Radio Age, 64 West Randolph Street, Chicago.

# *National Radio Week to Emphasize Educational Value of Radio Broadcasting*

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THE tremendous contribution of radio broadcasting to the educational life of the country is to be especially emphasized during NATIONAL RADIO WEEK, to be held from December 23 to 30.

Broadcasting has assumed many roles since its inception, but none has received such wholehearted and enthusiastic support from the nation's leaders as when it dons the toga of the educator.

Sending of operatic arias out on the air has become frequent within the past few months. All the progress thus far made in that field, together with a wealth of new material and ideas, is to be assembled during NATIONAL RADIO WEEK for a grand display.

Announcement to this effect has just been made by J. Andrew White, chairman of the Executive Committee of NATIONAL RADIO WEEK. Mr. White and the Committee feel that the broadcasting of the highest type of music not only has recreational value but is inspirational in home circles, as well, and there is tremendous economic benefit to be gained in educating the American people through radio to an appreciation of the higher forms of culture.

Radio's use in the church and school are also to be demonstrated in special nation-wide programs from scores of stations.

NATIONAL RADIO WEEK is an unselfish, co-operative effort on the part of everyone in radio, from listener to manufacturer, to demonstrate what the new science and industry has accomplished thus far in the brief span of one year of general popularity and to give the listener an insight into the yet unrealized possibilities of the near future. It is an organized effort to add to the ranks of listeners—to double this number in fact.

Every listener will endeavor to enlist one other person as a radio fan. This will double the number of broadcast listeners. Programs from every station in the country, specially prepared to fit the holiday season and the spirit of the week, will be sent out on the air. Sporting events, operas, jazz bands, speeches, and other particularly interesting programs will fill the air. Nation-wide broadcasts of a single event to be heard in every section of the country at once, will be made.

# RADIO AGE

"The Magazine of the Hour"

M. B. SMITH  
PUBLISHER

PUBLISHED MONTHLY GARRICK BLD'G CHGO.

FREDERICK SMITH  
EDITOR

## A Homemade Battery Charger for \$3.00

By F. D. PEARNE

ONE of the most essential requirements of a radio set is some kind of a charging apparatus which will keep the storage battery charged at all times. This is comparatively easy where the electric lighting circuit is of the direct current type, but unfortunately for the radio fan, most lighting circuits use the alternating current and before a battery can be charged with this current, some method of rectification must be used. Various devices for this purpose are now on the market, some of which are sold at

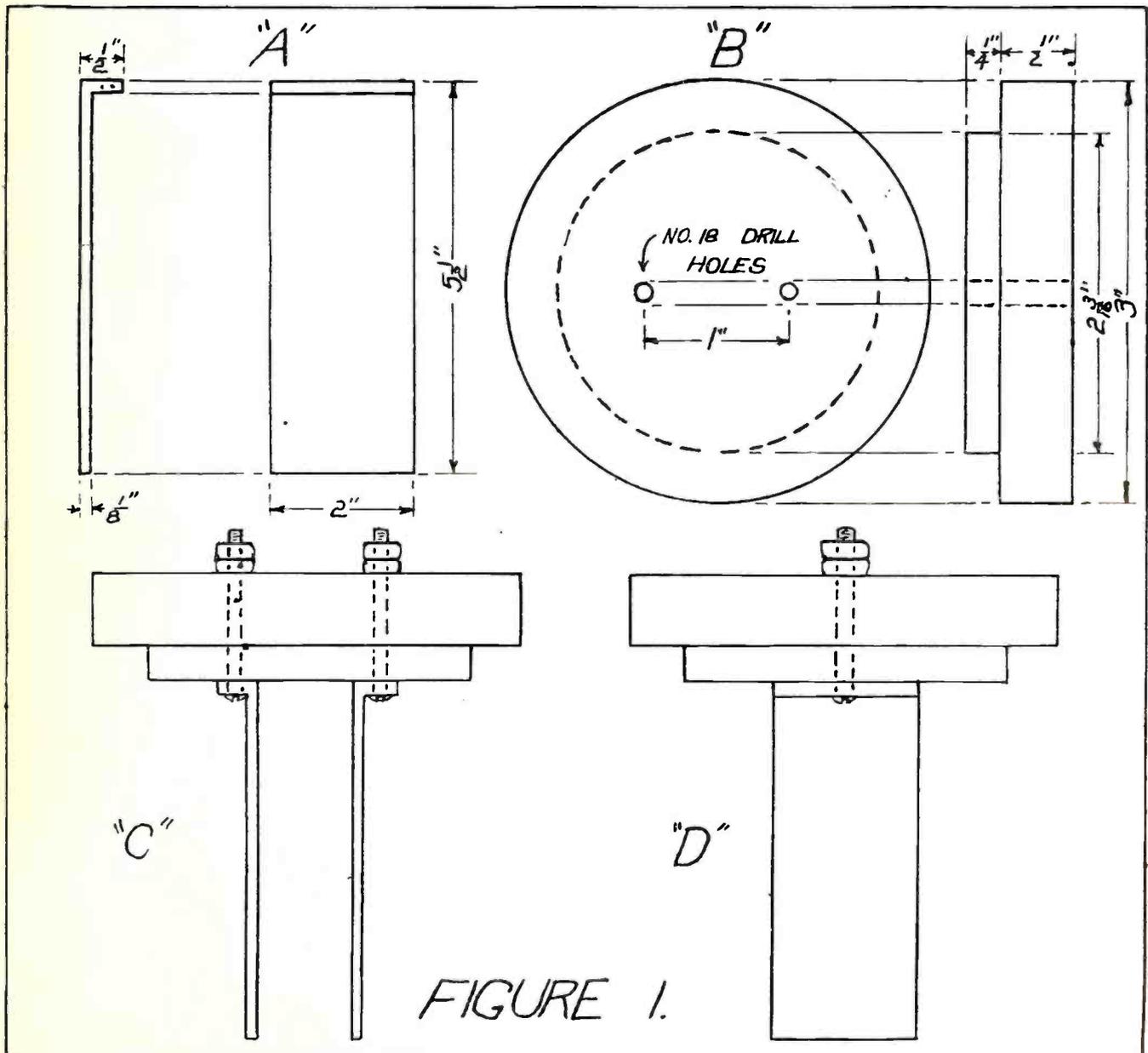
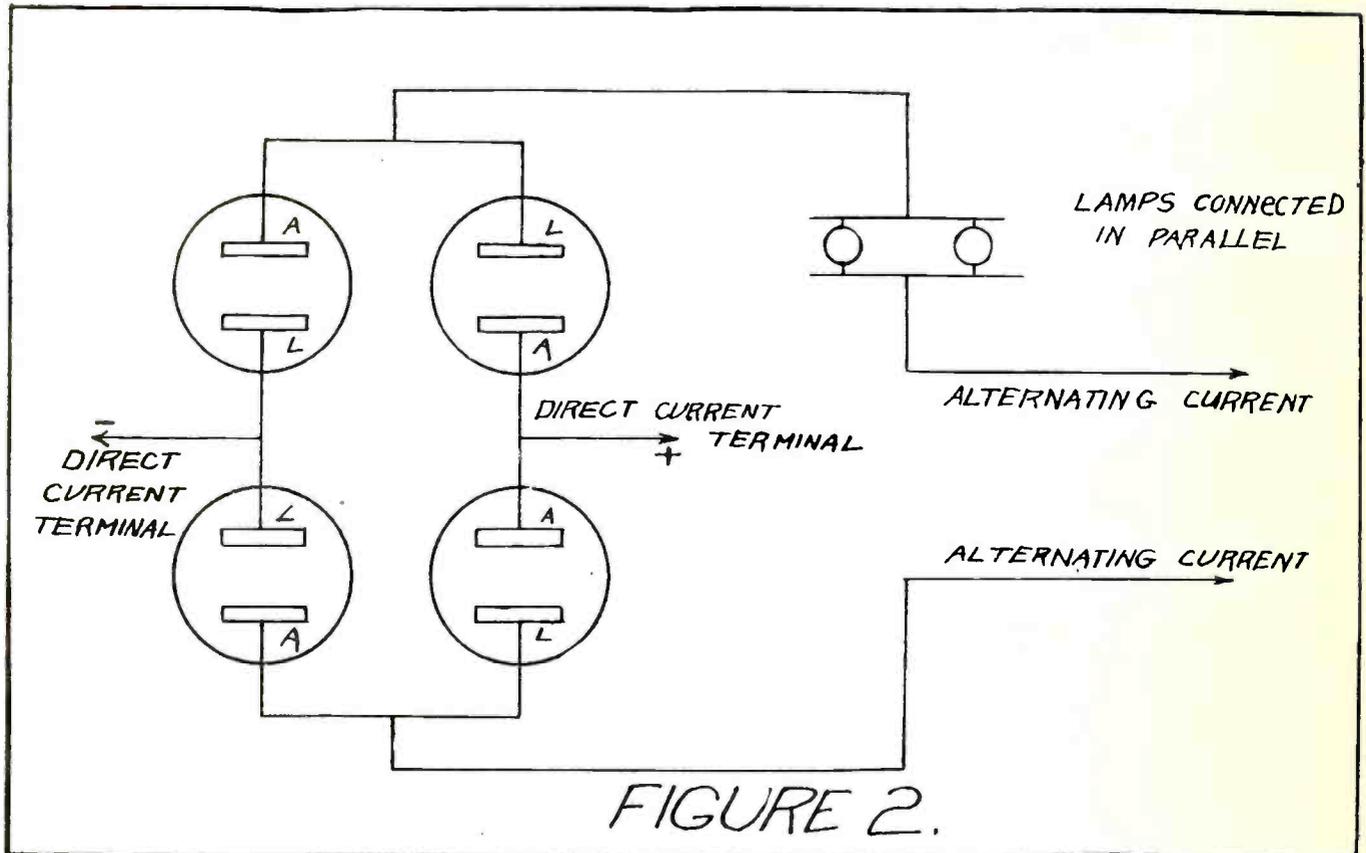


FIGURE 1.



reasonable prices, while others are really expensive, and as the average radio fan usually has plenty of outlets for his spare change, I am going to describe a rectifier which any amateur can build at an expense of less than \$3.

This outfit is known as the "Norden valve" and will answer the purpose very well and in fact is really better than some of the rectifiers one may buy, for the reason that it rectifies both sides of the alternating current wave, which some of the standard outfits do not do. The materials required consist of four ordinary quart size mason jars, such as are used for putting up preserves; four pieces of sheet aluminum one-eighth of an inch thick; four pieces of sheet lead of the same size and thickness, four wooden tops to cover the jars, a few brass machine screws and nuts, and about two and one-half pounds of phosphate of ammonium.

First cut out four plates of good, soft sheet aluminum, six inches long, two inches wide and one-eighth of an inch thick. Bend one end over, one-half inch as shown at "A", Figure 1. Drill a hole through the center of the part which is turned over. This should be drilled with a No. 18 drill which is large enough to allow an 8-32 brass machine screw to pass through it. These plates should be made of soft aluminum for the reason that hard aluminum will crack and break, if bent at a sharp

angle. Next cut out four pieces of sheet lead of the same size and shape as the aluminum pieces, and drill holes of the same size in the same place.

The wooden tops for the jars should be turned out of hard wood. The flange should be three inches in diameter and one-half inch thick and the smaller part is two and three-sixteenths inches in diameter and one-quarter inch thick. This small projection is to extend down into the jar and will just fit into the neck of the quart-sized fruit jar. If any other kind of a jar is used, this size should be changed to suit the case. If it is not convenient to turn these tops out in a lathe, they can be made of two pieces cut out with a jig saw and fastened together with screws, but these screws must be so located that they do not interfere with the holes which are to be drilled, as shown at "B", Figure 1. Now mount one aluminum plate and one lead plate on each of the tops as shown at "C," Figure 1. These plates are held in place by 8-32 brass machine screws, one and one-half inches long and fastened with a nut on the other side. The nut should be turned up very tight so that the plate is held rigidly in place. Another nut on top of the first one serves as a binding post to which the wires will be connected later.

After all four units are complete the part of the plates which was

turned over, as well as the screw heads and the part of the wood which goes down into the neck of the jar should be coated with melted wax, or paraffine to prevent any gas or fumes from the solution corroding the screws, thereby causing a poor joint. Next, make up the solution with which the jars are to be partly filled, make a saturate solution (all the water will dissolve) of distilled water and phosphate of ammonium. It is necessary that the distilled water be used as it will not work if the water contains any impurities.

Fill the jars with this solution to within about one inch of the top, that is, the solution should be within one inch of the top when the plates are in the jars. It is a good plan to measure out enough water to fill the jars three-quarters full and then add the phosphate of ammonium, until no more can be dissolved. In dissolving this chemical, it should not be stirred with a metal spoon, use a piece of glass, so as to make sure that no impurities get into the solution. Figure 2 is a diagram of the circuit, which shows how the connections are made. The aluminum plates are marked "A" and the lead plates are marked "L" respectively. Lamps are connected in the circuit, which allow only a certain amount of current to pass from the alternating current wires to the rectifier. Each lamp added in

(Continued on page 28.)

# Radio Receiving Equipment\*

By FRANK CONRAD

Assistant Chief Engineer, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

THIS paper is intended to discuss questions of design of those types of receiving apparatus which are adapted for reception over a limited range of wave length, and which depend for their operation on such manipulation as can be successfully carried out by persons entirely unfamiliar with the technique of radio apparatus. Their principal field of application is the reception of broadcast radio telephone signals.

Among the many requirements which an ideal receiver of this class should fulfil are that:

(1) It should tune in the wave length desired with only simple adjustments, which should not interact on each other. With a signal of normal audibility from a desired station, the signal strength from another equal or possibly more powerful station, separated by ten thousand cycles, should be below audibility.

(2) Its sensibility should be such that its range will be limited by static interferences, fading, and so on, rather than by actual lack of response. Any local sources of power necessary for its operation should require infrequent attention.

The first-mentioned requirement, which may be termed selectivity, is more or less fulfilled by giving the receiver a characteristic in which its impedance to the desired band of wave length is very low in comparison with its impedance to the

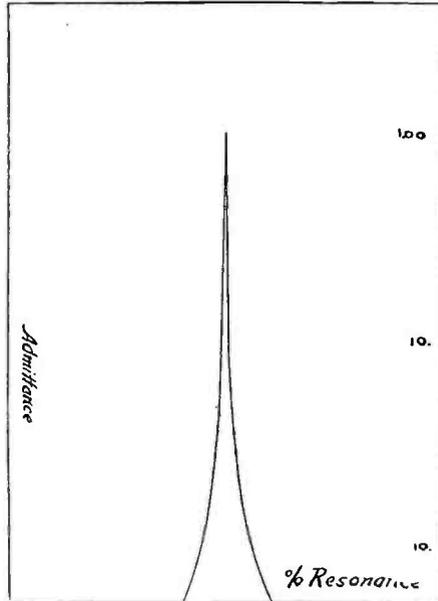


FIGURE 2

wave length above and below this band.

The curve in Figure 1 shows the relation of admittance to wave length in a simple oscillating circuit which has the constants of the antenna ordinarily used and which is tuned to a definite wave length by the addition of a variable inductance.

An examination of this curve shows that, although the maximum signal is obtained for the wave length to which the circuit is tuned, appreciable response is given to wave lengths differing considerably from those for which it is in resonance.

In order to obtain the desired selectivity, it is necessary considerably to increase the time constant of this circuit. This result can be accomplished in one or both of two ways: namely, by increasing the inductance element with a corresponding reduction, of capacity, or by decreasing the effective resistance by regeneration.

The curve in Figure 2 shows the effect of placing an additional capacity of 25 micro-microfarads in series with the circuit with a corresponding increase in inductance to bring the circuit in resonance with the same wave length as under the first condition. It will be noted that the selectivity is very considerably improved.

In the case of a vacuum tube detector, which is nominally a voltage-operated device, the large inductance implies a correspondingly large voltage available for operation of the

detector, with the resultant increase in signal strength. In the case of the crystal detector, the maximum signal strength is obtained when the effective resistance due to the detector is equal to that of the balance of the antenna circuit. It, therefore, should be connected across such part of the inductance as will give the best compromise between selectivity and sensitivity.

The use of the regenerative vacuum tube offers the further possibility of increase of selectivity with the additional advantage of a very marked increase in sensitivity.

The curve, Figure 3, shows the relation of admittance to wave length of the same circuit as that for Curve 2, with the exception that the resistance element is assumed to be one per cent of that in Figure 2. This is an amount of regeneration which can readily be obtained. The ordinates of this curve are drawn to a scale one hundred times that of Figure 1 and 2, and it might be assumed that the signal strength would be one hundred times that which would be obtained from the circuit of Figure 2. This condition does not necessarily follow, owing to the fact that there is a definite limit to the component of antenna current which is proportional to the incoming signal.

This condition may be illustrated by the diagram, Figure 4. In this diagram, *OE* represents the incoming signal field affecting the receiving antenna. Should the impedance of the receiving antenna circuit be infinite, the voltage induced in this circuit will be in the phase *OC*. For finite values of resistance impedance in this circuit, the current will be bounded

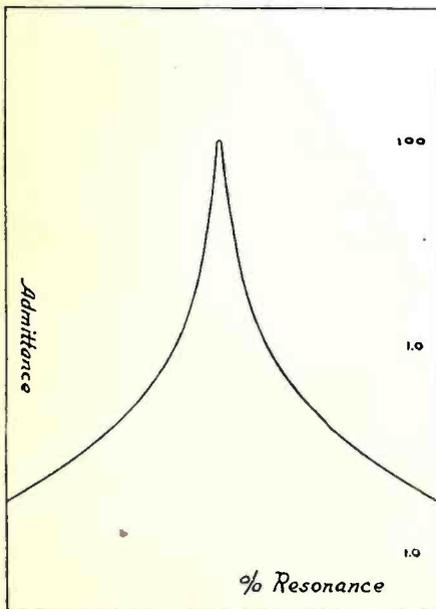


FIGURE 1

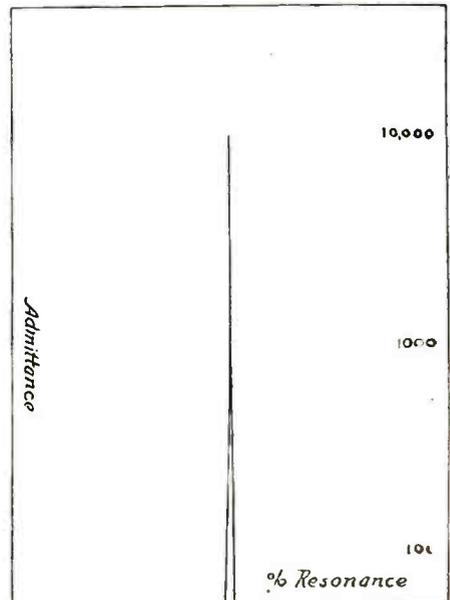


FIGURE 3

\*Presented before The Institute of Radio Engineers, New York, October 4th, 1922.

by the circle  $O B A$ . Thus, for a given value of resistance impedance, the current will be represented by the line  $O B$ . The field surrounding the antenna due to this current will have the same phase and relative length, and the total effective field will be the sum of  $O E$  and  $O B$ , or  $O D$ . For zero resistance the current will have the phase and relative length  $O A$ , with a zero resultant field. Further consideration will show that this ultimate received antenna current is independent of the height of the antenna, provided all sections of its length are affected by the same field intensity, it being dependent only upon the field per unit length.

The antenna therefore may be considered as a constant voltage generator, having a definite internal impedance, which is proportional to antenna height. This generator supplies a load circuit having the constants of the oscillating circuit.

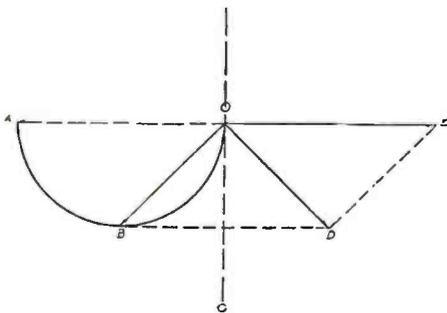


FIGURE 4

In the case of a regenerative system in which the regeneration is carried out to such an extent as to produce oscillations, the current due to the incoming signal will be super-imposed on the local current, and have a value dependent entirely upon the effective resistance but independent of any local oscillating current.

Figure 5 shows the conditions determining the resistance of the antenna circuit under the oscillating condition. In this curve the line  $G$  shows the relation of voltage impressed on grid terminals to the oscillating component of plate circuit. Curve  $P$  shows the oscillating component of plate circuit set up by this impressed grid voltage. From this curve it will be seen that, once the oscillations are started, they will increase to a point where the curve  $P$  intersects the line  $G$ . The effective resistance of the antenna circuit is determined by the relation of the angle of this intersection to the angle of  $G$  with the base. In actual practice, it is possible to reduce the angle of intersection at this point to such a value that the antenna current due to incoming signal will closely approach the ultimate value. Any possible increase of the sensitivity is therefore limited to an increase of the inductance across which the detecting circuit is connected. The extent to which this increase can be carried out is largely a matter of design.

The limitation of sensitivity due to ultimate antenna current also imposes an apparent reduction in selectivity and is a feature which usually is not considered in the discussion of the oscillating circuit.

Referring to the curves, Figures 2 and 3, these show the characteristic of simple circuits made up of capacity, inductance

and resistance. In the case of an actual antenna circuit, it has been shown that there is, in addition, a limiting impedance which is proportional to the height. In the consideration of the sharpness of tuning the antenna circuit, it is necessary to consider this limiting impedance in addition to the actual impedance of the oscillating circuit. Therefore, the actual increase of sharpness of tuning which can be obtained by regeneration is largely determined by this limiting impedance, or, in other words, by the antenna height.

In Figure 6 are shown two curves taken with similar receiving sets, but on antennas of different heights. The left-hand curve is from a single-wire, inverted-L antenna, having a height of 35 feet (10.6 m.) above ground, and a length of horizontal portion 75 feet (23m.). The right-hand curve was taken from an antenna having a height above ground of 15 feet (4.6m.), the length of horizontal portion being the same. The same receiver was used in each case.

These two curves show the very great increase of selectivity to be obtained by the use of the low antenna. In fact, the increase is considerably greater than would be expected from consideration of the comparative heights of the two antennas. It is probably accounted for by the condition that the effective height of the lower antenna is a considerably smaller percentage of its actual height than in the case of the higher antenna, owing to the indefinite height of the ground connection which was made to the hot water heating system, thus giving an effect equivalent to raising the height off the actual ground.

Due to the absorption by objects on or near the ground, it is usually impossible to realize completely the condition of equal signal strength with low as with high antenna, and of course the possibilities in this direction depend on the surroundings of the antenna in question.

Under conditions in which the reduction of signal strength with height is due, as is often the case in thickly built-up districts, to the appreciable absorption near the ground, it is possible to improve the selectivity of the antenna by the use of a coupled secondary circuit in the receiving set. If another resonance circuit of the same constants were connected to the output circuit of a vacuum tube amplifier connected to a resonance circuit having the constants corresponding to that of Figure 2, the characteristic of this double circuit would be proportional to the product of the characteristic curves, which, it is evident, would give a very greatly increased selectivity.

This arrangement constitutes the ideal method of improving the selectivity of a receiver. If, in place of the relay coupling between the oscillating circuits, a direct coupling were used, the relation of the secondary to primary would, in a sense, be a duplicate of that existing between primary and the transmitter, with the equivalent antenna height of secondary corresponding to the looseness of coupling, thus permitting the possibility of a receiver connected to a high antenna and with the selectivity of a low one. However, the extent to which this can be carried out is limited by the fact that,

as the apparent secondary antenna height is reduced by reduction of coupling, the reduction of primary resistance by regeneration is also reduced, with a corresponding limitation of ultimate secondary signal current and its attendant reduction of selectivity.

Owing to the difficulty of carrying out the necessary interacting adjustments, the use of a coupled circuit receiver is justified only under those particular conditions in which it is not possible to take advantage of the selectivity of the low antenna.

A further possibility towards the solution of the receiver problem for congested districts is the use of a closed coil or loop in place of an open antenna. The loop receiver will have the advantage that, similar to the short antenna, it embraces a limited field area, and at the same time can usually be placed sufficiently above ground level to be in a somewhat denser field than would be the case with a corresponding short, open antenna. The limiting impedance of the loop is comparatively low, but as the induced signal voltages are also low, it is necessary that a regenerative system be used in order to obtain the benefit of selectivity. It, of course, has certain possibilities of eliminating interference, due to its directional properties. In general, the loop receiver under its best conditions, will give results which are practically identical with those obtained from a receiver connected to a properly proportioned, open antenna, barring, of course, the possibility that the relative position of the interfering station may be such as to permit of advantage being taken of the directional effect. It has the advantage of convenience of installation and of not being restricted to location as regards height where the field density may be low. How-

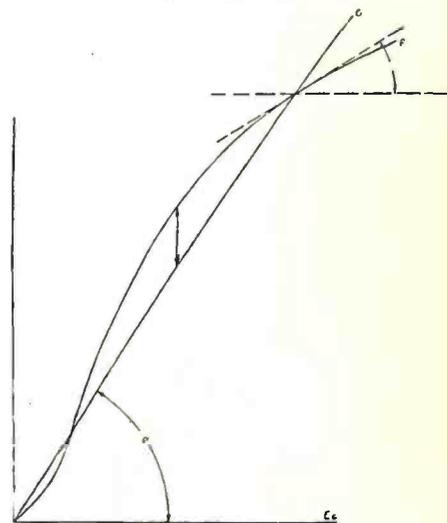


FIGURE 5

ever, the first cost and maintenance expense of such a receiver are far greater than those of the equivalent regenerative set on an open antenna, and for these reasons, cannot, at the present time, be considered as a real competitor of the open antenna receiver.

The foregoing conclusions in regard to the conditions effecting selectivity are based on the premises that the receiver is used for the reception of modulated continuous wave signals and that the inter-

ferences to be dealt with are those set up by similar transmitters.

In the case of interference resulting from atmospheric, or static, the particular precautions which would minimize interference from other transmitters would have insignificant effect, and at the present time there is no practical scheme which gives any appreciable reduction of interference from static.

In the case of interference from damped wave transmitters, the effects will lie between the conditions of a modulated continuous wave signal and static, the similars to one or the other being determined by the decrement of the interfering signal.

In the case of the usual amateur spark transmitters, which is the one most likely to set up the interference, the conditions will be not far removed from those governing the effects of static, owing to the usual high decrement of these transmitters.

The solution of the problem of interference from this source should be in the direction of elimination of the spark transmitter by the substitution of continuous wave sets, rather than by any receiver development, owing to the actual great width of wave band covered by even the best type of spark transmitter.

The one serious defect of the regenerative receiver is the interference it can produce on other receivers due to radiation when regeneration is carried to the oscillating point. The intensity of this radiation can be controlled to a certain extent by the antenna circuit constants and the constancy of regeneration of the receiving set with various wave length adjustments.

With increase of inductance element in the antenna circuit, the antenna current for a given voltage applied to a receiving tube is correspondingly reduced, with attendant reduction of interference; and, with constancy of regeneration with varying wave length adjustment, the possibility of the set producing strong oscillations during the tuning operation will be reduced. This latter feature has considerable bearing on the system of regeneration which it is advisable to employ.

The mechanism of regeneration implies a coupling between anode circuit of tube and oscillating circuit, such that any fluctuations in anode current sets up corresponding oscillations in the oscillating circuit, and of such phase relation as to reinforce the original oscillations which had acted on the grid of the tube. This coupling may be electro-magnetic or electro-static.

In the electro-magnetic coupling a coil which is in series with the anode circuit is so disposed that its field embraces more or less of the inductance in the oscillating circuit.

With the electro-static coupling, advantage is usually taken of the capacity between grid and anode elements of the tube and its connections. When the impedance of the anode circuit is altered by a varying grid potential, corresponding potentials are induced on the grid element through the capacity of tube and connections. When the grid is connected to a resonant circuit and the impedance

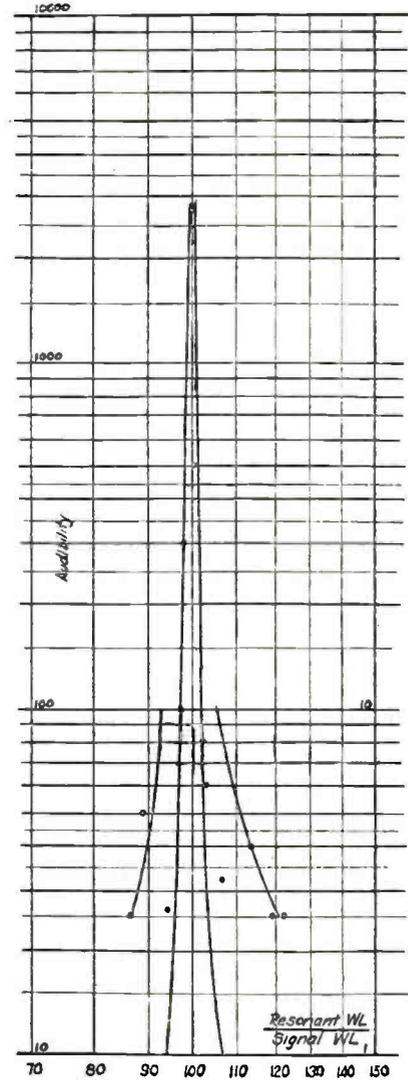
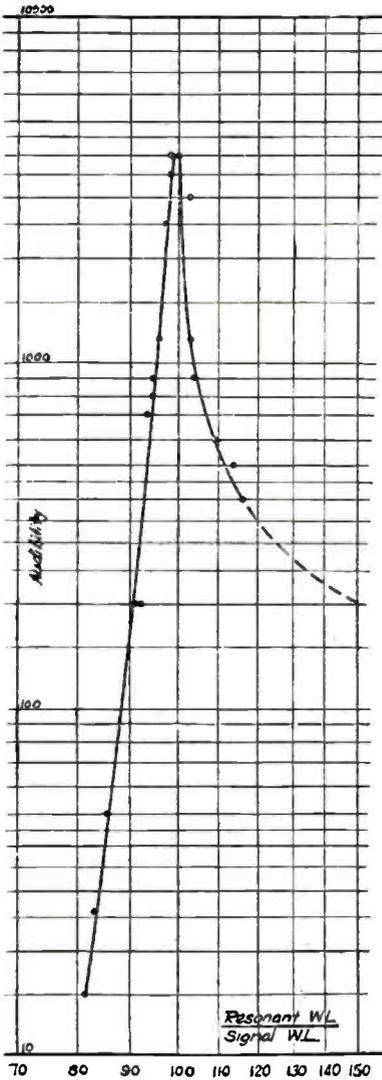


FIGURE 6

in the anode circuit is principally a resistance, the phase relation of induced potential on grid through anode is 90 degrees displaced from the original controlling potential of the grid. An inductive reactance in the anode circuit so shifts the induced potentials that it assists or adds to the potential grid controlling potential. A capacitive reactance so shifts the phase relation that the induced charge grid subtract from the original controllings potential. Therefore, by incorporating a variable inductance in the anode circuit, the amount of regeneration can be controlled at will.

The inductive coupling method of regeneration possesses the advantage that when the anode coil is coupled to the variable inductance which controls the wave length of the oscillating circuit, the amount of regeneration remains practically constant over an extended wave length band. In the case of the capacitive coupling, both the effect of capacity between anode and grid circuits and the effect of inductance in the plate circuit vary with change of wave length. The regeneration, therefore, requires readjustment with each readjustment of wave length of the set. For this reason the operation of tuning-in a signal is more complicated. The inductive coupling method, however, requires proper proportion-

ing of the relation between coupling coil and turning inductance, while the capacitive coupling merely requires the insertion of a variable induction in the anode circuit and the necessary by-pass condensers to shunt the radio frequency fluctuations in this circuit around intertube transformers or telephone receivers. For this reason, this arrangement has been a great favorite with radio experimenters as well as manufacturers of receiving apparatus, who have merely assembled conventional parts in a containing case.

From the standpoint of interference produced by the receiver, therefore, the inductive coupling method is considerably superior to the capacitive coupling, owing to the fact that the coupling can be set at some value below the oscillating condition, which it will maintain throughout the whole range of wave length adjustment. The degree of regeneration which can be obtained over the whole range without oscillations occurring at any point is, of course, dependent upon the excellence of design of the set. In case of the capacitive coupling, as the degree of regeneration increases at a very rapid rate with decrease of wave length setting, it is necessary, in order to obtain any appreciable regenerative ef-

(Continued on page 28.)

# How to Avoid Interference

By C. W. HORN

Director of Radio Operations, Westinghouse Electric & Manufacturing Company

**I**N order to assist radio broadcasting, the Department of Commerce has specified two wave lengths on which broadcasting may be conducted. These wave lengths are 360 meters, the one in general use up to this time, and 400 meters, just recently allotted. While these wave lengths are forty meters apart, undoubtedly there will be considerable confusion on the part of those owning radio receivers who are located very near a broadcasting station.

For the purpose of assisting those who are located so that a 360-meter and a 400-meter station are picked up by their receivers simultaneously a number of methods will be described, which, if applied, should greatly assist those desiring to get either one of the two waves without interference. There is one case, however, which will be very difficult to assist; that is, where the receiver is exceptionally near to a broadcasting station—say within a few thousand yards.

The assignment of two wave lengths so close together will have the effect of stimulating construction of radio apparatus which will be capable of tuning more sharply, and it is the case of "necessity being the mother of invention." Therefore, while there may be some inconvenience at the present time, this should be overlooked in order to help the radio game by creating a condition which will stimulate the construction of better apparatus, and which will permit the assignment of more wave lengths, ultimately creating a better situation in the ether.

One of the greatest faults that has been found in connection with the installation of radio receiving apparatus is that it is believed that the more wire and the larger the antenna the more will be received. An exceptionally large antenna makes it more difficult to tune sharply, and for this reason it is advocated that a very short, single wire antenna, approximately 75 feet long, measuring from the apparatus to the far end, be used. This single wire antenna should be stretched away from all metallic objects and run straight and clear of all obstructions.

Another fault in the installation of receiving apparatus can be eliminated by not running the antenna or lead-in over metal roofs, along

## Code-Sender is Sued by Owner Receiving Set

**W**HO has first right to ether, the radio receiver or the radio sender? This is the problem—entirely new—which is raised in the suit filed by Edward McWilliams of Dwight, Ill., in the Circuit Court at Pontiac, Ill.

The suit is filed against Wiley Bergman, another radio fan of Dwight, who has a sending apparatus. Mr. McWilliams has only a receiving set, and when Bergman is sending he declares that his service, as well as that of the twenty other radio fans in Dwight, is interrupted.

McWilliams wants the court to determine whether one person has a right to send wireless messages into the air, disabling the pleasure of countless other persons while they are receiving prearranged programs from all parts of the country, which fact McWilliams declares Bergman is aware of but refuses to recognize.

McWilliams also asks an injunction restraining Bergman from operating his sending apparatus when programs are being broadcasted by recognized stations throughout the country.

water spouts or drains, or parallel to telephone and power wires.

Frank Conrad, assistant chief engineer of the Westinghouse Electric & Manufacturing Company, has made measurements and drawn resonance curves which show that a short low antenna tunes more sharply than a large and long antenna. (See his article on another page of this magazine.) This holds true both for coupled and single circuit tuners.

Another method to pursue in overcoming interference, especially where vacuum tube receivers are used and where the receiver is located close to a broadcasting station, is to make use of the well-known directional properties of the loop antenna. A very simple loop can be constructed by winding a half dozen turns of wire spaced about one inch apart, on a framework, which can be rotated. It will then be easy to tune out a station which has a difference of

forty meters in wave length, especially so as a loop antenna forms a closed circuit which can be more sharply tuned than an open antenna. The two ends of the loop should be connected across the antenna, the ground terminals of the receiver, and no other ground or antenna used.

Those who are located a greater distance from a broadcasting station can, without any difficulty, tune in either one of the wave lengths mentioned. They should, however, bear in mind that a single wire antenna, not too long, and kept free from obstructions, and not running near grounded metallic objects, will tune sharper. Where the amateur has a transmitting apparatus it is of course desirable to have a fairly large antenna, with more than one wire, and if such is the case he should use a separate wire for receiving.

The ideal condition will be when stations can operate independently on either of two wave lengths without interfering with each other, and because the receiving apparatus is an important factor these suggestions are given in order that owners or receiving apparatus may have the necessary information to increase the efficiency of their apparatus.

## Experts to Meet

At the request of the Department of State, each Governmental Department interested in or having to do with wire and wireless communication has appointed a representative to serve on an inter-departmental committee for the consideration of problems of international electrical communications. At a meeting, soon to be called in Washington, the several members of the United States Committee will study the problems to be considered at the forthcoming international conference to be held in Paris, and the American agenda and policy will be worked out, in detail.

The membership of the committee follows:

Post Office, Mr. Paul Henderson, 2nd Assistant Postmaster General; War Department, Major General George O. Squier, Chief Sig. Officer of the Army; Dept. of Commerce, Mr. P. E. D. Nagle, Communications Expert of this Dept.; Navy Department, Rear Admiral H. J. Ziegemeier, Dir. of Naval Communications. (In his absence Rear Admiral Joseph Strauss will be available for this Service); U. S. Shipping Board, Mr. F. P. Guthrie, in charge of Radio Service of U. S. Shipping Board.

The State Department representative has not been designated.

# Questions and Answers

By Radio Age Institute, Conducted by Frank D. Pearne

To insure prompt reply to questions, please enclose self-addressed and stamped envelope.—The Editor.

F. M. P., Chicago, Ill.

Question: 1. I have the September issue of the Radio Age, which shows the Reinartz tuner with two-step amplifier. I would very much like to have it with jacks and plug connections. 2. What does it cost to build an Armstrong super-regenerative set like the one used by Paul B. Coats and shown in your September issue? Do you recommend it to be a good loud outfit for concert stuff on a loud speaker?

Answer: Circuit has been mailed to you. The Armstrong arrangement is quite expensive as compared to other circuits, but this is not the principal difficulty. Sometimes it will work and other times it will not and the general opinion of engineers who have tried it out is that the results obtained are not worth the great trouble of building it and trying to keep it in adjustment. It is plenty loud for short distance work, but is not much good for long distance reception.

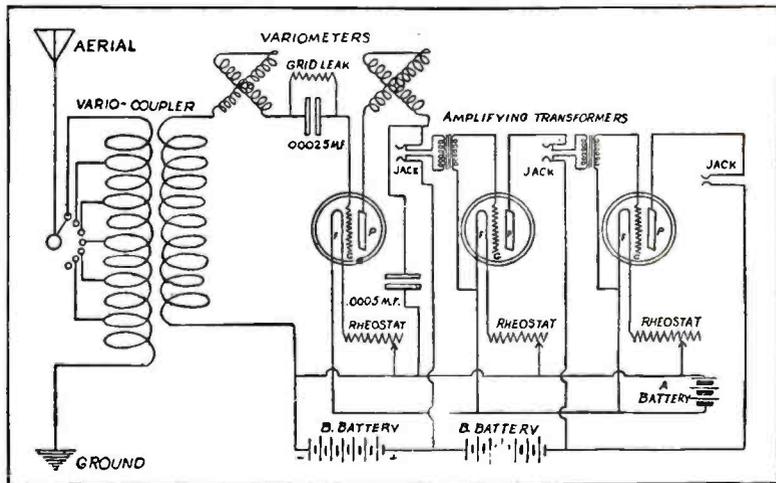
C. A., Streeter, N. D.

Question: 1. I have constructed the Reinartz unit with one-step of amplification as per your instructions and details published in the September issue of the Radio Age. So far I have been unable to make the set work. I made the coil out of No. 26 enamel magnet wire. Is this satisfactory for this work? I was unable to obtain the kind mentioned. I am using a variable condenser instead of the grid leak and condenser. 2. Will it be necessary to use a grid leak between this condenser and where it is connected to the grid connection on the socket. 3. Which wire should be connected to the rotating part of the condenser?

Answer: 1. If you followed the instructions carefully, there is no reason why you should not get results. Thousands of amateurs have made this set and only a small percentage have had trouble in making them work. The wire which you used is all right. 2. I think you would have better luck if you used a grid leak and condenser instead of the variable condenser. I am sending you the detector circuit showing just where to use it. 3. The ground wire should be connected to the rotating part of the condenser. In the case of the aerial condenser, the rotating part should be connected to the aerial.

F. M. J., Waco, Tex.

Question: 1. I am sending you a circuit using a vario-coupler and 2 variometers. I am not having much success with this circuit and I am in doubt as to whether or not it is correct. As you will notice, I am using two-steps of audio frequency amplification but it does not seem to do any good. Will you kindly look over my hook-up and tell me if I am right, and if not, please send me the proper hook-up for this set.



Answer: 1. Your circuit is all wrong, F. M. J., and I don't see how you could keep your batteries up if you used it. I am showing a cut of the correct circuit, with a two-step amplifier.

L. T., Independence, Kans.

Question: 1. Will you please send me a circuit for a sharp tuning, long distance, crystal set if possible. If you can't send it, please let me know where I can get it.

Answer: 1. I am sending this circuit to you by mail. The only reason this is called a long distance set is because the tuning is so much sharper that stations which cannot be heard with an ordinary crystal set can be picked up.

E. O. W., Lincoln, Nebr.

Question: 1. I have a loose coupler tuning coil which I constructed myself. The primary of this coil is seven and three-quarters inches long and three and three-fourths inches in diameter. It is wound with No. 22 enameled wire. The secondary is six inches long and three and one-half inches in diameter and wound with No. 26 single silk insulated wire. Would you kindly send me a vacuum tube hook-up using this coil, with which I could get high powered

broadcasting stations of 360 meters, from 500 miles up, distant? If it is possible I would like the apparatus in this hook-up efficient, but inexpensive, as my capital is rather limited.

Answer: 1. I am mailing this circuit to you. I don't know how far you can receive with it, but it is as good as you can get for a loose coupler circuit.

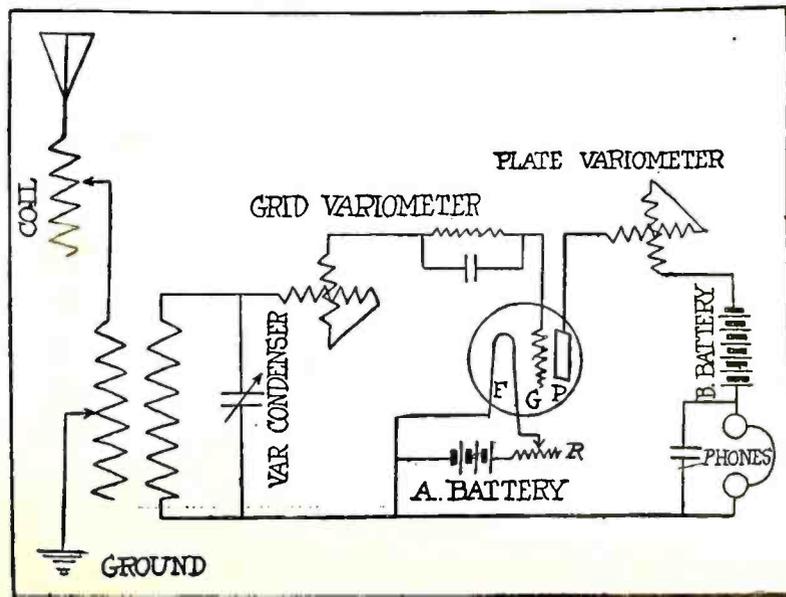
M. O. R., Arcola, Ill.

Question: 1. Will you please send me a circuit showing how to connect a loading coil to a vario-coupler and variometer set?

Answer: 1. This should be connected in the aerial circuit as shown in the following diagram.

A. K., Chicago, Ill.

Question: 1. I have decided to make the Reinartz tuner which was printed in the November issue of the Radio Age, on page 5. I would greatly appreciate it if you would answer these questions for me. Please give a diagram showing where to place three jacks. 2. Is it possible to use a loop aerial with this set? 3. Can I use a 43-plate condenser instead of 23 plates? Will it make any difference? 4. I used No. 26 S. S.



covered wire for the coil. Is it O. K.?

Answer: 1. I am sending you a rough diagram by mail, as it would be too large for this column. 2. Yes, I have used a loop aerial with mine and while I did not get as many stations as I got with the outside aerial, still I did get very good results. Use about 8 turns on a frame 4 feet square. 3. You can use the 43-plate condenser if you want to, but they are more expensive. 4. The No. 26 S. S. covered wire is all right.

R. N., Chicago, Ill.

Question: 1. Will you please send me a hook-up using the following parts: 1 two-slide tuner, 1 grid leak and condenser .00025, 3 rheostats, 3 V. T. sockets, 1 All American transformer, 10 to 1, 1 Thordarson transformer, 4 to 1, 1 six-volt A battery, and 2 B batteries, 22 1-2 volts each?

Answer: 1. I am sending you this circuit by mail, but I think you would have much better luck if you used a vario-coupler instead of the tuning coil.

H. E. K., Mt. Morris, Ill.

Question: 1. I have read your article in the Radio Age regarding the construction of a Reinartz tuner and intend to make one. As I have a quantity of No. 28 double cotton covered magnet wire on hand, I would like to know if I could get the same results by using it for the tuner. Also would appreciate a diagram showing how to mount the instruments on a panel 8" by 18". This is my first attempt at constructing a set and am a little skeptical as to the results, but from the records made by others, I do not think I can go wrong.

Answer: 1. You can use the No. 28 wire all right, the only difference being that it will slightly increase the resistance of the coils, which I do not think will effect your reception. There is no reason why you cannot be just as successful as others in the making of this set. Will be glad to help you out if you have any trouble.

## Club News

A radio club has been formed by the Jewish People's institute, 1258 West Taylor street, where meetings will be held at which the theory and practice of radio will be explained by some of the more expert members of the organization. During succeeding weeks the construction and operation of both crystal and vacuum tube sets will be explained, as well as use of radio frequency and audio frequency amplifiers.

Four Wisconsin radio stations, two at Oshkosh, and one each at Appleton and Berlin, have formed an association, which holds its business meetings by radio. A new station is under construction at Neenah, which will also be admitted to the "Fox Valley Radio Association," as the new organization is known.

Alfred Thomas, Jr., was elected president of the Radio Club of Illinois at the recent election. The newly elected vice-presidents are Paul C. Niehoff, A. H. Kopprasch and Herman J. Pomy; Secretary, John P. Tansey; Treasurer, J. Elliott Jenkins; Directors, Frank D.

Pearne, U. J. Herrmann, Thorne Donnelly, E. H. Gager, Charles O. Stimpson, W. L. Holst, Leroy M. E. Claussing.

Zanesville, Ohio, is headquarters of a Radio Association for which a membership of 500 owners of sending and receiving sets is sought. The association held a meeting in the Zanesville Banking & Trust Company recently. John Garrett was named to lead the membership campaign. Team captains in the drive are Ed. Bonnett, Will Fouts, Ed. Garrett, Mike Hellyer, Arthur Jones, Alf Williams.

Two radio clubs, organized and supported by some of the most prominent figures in the Danish field of communications, have recently been formed to promote interest in radio telegraphy and telephony throughout Denmark. The aim of these clubs is to spread knowledge and create interest in wireless communication through lectures, demonstrations, and other means.

## Costs Only \$25 to Join

Those interested in the organization of radio clubs will find in the following program of activities, issued by the Radio Club of Illinois, some valuable suggestions as to what a radio club can accomplish. The circular containing the information is signed by Alfred Thomas, Jr., President of the club, and John P. Tansey, Secretary.

The functions of the club are outlined as follows:

Our activities in addition to promoting interest in Radio and bringing together all persons similarly interested, for social and educational advantages, are in part as follows:

1. Interesting all concerned in the proposed National Radio Control Bill. All Chicago members of Congress are anxious to serve the best interests of this new industry.

2. Prevent the passage of any regulatory ordinance by the City Council at the present time, and to continually oppose any ordinance providing for Inspection Fees. We claim credit for freedom to date from this abuse.

3. To foster the interests of those engaged in the trade or business of

manufacturing radio apparatus and accessories and parts thereof.

4. To reform the abuses relative thereto.

5. To secure freedom of its members from unjust and unlawful exactions.

6. To diffuse accurate and reliable information as to the standing of merchants and others dealing with members with respect to their credit and as to all inventions, patents, processes, or devices designed or intended for use in, upon or in connection with such apparatus and the manufacture thereof, as to the state of the art relative thereto, and as to the condition and development of the trade in which the members are engaged, in the United States and foreign countries.

7. To procure uniformity and certainty in the customs and usages of such trade.

8. To promote radio and carrier wave broadcasting and the quality of such service.

9. To settle differences between members.

10. To promote a more enlarged and friendly intercourse among business men engaged in such trade or dealing with persons engaged therein.

11. A program of lectures, reading of technical papers by recognized authorities, has been inaugurated.

12. Steps for the installation of a laboratory will be taken.

13. Our Club will shortly be in a position to furnish accurate information to our members as to circulation and advertising benefits of Radio papers and magazines. A saving of many dollars will be the result.

14. Necessary steps, and unlimited effort, for the stimulation and encouragement of the Radio industry are an important part of our plans.

15. We will furnish lectures and speakers on Radio, for special occasions.

16. We will endeavor to induce public and social service agencies to install sets in the conduct of their work.

17. Promote installation of Radio in industrial plants.

18. Our Club Rooms at disposal of traveling radioists.

19. Will furnish service by competent mechanics to those in need of same, and will act as an employment exchange for our members.

## This Coupon and \$2

Cut this out and send to Radio Age, 64 West Randolph Street, Chicago, Ill., and receive this magazine for one year. The regular subscription price is \$2.50 per year.

RADIO AGE,

64 West Randolph Street, Chicago.

Enclosed find \$2 for which please send me Radio Age for one year.

Name.....

Street No.....

City.....

State.....

# Homecharging Your Radio Battery

**W**HILE there has been some very successful receiving sets developed, operating from dry cells, the great majority of those in use, and likely to be sold in the future, require a storage battery for heating the filament in the detector and amplifying bulbs.

The maintenance and recharging of this storage battery has proved the bugaboo which has prevented many a radio fan, not familiar with the facts, from buying or making a real receiving set with several stages of radio or audio amplification, or both. There is no real reason, however, for this feeling, as any storage battery of reputable make will last for several years in radio service without any attention or trouble, excepting the addition of distilled water from time to time and recharging when exhausted.

It is admittedly, however, quite inconvenient and expensive to lug a storage battery to a service station every time it requires recharging, which, in the case of a receiving set employing several bulbs, may be once every week. Fortunately, however, there are many makes of home chargers on the market retailing at a popular price, which enables the radio fan to home charge his battery at practically no expense, and without removing it from the receiving room.

While many of these devices require some electrical knowledge for their successful operation, the majority of them are extremely simple in construction, and can be successfully operated by any one. The most efficient of these home chargers will fully recharge any "A" battery overnight with a current consumption of less than one K. W. hour, which, based on the average cost of electrical current throughout the United States, amounts to but 5 cents.

In the purchase of such a rectifier it is important that the buyer consider the following points:

**One—Self-Polarizing Feature:** With a rectifier of this type battery may be connected either way and will always charge. Otherwise, it requires considerable knowledge and skill to determine proper battery and rectifier polarity, and should battery be connected the wrong way, it is likely to be ruined, or, at least, seriously harmed through reverse charging.

**Two—At Least a Five Ampere Charging Rate:** With a charging rate of five amperes or more any battery of eighty ampere hour or less capacity may be fully charged overnight. Where a lower charging rate is employed a correspondingly greater time is required. For instance, with a rectifier delivering but two amperes about fifty hours continuous operation is required to fully charge a battery, during which time, or course, it is impossible to use the receiving set.

**Three—Underwriters' Approval:** The National Board of Fire Underwriters

## Why Crystal Sets Sometimes Pick Up The Far Calls

**Q**UITE often we hear some radio fan tell of some case of particularly long distance reception with a crystal set which does not seem possible.

However doubtful such a statement may seem to be, one must not be too quick to challenge the statement, for there are what is known as "freak periods" during which time great distances may be covered by the most simple type of receiving sets.

When these periods do appear which is usually in the Winter time hitherto quite impossible distances may be heard with ease.

The origin of these freak conditions in radio reception is not known, but many theories have been advanced, one of which is the fact that daylight always produces some heat, which may cause radio waves to be absorbed more during the day than at night.

This is one explanation of the reason for better reception at night than in the daytime. There seems to be a wild desire on the part of the normal radio fan to hear long distance stations and he will work hard to tune out some perfectly good program coming from a nearby station if he thinks there is any chance of hearing a few words from some city a thousand miles away.

are becoming more strict in the enforcement of rules covering the use of only approved electrical apparatus. Any rectifier having the Underwriters' approval has been carefully tested by them and possesses practically no fire hazard. Considerable difficulty may be experienced in effecting an adjustment with the insurance company in case of fire, if the rectifier you are using has not been approved by them.

After your rectifier has been purchased, it is advisable to secure a hydrometer from your dealer for telling when your battery needs recharging. This instrument can be purchased for 50 cents to \$1.00, and will pay for itself many times over through elimination of unnecessary charging.

A new storage battery should always be given an overnight charge before being used, since it has most likely been several months since recharged at the factory.

Maximum receiving range and strong, clear signals are obtained best when your battery is fully charged. For this reason it is always well to keep your

battery in as near full charged condition as possible.

By taking a hydrometer reading after an evening's use of your receiving set, if the specific gravity of battery is below 1200, it is best to connect home charger and charge battery overnight. It will then possess maximum power, be ready for a long period of use, and will bring in the signals stronger and increase the receiving range of your set.

## New Loud Speaker

The radio public are giving an ever increasing amount of attention to the loud speaker. Just as the phonograph attained lasting popularity through its ability to entertain a room full or even a recreation hall filled with guests by the use of a single amplifying horn, so it is conceded that for the average owner of a radio receiving set a loud speaker will sooner or later be considered a necessity.

Put briefly, the general requisite of a really good loud speaker, according to one authority, is one that will give "faithful tone reproduction, from which noise and static disturbance are practically eliminated, with volume enough to satisfy the most exacting requirements."

While admitting that this is a "large order," officials of the Planet Radio Corporation announce that in the Planet Loud Speaker they have fulfilled nearly 100 per cent of the above mentioned requirements.

In giving the specifications of the Planet Loud Speaker, an official of the company outlined the principle behind its manufacture as follows:

"The Planet Loud Speaker is made of solid, specially prepared bell metal alloy, which assures clear tones. It is of patented, special shape and construction, cast all in one piece, and is far superior to horns made of sheet metal or tin. The wiring, cabinet work and other details of construction are of the highest quality. The Planet Loud Speaker can be attached to any standard two-stage amplified receiving set.

"The Planet Loud Speaker is distinctive in appearance. It is compact and ornamental, a complete unit in itself. The case is of mahogany, with a beautiful piano finish; the emitter is burnished and the connecting cord silk covered."

The same company also is offering a loud speaker called the "Plan-O-Phone" which sells for \$3.50 and may be used with any two-stage amplified receiving set. It is of statuary bronze and fits any receiver.

The Planet Power Amplifier, made by this company, is a complete unit of beautiful design in a richly finished mahogany case and polished emitter with gold or aluminum finish. It adds loud, clear and distinct reproduction to the sound, transforming the set into a delightful musical instrument.

# What Radio Is Doing for Ohio Farmers

(By Ohio Division of Markets.)

Among the many factors which have entered into the improved conditions surrounding the management of the farm in Ohio is the installation of the wireless telephone. Its possibilities have just begun to be realized and they are infinite and endless. A visitor at the office of the Ohio Division of Markets, of the State Department of Agriculture, during the past week said:

"I am now getting my prices on live stock and other commodities every day over the wireless and it has proven a great help to me. I live on a farm and deal somewhat in cattle. In this way I am able to keep in touch with the market and find it of great advantage in buying and selling stock. I know at just the hour the report is coming and all I need do is be at my receiving instrument and I can catch them as they come in from the sending station at Dayton, giving quotations and market conditions from the principal market centers of the country."

This man is no exception to many others throughout the state, as a canvass made by the Market Division has shown. There are now five sending stations, well distributed throughout Ohio. They are located at the Electrical Engineering Department of the Ohio State University, Columbus; the Rike-Kumler Company at Dayton; the Wm. B. Duck Company at Toledo; the Union Trust Company at Cleveland, and the White Radio Laboratory, Stockdale, Pike County.

The area covered by these varies according to the strength of the sending instrument, but there is not a nook or corner of the state into which the reports do not go. Many places outside of Ohio, located in other states, are also receiving the reports, particularly in Indiana, Michigan and Pennsylvania. Farmers and dealers show their appreciation of the service by sending congratulatory messages.

The wireless has just begun to play its part in the betterment of marketing facilities. What it can and will do is no longer a matter of conjecture, but a certainty. It will be but a short time before every progressive farmer in the state has installed a receiving instrument, as a large number of them have already done. Then he will be able to sit in the quiet of his home and catch the prices on the commodities he has to sell or wishes to buy as they come through the air and are given to him by his wireless phone. He can keep in daily touch with conditions in every part of the country and know to a nicety just how things are going. If he is away or at work in the field the good wife can take the report for him and he can get the information upon coming to the house. His calculations can be made accordingly. It places another very important spoke in the wheel of progress, as it revolves on the farm.

One enterprising farmer in the northern part of the state has gone a little

## Crop Service By Radio Now Covers World

A WORLD radio crop service has been established by the United States Department of Agriculture. The Department has representatives in many important European cities, who send reports of crop conditions to Washington. The information is then broadcast by radio over the United States. A recent message from the Berlin representative was received in Washington and relayed throughout the country in less than five minutes from the time the news left Germany.

In return, radio dispatches on crop conditions are sent each week from the Navy Department stations to the International Institute of Agriculture at Rome and to other agricultural centers abroad.

beyond his neighbors. He has placed a large amplifier on his instrument and it covers a considerable territory in the countryside. All this ambitious man need do is to sit on the handles of his plow or stand at leisure in the field and the report is wafted to him. If the conditions warrant he can hurry to the nearest market and make a sale or purchase as best suits his fancy. Surely, as the colored parson said, "De world do move."

But to the farmer who has no receiving instrument the broadcasting system renders a valuable service. There is hardly a farm house in these days without a telephone, and probably not a town or community center without a receiving instrument, which can pick up the report. The farmer, if he has the will, need but go to the phone and call the proper number in the nearby village.

"What are the quotations and market conditions today?" he can ask and the answer will be given him without delay. If he has no telephone, the chances are he has an automobile, or, at least, a horse and buggy. Should he be so unfortunate as to possess none of these, he can go back to nature's first means of transportation and walk. In any event, it requires but a little energy and the exercise of no ingenuity to get the news.

Bankers are playing a very important part in the developments of this wonderfully helpful work in the vicinity bordering on Cleveland and Cuyahoga county. A large number of financial institutions in the cities and towns there have installed receiving equipments. They catch the daily reports. As a goodly portion of their patronage is in the rural districts the farmers avail themselves of the opportunity of securing the news, which plays so large a part in the successful transactions of their

business. They call by phone or in person, and keep in closest touch with the markets, the prices and the conditions.

Farm agents, in the different counties, acting under the direction of the Extension Department of the College of Agriculture at the Ohio State University and the Ohio Farm Bureau Federation are placing receiving equipment in their offices. Soon all will have done so. There are meeting places for the farmers in the community. They can come in, as they like to come, chat with their neighbors, receive the reports and perhaps secure information which will make them a tidy sum or forestall a transaction that might have entailed a loss. If they cannot come they still have the home telephone as a transmitter of information.

The broadcasting system of market reporting, in which Ohio leads, is playing a most important work in modern farming and farming methods. It is daily growing in usefulness and performing the fundamentally gracious act of service. More and more it will continue to do its good work until eventually every farmer will garner the reports daily in the stronghold of his home.

## "The World Do Move"

"Aeronautics and the radio telephone are perhaps the most marvelous developments of a marvelous age," said Rear Admiral Wm. A. Moffett, Chief of the Naval Bureau of Aeronautics, speaking over the radio phone from NAA, Arlington, a few nights ago.

Admiral R. E. Coontz, Chief of Operations, who also broadcasted a speech in the interests of the recent Marine Exposition in New York, said that among its activities the Navy Communication Service handled three and three-quarter million words by radio for the American Merchant Marine in the past year.

"During the winter months," he said, "the naval Communication Service handles on an average of 30 S. O. S. distress calls per month, or one a day." That the value of this service to the American public as a whole, and to shipping interests in particular, cannot be overestimated, he insisted.

He also mentioned the developments of the radio compass or direction finder, and stated that the Navy has established stations equipped with this apparatus at various points along both coasts of the United States near the entrance to harbors. When a ship is approaching one of these harbors in a dense fog and is uncertain of her position, all that is necessary for her now to do is to ask two or more radio compass stations for her bearing, he explained.

## The Crosley Weekly

The Crosley Manufacturing Company of Cincinnati, publishes a 4-page weekly, containing news, detailed broadcast programs from Station WLW and advertisements. It is a unique "house organ" and has a wide circulation.

# Uncle Sam is a Busy Broadcaster

**T**HESE days when 573 private broadcasting stations are offering daily programs, the radio public is likely to lose sight of the fact that its Government is also broadcasting information on many subjects. Six Departments are scheduled for daily or semi-weekly programs and 42 Naval radio stations are carrying news of one sort or another.

Requests for permission to broadcast have become so numerous that the coordination of all Government broadcasting has become necessary. A committee of twelve officials, representing as many branches of the Government at Washington, is endeavoring to supervise matter submitted for public broadcasting over radio telephone circuits furnished through the courtesy of the Navy Department. In order that the listeners-in may receive the maximum service with a minimum of interference and without duplication, this committee was appointed last spring at the suggestion of Secretary Hoover. It is known as the Inter-Departmental Advisory Committee on Radio Broadcasting. Although the committee meets bi-weekly, its sub-committees are busy almost continually with this work.

Demands for broadcasting of telegraph matter, as well as telephone, are constantly increasing, and the scope of the committee's work is gradually growing greater. Recently the question of broader activities and supervision has arisen, due to the frequent requests for investigation and advice on matters other than telephone broadcasting, originally the committee's sole function. Extension of activities is understood to have been generally approved by the different departments so as to cover the subject of radio communications, and the matter is now before the Secretary of Commerce for further action. It is quite probable that this committee will eventually become the statutory advisory committee provided for in the radio bills sponsored by Senator Kellogg and Congressman White.

Activities of the committee to date have made possible the broadcasting of several interesting programs from NOF, the Naval radio station at Anacostia, which is primarily the experimental radio station of the Navy's Bureau of Engineering. The Anacostia station, however, cannot carry the load and does not operate on Saturday afternoon, due to other official duties. As soon as arrangements are completed, all radio telephone broadcasting for the Government will be transferred to the big Arlington station.

Last spring, when the popular demand for broadcasting reached its height, so many official and semi-official requests to use NOF were made of the Naval Communications Service that Secretary Denby could not grant them all; in fact, he finally ruled that only official messages could be transmitted. At one time NOF was closed to all except the highest

Government officials. Suggestions, that an inter-departmental committee be appointed to pass on broadcasting and supervise its operation, made by Secretary Hoover, therefore, were welcomed by the Navy Department, and the Committee began to function on June 1. Matter submitted for broadcasting is inspected and methods of operation arranged by sub-committees which attend to all details, determining the value and demand for particular broadcasts.

Applications for broadcasting by the Interior, Agriculture, Labor, Treasury, Commerce and War Departments, have been approved by the committee and fixed schedules, giving each applicant a maximum service of three fifteen-minute periods each week, have been put in operation. Many listeners-in throughout the country have undoubtedly heard the evening lectures and band music over the NOF phone on 412 meters.

On Monday, Tuesday and Thursday evenings, The Treasury Department broadcasts the activities of the Public Health, Internal Revenue and Savings Bureaus. The Commerce Department's schedule on Tuesday and Thursday evenings includes information on foreign and domestic markets, trade news, and fisheries. Talks on immigration, women's activities and child welfare are made on Monday, Tuesday and Thursday evenings by officials of the Labor Department. The Interior Department furnishes lectures on education and mining on Monday and Thursday evenings and Tuesday afternoons.

Information pertaining to crops and weather is transmitted every Monday, Tuesday and Thursday evening by the Agriculture Department. Officers of the War Department will shortly broadcast a series of talks on military activities and recruiting on Monday evenings. Sometimes special broadcasts are arranged for national associations, such for example as the series of speeches on Naval Activities by officers of the Navy, requested by the American Marine Association, during its exposition in New York. The evening programs are so grouped as to make a compact schedule and not interfere with private broadcasting. Each week the programs will be announced by the Navy.

The opening of NAA at Arlington as the official Government broadcasting station has been delayed due to difficulty experienced in operating on the lower Governmental wave band designated for telephone broadcasting. Very soon the Arlington station will open two telephone broadcasting circuits. It is a very busy station and it is necessary to operate several circuits simultaneously without interference. NAA's new broadcasting telephone set of 750 watts, which has just been installed, operates very successfully on the 2050 meter wave telephone circuit, using the main antenna, but does not give good results on the Government's 490 wave, due to reactions between other sets when in use.

For this reason, the sub-committee on technical matters has been requested to consider the use of a wave length of 430 meters in this work and, if it is approved, special permission will be requested of the Commerce Department for its use, since it lies in the band assigned to private and toll broadcasting. The lower wave length is believed necessary so that the service will be available to the people who do not own sets capable of picking up the long 2050 meter wave.

Telephone broadcasting for the departments is not the only work handled by the Naval Radio stations; many messages are also broadcast in telegraph code. NAA carries 10 telegraph broadcasting schedules daily, totaling 30 hours each week, and comprising chiefly quotations on foodstuffs for the Agriculture Department, which approximate 35% of its total day work. NAT, the Naval station at New Orleans, broadcasts two schedules a day, aggregating four hours a week, and the Great Lakes station, NAJ, carries 18 daily schedules, constituting 36 hours a week.

In addition to this matter, twelve Naval stations broadcast two time signals daily; twenty, carry hydrographic information; 37 transmit weather forecasts; and six broadcast press matter. Sandwiched in between these many schedules, the Navy carries on its own official communications, as well as many for the State Department, to ships and foreign stations, and conducts its experiments.

A glance at the operating schedule of any Governmental radio station will explain why the Government requires the service of the Inter-Departmental Committee in an effort to simplify and standardize Government broadcasting. Uncle Sam is generous with his information but he is also generous with the means for transmitting it to the country at large.

## Radio Saved the Day

For the first time in history, radio telegraphy was utilized on November 8 to transmit a full press association news report across the Continent. Due to severe sleet, snow and wind storms in the Rocky Mountain region and the crippled service on land lines, the International News Service transmitted a full election service from New York to San Francisco by radio through the cooperation of the Radio Corporation of America. While the usages of radio have increased greatly in the development of recent months, never before has trans-continental transmission been attempted on such a scale. Under the stress of a great emergency, the International News Service report was transmitted efficiently to the newspaper offices in San Francisco and was as fast as that obtained over land lines under ordinary conditions.

# Radio Cheers Remote Log Camps

WASHINGTON, November 27. —The spirit and morale of the logger, situated far within the vastness of our great Pacific forests, has been materially improved since the installation of modern radio receiving sets in logging camps. Many of the western newspaper broadcasts carry the daily news of the world into the heart of our lumbering districts, where their daily papers do not reach and the telephone is not available.

Instead of waiting a month to learn of some event in the outside world, the logger gets press dispatches daily. Thanks to radio he is no longer a "back-woodsman" in the old sense of the word. He got a good item on the President's message on the Ship Subsidy and the final score of the Army and Navy game almost as soon as the city radio fan did.

"With modern apparatus of the vacuum tube type, the logger can tune in on no less than forty broadcasting stations from Calgary to Los Angeles and from Denver to Portland," according to the National Lumber Manufacturer's Association, whose research department has of late been devoting much attention to the use of radio. Up in the forest-clad hills of Oregon, far from the railroad and mail routes, a digest of the daily news or a concert from San Francisco, "listens pretty good," as one logger put it.

The logger's radio set has a more important use than its recreational value, however; it is a business asset in the remaining big timber stands of the country. Through the aid of the fleet of air-planes, assigned to forest fire observation by Major General Patrick of the Army Air Service, each of which is equipped with sending and receiving radio, conflagrations in the districts patrolled have lessened notably.

Cooperating with Federal, State and private forest protection, high-flying airplanes cover more territory in a day than a forest ranger on foot could cover in three months. "Spotting" a fire, or smoke, the plane hovers over the site while the observer plots the location on a map and then broadcasts a fire warning giving the location. Station operators equipped with receiving apparatus catch the air scout's message and relay it, usually by private phone lines, to the ranger or patrol station nearest the fire, and within a few minutes detachment of skilled fire-fighters are enroute to the sec-

tion in danger. Since speed is so essential in fighting forest fires, first the airplane, and now the radio won the deep respect of the owners and operators of timber lands.

Radio also serves to anticipate the approach of lightning storms and to approximate their intensity, by means of a static barrage, which might be called a "radio lightning recorder." This consists, the Lumber Association states, of a movable loop antenna which rotates about a vertical shaft, not unlike a radio compass. By turning the loop parallel to the general direction of the oncoming storm the direction of approach can be determined with an error of less than four degrees, as the static discharge is at its maximum when the loop is parallel to the line of approach.

The purpose of learning the direction of the storm is to enable the members of the patrol to plot its course and send out observers to locate trees struck by lightning. Lightning is said to cause 25 per cent of forest fires, and its particular hazard lies in the fact that unseen bolts strike trees and smoulder for days before actually breaking into flames.

The static barrage, the latest of radio fire-fighting equipment, has been operated quite successfully. Technically it measures the frequency of the static discharge and records it on a dial or indicates it visibly across a spark gap. When the frequency of the discharge becomes excessive an automatic electric gong is rung to announce impending danger. The direction of the storm is then determined by means of the radio loop and by the time the lightning is flashing over the stands of timber, patrols have started through the district threatened, alert to spot trees struck by bolts of lightning.

Many of the forest wireless stations are manned by ambitious young amateurs, some of them owning their sets, and all of them seeking to do constructive radio work and perfect their knowledge. One privately owned receiving set is reported to have picked up accurately messages from four airplane patrol routes scores of miles apart. It is easier to pick up different airplanes than it is to tune out an undesirable broadcasting station on a city set, because schedules and wave lengths are so well arranged in fire patrol work.

that there is no interference, although several patrols may be flying at the same time.

City amateurs, who boast of thirty-foot aerial masts, would be envious of the natural masts available in the western forests, where giant fir trees tower two or three hundred feet aloft. At least they would be envious until they began to wonder how to utilize this excessive height for stringing an aerial. Upon the camp "high-climber" devolves the job of rigging the lofty antenna; he is skilled in climbing tall trees as part of the logging business demands daily trips aloft to oil pulley blocks for cables or in preparing a new setting for the yardage operation. By skillful manipulation of a single loose loop of rope around his waist and around the bole of the tree, the high climber, equipped with a pair of leg irons or spurs, slowly raises himself upward. With a deft twist of his wrist he flips the rope a foot or two upward at a time, trusting his weight to it while he replants his leg irons a little higher on the trunk. It is a task the city aerial erector would not relish, and one requiring great skill and steady nerves, on the part of the climber, but that veteran thinks nothing of it.

Foresters and lumbermen say that in the Pacific Coast timber belt radio has accomplished within a few months what would otherwise have taken decades to bring about. It has become a permanent fixture tending to promote both contentment and efficiency as well as to afford a means of fire protection of hitherto undreamed of worth.

## Harbord Succeeds Nally

Major General James G. Harbord, Deputy Chief of Staff of the Army, upon his retirement will become President of the Radio Corporation of America, Secretary of War Weeks announced Saturday. General Harbord was elected head of the Radio Corporation at a meeting in New York on Friday, and his release from the Army was requested on Saturday. His retirement will be effective on December 29, Secretary Weeks said, and he will assume his new duties on January 1, 1923.

Edward J. Nally, President of the Radio Corporation, it was announced, has been elected to a new office—that of Managing Director of International Relations, with headquarters in Paris.

# Radio Direction and Range Finders Aid in Coast Defense

By CARL H. BUTMAN

(Copyright, 1922)

WASHINGTON, D. C.—The ranges of the shore defense guns of the United States will in all probability be extended twenty-five miles farther to sea by virtue of a newly developed radio range finder, now being tested on the Atlantic Coast. Previously, the maximum range of the great coastal guns was approximately 25 miles when visibility was good, but with the perfection of the signal corps radio devices, poor visibility is not a handicap and it is expected that a maximum range of about 50 miles can be reached provided the guns can be elevated high enough to shoot that far. Enemy ships will have to stand farther out at sea to be safe; at least, the fleets will be prevented from anchoring or disembarking troops within fifty miles of our shores in war time.

Three factors make up the essential principles of the new long-range fire control: Radio, aviation and plotting. For the first time in history, the post-war developed radio compass will be employed for a purpose other than to locate stations or give ships their bearings. The use of an airplane equipped with radio for spotting the fall of projectiles is not new but the unique feature today is the fact that the airplane itself will be out of sight, over the target or ship. Without awaiting the fall of sighting shots, the observer will send a series of radio signals which will make it possible on shore to plot the successive positions of the ship and determine its course and speed.

One of the problems of the Joint Coast Artillery and Air Service maneuvers, off the Virginia Capes, is a test of the new radio fire control devices and a comparison with the old method. Further trials will be held on Friday.

A boat visible from the shore will run various courses in an area several miles wide stretching seaward from Cape Charles and Cape Henry, the master of the vessel keeping an accurate time record of his course and speed. An airplane from Langley Field equipped with radio-sending apparatus will fly out, locate the ship and remain over it as much as possible by executing figure eights in the air. Flying at a height of several thousand feet, calculated to be safe from anti-aircraft fire, this

observation plane will send special signals to the shore only when it is exactly over the vessel, continuing to do so until ordered in by the shore stations.

On the shore two radio compass stations several miles apart have been set up and direct lines of communication laid to the batteries. Operating just as when a ship's bearing is furnished, these two stations will pick up the signals sent by the observing plane when it is over the target ship, in other words, they will turn their compass coils until the radio signal is received with equal strength in both receivers, then the direction or angle from the stations will be read and plotted. With the angles at each station read simultaneously and the distance apart known accurately, it is a simple problem in trigonometry to locate the position of the ship and its distance from the battery. It is even simpler to plot the location of the ship on a map by laying down the angles from the two stations, extending the lines and noting their intersection. Within a few seconds a second signal comes in, and then another, all of which, when carefully plotted and timed, give the course of the moving target and its speed.

Firing may or may not be undertaken in the initial test, it does not matter, as that is solely a problem of ordnance and ballistics after the ship's course is plotted. The artillerymen do the rest, although they see nothing of their target many miles at sea. The most important feature of the scheme is its adaptability to night operations and in thick or foggy weather. Conditions do not matter as long as the observing plane can find the ship and fly over it. The distance from shore does not matter, but the range can be increased over the old range, limited by visibility from the observing towers, planes or balloons ashore, by many miles beyond the horizon.

A comparative test made by another plane flying nearer shore will also be made, but as the data this observer can give will be only in the form of estimates as to the bearing or azimuth of the vessel and its distance from Fort Munroe, it is not thought this old method can furnish the plotters with sufficient ac-

curate information to compare with the more exact radio direction finding system.

Cooperating with the board of Coast Artillery and Air Service Officers conducting the test, Captain G. W. Morris of the Signal Corps is in charge of all radio operations during the first tests of the Army's new Radio Direction Finder now applied to gunfire.

Among other experiments to be conducted during the week will be tests to determine the extent of interference to radio telephone and telegraph messages caused by neighboring radio communications in operation.

## Identifying Stations

(By Washington Radio News Service.)

Broadcasting stations are coming to be known by the voices of their announcers, their slogans and the stunts they do to identify their stations as well as the cryptic call letters assigned by the Department of Commerce.

There is little romance or euphony in the letters "WSB," but listeners-in are very familiar with the big gong which rings "bong, bong, bong," with the announcement of the entertainment and know it is the Atlanta Journal. The unmistakable southern drawl of the broadcaster there announcing that this is the "Voice of the South" is also an indication that W. S. B. is sending.

As the radio enthusiasts well know, there are a number of other stations using identifying phrases and sounds. For example, Courier Journal and Louisville Times WHAS, plays a few bars from the appropriate Southern melody, "My Old Kentucky Home." WDAJ, the Atlanta and West Point R. R. Co.'s Station, at College Park, Georgia, has conceived the unique method of establishing its identity and business by blowing four blasts on a locomotive whistle; when "toot-toot-toot-toot" resounds in your receivers, it is sure to be WDAJ broadcasting. The Naval Station at Anacostia, NOF, is known by the deep bass voice of the announcer.

It is not only in the Southland that these slogans and phrases have become popular; farther west we have the Palmer School of Chiro-

practic at Davenport, Iowa. "This is WOC," the announcer states, "Out Where the West Begins." Another station identifies itself with: "Out where the corn grows tall." The voice of the spokesman at WOH, the Hatfield Electric Co., at Indianapolis, might confuse one at first, it sounds so southern and is similar to that of WSB in Atlanta. Who says "Ayand"? The pronunciation of the simple word "and" would hardly locate a station, but ask anyone who has heard "Mr." KDKA at Pittsburgh, and see if they will not admit that the drawled "ayand" is a positive identification?

The voices of the evening story tellers are all well known by the small radioites. Some of the broadcasters sound a signal on the telegraph key giving their call or some single letter indicative of their station besides the customary transmission of the letters by an announcer.

Methods of announcing the time also serve to establish who is at the transmitter, and those who hear the Louisville Courier Journal say they like the method of telling the time as the hour approaches, with a simple statement of ten o'clock when the minute hand reaches twelve better than the standard tick system of the Naval Broadcasting stations.

When the Detroit News signs off, the exact time is given, which is a benefit to those who have not set their timepieces for the night.

Probably the custom will grow rapidly and familiarity with the voices of broadcasters all over the country as well as the mottoes and slogans of stations will extend the acquaintance of listeners-in with the voices of the air.

## An Excellent Detector

Radio Age Institute has received from the Clifton Manufacturing Company, Newark, New Jersey, one of the new detectors being manufactured by that company. The detector performs excellently and one Chicagoan who is using a Clifton detector reports that "It is the neatest and most compact little thing I have yet seen and adds 100% to the efficiency of the set."

## Safety Talks via Radio

In connection with the activities of National "Safety Week," NOF, at Anacostia, carried a series of safety talks by radio each evening. Colonel C. O. Sherrill, Superintendent of Buildings and Grounds at the Capital, arranged with the Naval Communications Service for speakers to broadcast short talks on safety, commencing Monday, November 27.

# The Aerial Press of America

By Washington Radio News Service

PERHAPS at last there is something new under the sun. Who ever thought of an aerial newspaper before a few pioneer mentors of public opinion began broadcasting their news items that all who "listened" might hear—free?

Among 582 radio stations broadcasting in the United States today, there are 83 representing publications, most of them daily newspapers. Nine of these etherial news sheets are super, or Class B, stations especially licensed to broadcast on a 400-meter wave. All told, these news broadcasts of the air reach millions who do not subscribe to the publications but who are most enthusiastic aerial "hearers," none the less loyal to their favorite papers because they are unknown to the editors. There is an "Aerial Press of America" even though there are no aerial subscription lists and no advertising accounts.

It is certainly something new, this broadcasting of the news and sports of the world gratis; it is a service highly valued by the hearers and many predict that it has come to stay. Some Canadian newspapers have also taken up the scheme of news broadcasting, as well as publications in Porto Rico and Hawaii.

Radio can be used in the gathering of news as well as in its dissemination, especially in country districts, and tends to broaden the scope and circulation of a newspaper. There are several known instances where radio carried daily news reports when other lines of communication failed, and in some instances amateurs aided. An "SOS" story on land has been covered by wireless and aid rendered by means of radio, as well as at sea, and instances where the wires and regular channels were beaten are recorded.

Government weather, crop and market reports are now carried via radio in advance of press releases, and the only way a paper can hope to compete is through the same medium.

"Why give away material?" may be asked, and this is well answered by citing the case of the Boston American's experiments in broadcasting bulletins from its news before they were printed. The news is transmitted from WGI, Medford Hillside, and the service to thousands is reported to have brought most valuable publicity to the Boston sheet. Those who listen

into brief news items all want to know more of the details and naturally purchase a copy of the "Mother" sheet as soon as it is available. Out of over 80 papers licensed to broadcast, only about half a dozen have stopped this service and some of those have combined with other organizations in the use of a single broadcasting station.

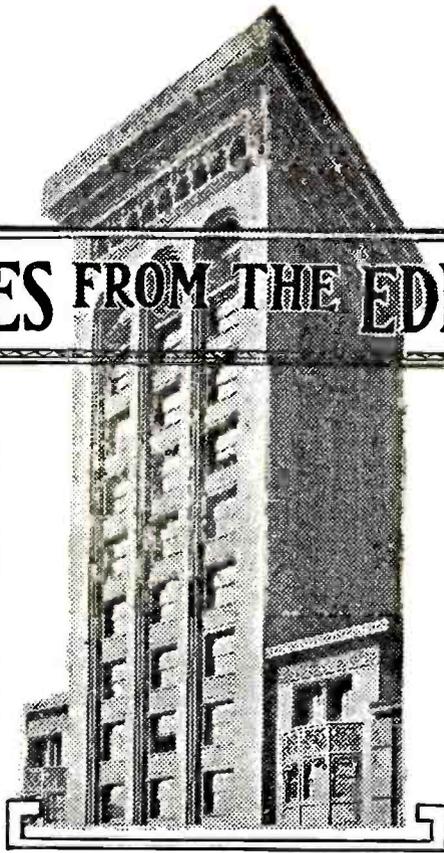
Press broadcasting stations should handle all news, some students of the problem believe, looking to the future, since the news is really owned by the members of the press and is received first by them; besides which, the publishers know how to handle the news better than any other agency. Newspapers, usually in the lead of progressive developments, are apt to find it necessary to follow the lead of the aerial pioneers and carry radio news bulletins for their clients in the future. Radio as a household contact with the world has come to stay. On the farm especially this is so, and unpaying aerial subscribers would be very loth to lose their news service.

Of the newspaper broadcasters, nine have secured the Class B License permitting them to broadcast on 400 meter wave; they follow: Atlanta Journal, Atlanta Constitution, Dallas News, Detroit News, Detroit Free Press, St. Louis Post Dispatch, Kansas City Star, Fort Worth Star Telegram and Los Angeles Times-Mirror.

The Seattle Post Intelligencer now uses the broadcasting station KFC; the Philadelphia Record broadcast; through WCAU; Ensenada News at Yauco, Porto Rico, uses WGAD; The Indianapolis Star's news is released through WOH; The Tacoma Times cooperates with KMO; the Oklahoman "speaks" its news over station WKY; the Boston American uses WGI, and the Memphis News-Scimitar announces over WPO. In Canada, two news broadcasters are the Toronto Daily Star, operating CFC, and The Winnipeg Tribune CJNC.

Among other daily sheets said to be planning to use news broadcasting are the Courier of Grant's Pass, Oregon; Midland Mail, S' D.; Billings Mont., Gazette; Raleigh Register, Beckley, W. Va.; Adrian Daily Telegram, Mich.; Litchfield News Herald, Ill.; and the San Pedro Pilot, California.

# THOUGHT WAVES FROM THE EDITORIAL TOWER



**L**EAST observant of radio enthusiasts will have discovered an interesting new tendency on the part of users of radio receiving sets. Everywhere it is apparent that fans are most keenly absorbed in getting long distance calls. They will tune out a delightful concert near by in order to hear a station anywhere from 500 up to 2,000 miles away. Many fans are happiest when they are striving for a record in hearing the greatest possible number of stations in a single night.

The trade will not overlook the situation. With this rivalry for premier excellence in getting long distance broadcasting and in covering as much of the country as possible in a single sitting there is bound to be a growing demand for superior receiving sets. The amplification question will be one of the first considered. The selectivity of the apparatus will be another cardinal point to look for.

**W**E have heard a deal about the activities of the National Radio Chamber of Commerce. It is an organization which has announced its interest in all phases of the radio art and the radio business. Perhaps the Chamber of Commerce will soon issue some needed information as to the demand and supply situation. We suggest that a survey giving all the radio interests a comprehensive glimpse of the radio business and what is holding back that long-deferred revival would be of value. Come on, National chamber, if you have something of interest for the whole crowd we'll print it.

**A**. H. GREBE & CO. have been sued by the Radio Corporation of America for alleged violation of patent right in connection with the use of vacuum tubes. Counsel for the Grebe company contend that if the claim of the Radio Corporation is sustained it will tend to establish a basis upon which a monopoly could be reared. The defense points out that all radio

instruments must be used in connection with the vacuum tube.

We have never met Mr. Grebe although we are perfectly familiar with the Chinese who always adorns the Grebe advertisements. That Chink is becoming as well-known in radio as is the gentleman of color who decorates the Cream of Wheat ads. If the Grebe Company would like to reach an important middle-west circulation with detailed information about this suit Radio Age would be pleased to publish it.

There is considerable litigation in progress in connection with the radio patents and the radio business. Any piece of news that suggests that an effort is being made to monopolize radio patents and manufacturing and operation is the biggest possible piece of news for hundreds of thousands of Americans. We know nothing of the merits of this suit but all facts of record pertaining to litigation in this free country are privileged matter for publication. And there is nothing in the policy of Radio Age to interfere in the slightest degree with our publishing all the facts on both sides of any matter. We are going to get what we can for the January number. Let us switch on the light and quit trying to size up the radio game by reading obscure items in corners of newspaper pages.

**T**HE Associated Press is warning newspapers that they must not broadcast local news, if they are members of the Associated Press. That means that the newspaper which holds an Associated Press franchise—and most of the large daily papers hold such a franchise—that newspaper shall not broadcast or give to broadcasters news about a big fire, an election result, or any other information that the Associated Press might want to send out over its own wires as news.

Looks as if the broadcasting of news was going to get a setback. If radio is a craze or a toy, what in demnition is all the shootin' for?

**B**ROADCASTING of "La Boheme," grand opera, was advertised for the evening of Wednesday, November 15, from the Westinghouse Station KYW, Chicago. At 8:30 that evening, when the opera was about to start, the station announcer gave the information that there would be no opera program for that evening. He made no explanation by radio but it was later learned that the reason for the sudden change of program lay in the fact that the American representatives of the owners of the "La Boheme" copyright had forbidden KYW to broadcast the music. These gentlemen maintained that such broadcasting would be an infringement of copyright.

The incident is important in that it seems to have set an informal precedent in a question which has been in dispute for some time. It raises the question in the minds of the broadcaster as to whether the owner of any piece of copyrighted music may not at any time set up a similar contention. Will owners of copyrighted songs be able to make the same restriction? Will the author of the "bed time story" arise to demand his fee?

The National Broadcasters' League is obtaining a legal opinion as to the rights of broadcasters to transmit copyrighted music, songs and printed material. For further information members of the League should address Frederick Smith, Secretary, Garrick Building, Chicago.

# The Voluntary Lid

**A**S A result of experience through the past year of broadcasting, we have a definite program to recommend for amateur consideration. There have been many unjustified complaints against amateur QRM and of course where amateurs in cities have hogged the air all evening there have been justifiable complaints. Most of us have realized that broadcasting was capable of becoming a powerful force for good in our country, of tremendous social, economic and educational value, and have known that meant the passing of the old days when we could pound brass from supper-time on and the ushering in of a new era when the air had to be shared. As we have pointed out previously, many of us have gone so far in the business of sharing that we have almost been afraid to operate at any time, and amateur radio has suffered for the lack of a definite plan. On the other hand there are uninformed novice listeners who object to amateur transmission at any hour of night, and again the need for a recognized scheme has been shown. This we now offer.

Broadcasting is admittedly an institution of the early evening hours. That is the time that quiet air should prevail, when the greatest good can be done for the greatest number. When should we open up our stations for transmission? Our Board has considered that question and has decided upon 10:30 p. m. as the proper time. We're regretfully obliged to conclude, fellows, that the time is here when we should voluntarily keep our transmitters silent during the early evening hours if their operation interferes with listening. This means that in all congested communities amateur stations should be quiet between the hours of 7 p. m. and 10:30 p. m. This is no new thing for most of us—we've been doing it already—but it makes it a recognized principle of amateur work.

We urge our members and clubs to get together with the listening-element in their community and have an understanding on the subject. Acceptance of this plan on the part of the amateurs means that they recognize the rights of the listeners to hear their concerts undisturbed, and that they will keep quiet between these hours. Acceptance of this plan by the novice listeners means that they recognize the rights of us amateurs to transmit and carry on our useful work and that they will not complain against the "meaningless buzzes" when the lid goes off at 10:30. This plan was proposed at a meeting of all radio people in Rochester recently and was adopted as a solution of the local difficulty.

We may well call it "the Rochester Plan."

Whenever a community gets together and agrees upon such a plan, we feel that it should become as law and that the mere possession of a transmitting license should not entitle an amateur to go contrary to the sentiment of all his fellows. It is our view that such operation, unless justified by an emergency or official tests, would constitute deliberate and malicious interference within the meaning of the federal radio law, and we believe the Department of Commerce will agree with us. On the other hand, in localities where this plan is adopted and quiet air is maintained between 7 and 10:30 p. m., we will expect amateur transmission to proceed without complaint after 10:30, and the A. R. R. L. will protect with every resource at its

**IT ISN'T** such a bad world after all! The American Radio Relay League, comprised of amateurs who transmit those dots and dashes which have been punctuating some of our most pleasing broadcast programs have taken official action to help diminish interference. Radio Age is a magazine for the novice, but we are glad to republish the accompanying editorial from Q S T, a magazine for the amateur, in compliance with a request from the American Radio Relay League.

command the right of any of its members to so transmit if unjustly accused while legally operating in such a community.

Now we have a working plan. Let us adopt it, fellow amateurs. This puts an important duty of self-policing on the shoulders of our affiliated clubs and we are depending upon them to handle the job. When this plan is adopted it must be respected, religiously, and this means that unlicensed and improperly adjusted stations must be hunted down and turned in. In bygone days such a station bothered no-one but its neighborhood amateurs, and if they could put up with it there was no harm done; but to-day such a station will bring discredit upon all of amateur radio and must not be permitted to exist. We would suggest that clubs establish committees to help local amateurs and render assistance when needed to get a station properly adjusted, but if the operator persists in operating

illegally after being warned he should be turned in to the inspector without mercy—we have too much at stake. Other folks are watching us too, and while we think about it we want to tip off everybody to get their station and operator licenses renewed promptly upon expiration.

What about local work, which used to occur in the early hours of the evening? Honestly, we don't know, and it will be up to the amateurs of each club to decide for themselves how they will divide their hours. The time after 10:30 is going to be very precious and, solely because it is not as important as DX work, we are afraid local work will have to be got over with by the time 7 o'clock rolls around. Low-powered battery-operated C.W. sets of course can be used for local work all evening long and not cause a particle of QRM for the broadcasting fan next door, but most of the lads who do local work have a far different kind of equipment—hi!

Our transmitters must improve. There will be too many of us with traffic to move at 10:30 and too many listeners with dumbbell tuners for us to continue much longer with the cycle-consuming spark of pre-war days. For the very efficiency of our traffic moving the selfish spark will have to yield to the valve set. We hasten to say, though, that there are selfish C.W. sets too, and we are just as much against a bum C.W. without rectifiers and filters as we are against the ordinary spark, and for exactly the same reason—it takes up too big a place in the air, its wave is too broad. We cannot be pushed into an adoption of C.W. versus spark against our will, but left to our own devices we believe it is evident to any thinking amateur that the quiet efficiency of the little bottles is just the thing we need—filtered D.C. C.W. transmitters.

Now let's get busy on our self-imposed 10:30 lid. Remember that the League does not feel that it can back a member who runs loco in a congested locality and smears a whole county with QRM from the minute his supper is down, but that it will safeguard the interests of its law-abiding members in communities where the Rochester Plan is adopted and respected.

One thing more. Noise this about a bit. Let it be known that we amateurs have decided among ourselves to preserve some quiet hours, out of consideration for the broadcast listeners. Spread a little honest propaganda in your local newspapers.

K. B. W.

The Monthly Service Bulletin of the  
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 Physics Dept. Loyola University  
 New Orleans, La.

J. Elliott Jenkins, W D A P  
 Midwest Radio Central, Inc.  
 Drake Hotel, Chicago, Ill.

H. A. Trask, K S D  
 St. Louis Post Dispatch  
 St. Louis, Mo.

Frank W. Elliott, W O C  
 Palmer School of Chiropractic  
 Davenport, Ia.

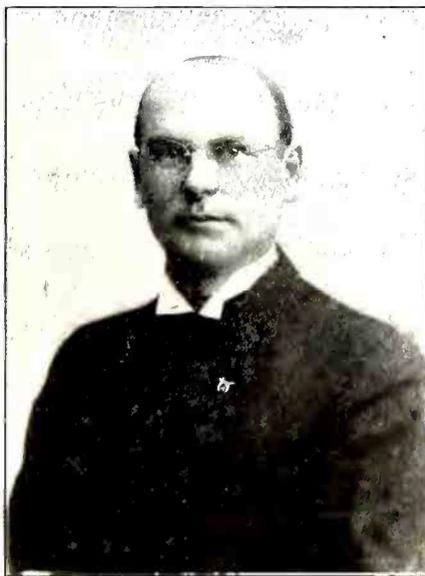
**T**HE organization of the National Broadcasters' League has been completed and the correspondence from members to the Secretary's office already has become voluminous.

One of the first tasks of the Secretary was to provide to many broadcasters copies of the Kellogg-White bill, about which there was considerable discussion at the initial meeting of the League in the Sherman Hotel, Chicago. Several broadcasters have expressed the determination to broadcast the gist of the bill and ask the listeners-in to support pressure on senators and congressmen to see that this legislation is attended to without further unnecessary delay.

It will be remembered that T. W. Findley, President and general manager of the Findley Electric Company, Minneapolis, Minn., and operator of the station WLAG of that city, suggested the broadcasting of the contents of the Kellogg-White bill in his speech to the broadcasters at the first meeting of the League.

Some owners of stations are opposed to the bill in some of its aspects but even these are agreed that the proposed regulations are better than none. All broadcasters have indicated a desire to see Congress put through some corrective legislation.

There have been numerous inquiries also as to the reason for the abandonment of the plan to broadcast the grand opera "La Boheme" from the Westinghouse Station KYW, Chicago, recently. It appears that owners of the music rights had warned the operators of the powerful Chicago station, which first put grand opera music in the air (thereby booming the radio business) that they would consider it an infringement of the copyright if "La Boheme" were broadcast. Without making any issue of the matter KYW, at 8:30 o'clock on the night the opera was to have been broadcast, issued notice via the ether, that he program had been changed.



**President George S. Walker, live-wire Chief of the Broadcasters League and President of the Western Radio Corporation, Denver, Col. His station is K F A F**

The blow to radio activities would be considerable if opera were to be removed from the winter entertainment of receiving set owners. It may be said, however, that other operas are not tied up by copyrights and that KYW will broadcast opera two nights each week.

Announcement of the election of directors in the League were sent out by mail to those who were unable to attend the Chicago meeting. Favorable replies were received from all of the station owners elected and all expressed deep interest in the League and readiness to give their time and effort to making it effective.

S. W. Place, of the Diamond State Fibre Company, is the Pennsylvania director. A. J. Westland, Loyola Uni-

versity, New Orleans, La., is hopeful that the League will be of great benefit to the broadcasting art but fears his multiplicity of tasks in connection with his university work may make it impossible for him to serve the league with the diligence that he would like to devote to it. The Secretary is writing to Professor Westland that the busy men are the ones the League wants in its directory, as they are the men who are getting somewhere in radio.

W. J. Baldwin, Second Vice President of the League, of the Alabama Power Co., writes: "I believe we have taken a great step forward in the development of radiophone broadcasting."

Howard E. Campbell, Chief Radio Engineer of the Detroit News Station WWJ is an interested correspondent. To Mr. Campbell, and to all others it may be said here that further data and news of developments will be going through the mails soon.

Arthur H. Ford, State University of Iowa, First Vice President of the League, writes that the formation of the League seems to have come at the right time and adds three cheers for the Iowa football team.

Earle C. Anthony informs us that his station is a new 500 Watt Western Electric plant, which receives its information from four studios by telephone wires and then broadcasts it. Mr. Anthony asks that all correspondence relating to the League be forwarded to him under the address "Earle C. Anthony, Inc., Los Angeles." The Anthony station is KFI and it is a good station, as all know, who have "listened in."

Stanley O. Need, the director in Connecticut, represents the New Haven Electric Company, writes that he is a long way off from League headquarters but that his spirit is with us and that he is "only too glad to do anything to assist the League."

T. B. Hatfield, President of the Hatfield Electric Company, Indianapolis,

which operates Station WOH, says, "I sincerely trust you have made a start which will be of benefit to all broadcasters."

J. Elliott Jenkins, one of the two owners of the now famous WDAP on the roof of the Drake Hotel, Chicago, is another director. His associate in the Midwest Radio Central, Inc., which operates WDAP, is Mr. Thorne Donnelly. Messrs. Jenkins and Donnelly have adopted many original methods in arranging programs and in announcing the programs. Furthermore, they are making some important long distance records and are adding to their equipment to make their station even more effective.

With such men behind the League it is bound to carry weight whenever it steps out to get something done.

George S. Walker, President of the Western Radio Corporation of Denver, Colorado, proprietor of Station KFAF, and President of the National Broadcasters' League, has been doing some effective missionary work for the League.

Mr. Walker returned to Denver a few days ago from an extended trip through the East, where he conferred with broadcasting station owners, manufacturers of radio apparatus and others, and when interviewed at his office by the Denver Post, said:

"As was to be expected, I found radio in somewhat of a slump as the result of the long Summer season, but with signs of a revival with the return of cold weather. Manufacturers of receiving sets, apparatus and supplies were, for the most part, a little discouraged and somewhat apprehensive as to the future. However, it was the consensus that radio has come to stay and that at no distant date the new science will be highly commercialized and will play just as important a part in the affairs of the world and in every-day life as the telephone and telegraph.

"I found that, while as late as May 15 of this year, manufacturers were away behind in their orders for sets, tubes and practically everything entering into the manufacture and operation of receiving sets, quite the reverse is now the apparent situation. Manufacturers, distributors and dealers, in all parts of the country at the present time, carry sufficient stocks of goods to meet almost any demands, except, of course, in the event that this demand should far exceed that of last year, and even then, the facilities of the manufacturers are such that there should be no real shortage in high class radio equipment, and as for the cheaper apparatus, this already is becoming a drug on the market; for the radio buying public has become a discriminating body

"That the broadcasting and reception of radio entertainments will steadily improve with the installation of better apparatus, goes without saying. Indeed, important improvements are noted almost daily, and will continue at almost the same speed that has established radio as one of the industrial wonders of the age.

"While much has been written and said with reference to broadcasting, and the

**O**WNERS of broadcasting station owners who have not yet joined the National Broadcasters' League, may do so by sending their check for the annual membership fee of \$10 to Frederick Smith, Secretary, Garrick Building, Chicago.

Membership will entitle broadcasters to periodical information as to developments in connection with broadcasting, intelligence as to steps taken to eliminate the present almost disastrous interference and news of events in any part of the country affecting broadcasting and broadcasting interests. Also members will receive the official organ of the League for one year.

This nominal fee is required for the cost of issuing circulars and handling the large volume of correspondence. You will find it useful to be associated directly with this clearing house for broadcasting information, which is also a protective institution, offensive and defensive.

broadcaster comes in for a lot of criticism, it can be truly said that the science of broadcasting is far in advance of the art of receiving, and this is not strange when the facts are carefully considered. The broadcasting apparatus has been developed to a high stage of efficiency by the government, by the large companies and also by a few individuals giving freely of their time and money in the work. These broadcasting stations, for the most part, are operated by experts in their line—radio engineers who have spent years in the service. On the other hand, reception of entertainments broadcast by the many stations in the United States, Porto Rico, Alaska and Hawaii is in the hands of countless thousands of fans operating apparatus from the lowly crystal set costing a few dollars to the highly developed instrument costing hundreds, and even thousands of dollars. These receiving fans have been, and still are being educated in the school of experience, whereas the broadcaster gained his knowledge of radio as a result of years of technical study and work.

"It is not strange, then, that there exists in the minds of the fan a feeling of dissatisfaction over present conditions. His constant complaint is of interference, but with increased knowledge and the use of improved apparatus will come to the fan a better understanding of radio and a feeling of grateful satisfaction, for outside of the initial cost and a small maintenance expense, his radio entertainment costs him absolutely nothing.

"There are two big questions in radio today. One is interference, which will be solved when the government stops issuing broadcasting licenses and applies different wave bands to the large number of stations now operating, and by a more

detailed knowledge by the fans of how to operate receiving sets. The second problem is how will the broadcasting station obtain proper support for their expensive efforts to provide this wonderful radio entertainment to more than one hundred and ten millions of people. Many plans have been suggested, but none apparently is workable. That some plan eventually must be found, goes without saying, for the broadcaster cannot be expected to indefinitely provide entertainment without cost to the largest listening audience ever assembled in the history of the world.

"It is for the purpose of solving this and other problems, to improve broadcasting, and also to educate the fans as to how to obtain satisfactory results from their receiving sets, to obtain broader and better laws governing radio, etc., that the National Broadcasters' League was organized. There are at the present time 531 broadcasting stations enrolled in the United States. Of this number 183 are located in the Eastern states, 209 in the Central and Southern states, 106 in the West Coast states, twenty-eight in the Rocky Mountain states, one in Alaska, two in Porto Rico and two in Hawaii. The investment in these stations will aggregate more than \$5,000,000."

## Pay for Stations

The following letter is written by Mr. Duryea Bensel, Secretary and Treasurer of the Bel-Canto Corporation, 417 East Thirty-fourth Street, New York City:

"Broadcasting has been under discussion for some time and much has been said pro and con, but I have something to say which I think is of paramount importance.

"The Radio Corporation of America were the pioneers of Broadcasting Radio concerts and have not only kept up the fine quality of these concerts but have improved upon them from time to time, giving the Radio fans the best quality of talent procurable. Without this broadcasting there would, practically, be no market for radio parts and it is my opinion that each and every manufacturer of Radio parts, whether it be a loud speaker, a complete set, a hundred feet of antenna wire or any of the other numerous parts that go into the making of a complete set, should be willing to contribute a certain portion of their net profits towards the maintenance of such a station. Each and every manufacturer of radio parts is indebted to the broadcasting stations; without them, the manufacturer might just as well put the key in the door and hang up a sign TO LET. Why should a corporation, such as the Radio Corporation of America, who are spending millions of dollars to make radio a permanent sound and healthy institution which in time is destined to become one of the greatest industries of the world, or, in fact, any other organizations who are maintaining broadcasting stations throughout the United States, have to bear the entire expense of maintaining these stations?

# Pick-Up Records by Our Readers

## Reinartz Makes Good

Mr. F. D. Pearne,

Dear Sir:

Just having read Mr. Bisnah's "pick-up" record in the November issue of the "Radio Age," I thought I would let you know of the results I am having.

I completed my Reinartz set in the latter part of September and since that time I have picked up WJAQ, Topeka, Ka.; WBL, Anthony, Ka.; WAAP, Wichita, Ka.; DN4, KFAF, Denver, Colo.; WSB, Atlanta, Ga.; WHAS, Louisville, Ky.; WLK, Indianapolis, Ind.; WFAA, WDAO, Dallas, Texas; WBAP, WPA, Ft. Worth, Texas; WEAY, San Antonio, Texas; WOH, Indianapolis, Ind.; WCAL, Northfield, Minn.; WBAD, Minneapolis, Minn.; WFAT, Sioux Falls, South Dakota; CJCG, CJNC, Winnipeg, Manitoba; KSD, St. Louis, Mo.; WDS, Jefferson City, Mo.; WMAB, Oklahoma City, Okla.; WAAZ, Emporia, Kas.; WLAD, Hastings, Neb.; KZN, Salt Lake City, Utah; KHJ, Los Angeles, Calif.; KGG, Portland, Oregon; KYW, WDAP, Chicago, Ill.; WOC, Davenport, Iowa; WLW, Cincinnati, Ohio; WFO, Dayton, Ohio; KDKA, Pittsburgh, Pa.; WWJ, WCX, Detroit, Mich.; KWX, Havana, Cuba; WFAG, Waterford, N. Y.; WGY, Schenectady, N. Y.

I used two stages audio-frequency amplification with a dictagraph loud-speaker; 95 per cent of these stations could be heard and understood fifteen feet from the loud speaker.

My aerial is a single wire thirty feet high and one hundred feet long.

I have constructed several types of sets but I find the Reinartz tuner more efficient, more sensitive and easier to adjust on DX work than any set I have ever seen. I wish to thank you for the instructions you gave in the Radio Age. I heartily recommend this set to any amateur who is thinking of building a set. I think this is a pretty good record for a little over one month.

Very truly yours,

K. P. ANDERSON,  
3032 Michigan Ave.

## From New Mexico

L. P. Evans, Artesia, N. M., on the border of Old Mexico, writes that he heard the Robin Hood selections broadcast by KYW, Chicago. W. N. Jacobson, San Francisco, reports that he was tuning in for Davenport when he got Chicago. Then a local San Francisco station took the air and that was the end of KYW.

## Wireless in Mexico

The Mexican Government is about to receive four powerful wireless telegraph sets, which are to be presented to the Republics of Guatemala, Honduras, Costa Rica, and Nicaragua, in accordance with the decision of the President of the Republic.

## Michigan Gets Honolulu

Editor Radio Age:

I note on page 22 of your present issue that you have an article headed long distance records. It might interest you to know that Mr. Kenyon Voght, of the Mead Drug Co., Escanaba, Mich., has with his set (Zenith) and two stages of amplification distinctly heard Honolulu on two different occasions.

This I think is a distance record for radio telephony.

Voght will be very glad to verify this.

Cordially yours,

E. F. McDONALD, JR.,

Chicago Radio Laboratory.

## Local Silent Periods

By CARL H. BUTMAN

The radio public is beginning to demand not only good entertainment, high class transmission but a greater range of reception. In other words, the listener-in wants to reach farther afield, his horizon is extending, he wants to hear the distant stations outside his city and state, and the Department of Commerce radio officials are making a survey of each radio district to see if there isn't some way that this can be arranged.

One radio enthusiast has put it well; he says that, while he is appreciative of all his local stations, he sometimes wants "to go visiting by radio"—listen to some of the big stations outside the local field, just as he frequently likes to listen to the conversation of others than his immediate family, which he cannot do if those at home talk all the time. It's the same in radio broadcasting he says.

In an effort to aid in seeking a solution of this new problem, the Department of Commerce has written letters to its nine radio district inspectors advising that information reaching the Department indicates that there is developing a sentiment throughout the country for silent local radio broadcasting periods so that the listeners-in can hear the distant stations which is often impossible when local stations are broadcasting. In some sections of the country steps for such an arrangement have already been taken. On the Pacific Coast, for example, what is known as the Pacific Plan of time division recently has been amended so that from 8 to 10 each evening the amateurs are silent, permitting the broadcasters to have a clear field, and at ten the amateurs have a period during which they can communicate without interruption.

In other sections the local broadcasters remain silent for one evening a week or a few hours one or two evenings a week so that those having receiving sets capable of long distance reception can pick up some of the powerful broadcasters outside their district. The Department points out that there is a great fascination to listening to distant sta-

tions and it is the opinion of the Radio Section that this desire on the part of the radio public will meet with the cooperation of most of the broadcasting stations, when it is understood. Broadcasters and local enthusiasts will do well to advise local inspectors what they think of the plan or take it up with the Department directly.

It may be found desirable to divide the United States into zones somewhat as it is divided into time zones, the stations in a particular zone having silent nights or periods of two hours each. It might be arranged so that the broadcasters in the Eastern Time Zone would not transmit on Monday night, those in the Central Zone keeping quiet on Tuesday, Mountain section Wednesday and the Pacific Coast on Thursday, all sending on the other nights. The Department Inspectors have been requested to bring this suggestion to the attention of owners of broadcasting stations in their districts and explain it to broadcasting and listening-in organizations. Reports from the Inspectors will indicate the desire on the part of the public and the attitude of the broadcasters, who will have to arrange the matter as the Department's plan is only a suggestion.

Radio fans who complain of interference must not forget, officials point out, that the execution of such a plan will not enable them to get long-distance stations unless they have good sets and know how to tune them in properly. The scheme is expected to receive the indorsement of the public and broadcasters alike but it can only be successfully carried out with close cooperation of everyone, and the reports of the Inspectors is awaited with interest in Washington.

## Gets Miami Naval Station

The lease of the Naval Radio Station at Miami Beach, Florida, was awarded to the Tropical Radio Company of Boston, Mass., the highest bidder in the recent call for bids. This company, which is connected with the United Fruit Company, offered to take the station for 18 months at an annual rental of \$3,600, with permission to extend the lease an additional year. The Radio Corporation of America, and Cutting & Washington of New York, also filed bids.

According to the terms of the lease, the Tropical Radio Company must replace the old rotary spark set with modern equipment which will reduce the objectional noise to a minimum.

With the enactment of necessary legislation, it is understood that the Navy will ultimately offer the station for sale.

Send \$1.00 to Radio Age, 64 Randolph Street, Chicago, and receive this middle-west radio periodical for six months. Regular subscription price is \$2.50 a year. Thus you will be getting one month free.

# With the Radio Trade

## Who's Buying Goods?

This magazine has received numerous inquiries as to the proper lines to follow in sales campaigns and has been able to give the trade some useful information obtained from its readers and advertisers. The following letter embodies an analysis that cannot fail to be of interest to the trade generally:

Dear Mr. Smith:

In reply to your letter of the 17th inst., I would say that on September 15 I started a national advertising campaign of selling our Sensitone regenerative sets by mail on the time payment plan, using the following mediums: Farm and home papers, fraternal, technical, trade and boys' home magazines. My main idea was to reach the farmer, as he was the one that should naturally take the greatest interest, i. e., getting market reports, etc. The results may be interesting to you. Out of the hundreds of sets that we have shipped, not one as far as we can trace, has been ordered by a farmer, in spite of the fact that we spent 40 per cent of our advertising appropriation in farm journals. 70 per cent of orders came from towns of 50,000 and over, and the balance from the small towns, mainly those with a population of from 1,000 to 5,000. As to States, the following produced the best results in the order named: Iowa, Texas, Oklahoma, Missouri, Illinois, Georgia, Wisconsin, Florida, California.

Trade papers like yours pulled well from a very intelligent class of customers. All the foregoing leaves an unanswered question in my mind, "Why doesn't the farmer fall for radio like he does for victrolas, piano players, etc."

Yours faithfully,

HAROLD R. WAKEM & CO.,  
Harold R. Wakem, President.

## New Battery Charger

A new type radio and automobile battery charger for convenient home use has been announced by the Valley Electric Company, 3157 South Kingshighway Boulevard, St. Louis, Mo.

The new model has been designed so that it is suitable for installation and use in any room in the home. Similar in appearance to the watt-hourmeter, it is enclosed in a moulded glass cover which shows all working parts. The material used in the contacts will not stick. No bulbs are used.

The Valley Type A and B Charger will charge a 6-volt A radio battery or any make automobile battery at a 5-ampere rate without the use of lamps or complicated connections. It will also charge 22½-volt and higher voltage B radio batteries.

This new model charger plugs in on the home lamp socket just like the ordinary electric light bulb. It connects to the battery by means of clamps which are furnished with the instrument. It produces a quick tapering charge at a trifling cost. It cannot harm or overcharge a battery.

## Radio Desk Set

One of the most interesting radio devices thus far submitted to Radio Age Institute is a business man's radio desk set designed along the lines of a telephone. Crystal detector, head set are combined complete in an instrument closely resembling the ordinary telephone transmitter with the exception, of course, that there is no telephone receiver attached.

The aerial that goes with this outfit is only forty feet long and is easily laid around the moulding near the ceiling or may be strung around the baseboard near the floor. All that is necessary to get a ground is to attach the clamp on end of the aerial to a radiator or water pipe.

The entire outfit can be set up in two minutes. It is capable of getting broadcasting stations within the same radius in which any other good crystal set operates.

It is a fool-proof device requiring no adjustment or outside aerial. Traveling men can easily put it into their hand bag and use it in their hotel room and get the concerts or market reports in any city they may be visiting. The busy man at his desk who is interested in the stock market or the grain reports can get them at the scheduled broadcasting periods by simply picking up the receiver and putting it to his ear. The outfit sells for \$20.00 complete. It was invented and is being promoted by G. D. Norton, 1705 Garrick Building, Chicago.

## An Improved Rheostat

The Wilcox Laboratories, of Lansing, Mich., are placing on the market a new rheostat about which they give the following information:

Our first aim in producing this rheostat has been to present a design incorporating every improvement possible in rheostat construction.

Our second aim has been to produce a rheostat so finely made and perfectly finished that it will add to the efficiency and appearance of the best equipment.

Our third aim is to sell this high quality product at the lowest price our quantity production will permit.

The resistance unit is formed of the best grade wire tightly wound on a strong fibre support and is not apt to become loose or lose its shape through overheating or rough handling. It is 100% ventilated, every inch of the wire being exposed to the air. The carrying capacity is 1¼ amperes and the resistance full six ohms.

The movement is exactly 180°, this being the most convenient for the operator and in addition permits the knob and pointer to be replaced easily and quickly by any 180° radio dial if desired.

The ¼-inch round shaft turns in a carefully fitted brass bushing which insures a long-lived free running bearing, regardless of the accuracy of the hole in panel, and precludes the possibility of a wobbly shaft.

## Simplified Ammeter

An automobile ammeter that has no electrical coils or connections and is very simple and rugged in construction, has recently been developed by the Westinghouse Electric & Manufacturing Company. Although designed primarily for automobile use, its compactness, reliability, and low price make this instrument, which is known as the type BT Ammeter, particularly well adapted for use also on motor boats, aerial craft, farm lighting plants, radio sets, and for charging batteries.

The design of the BT ammeter involves a radical departure from the principles used in all previous ammeters in that no wire connections or coils are used. The case of the instrument has a magnetic yoke or loop projecting to the rear, through which is passed the current carrying cable or wire, which functions as a coil. The yoke has pole pieces extending into the inside of the ammeter. These poles vary in magnetic polarity and strength, corresponding to the direction and strength of the current passing through the wire and, being made of a special alloy steel, act without any residual magnetism error which would change the zero of the instrument. There is also a fixed permanent magnet inside the instrument with poles located at right angles to the poles formed by the yoke. Pivoted on a shaft in the center of this group of poles is a soft iron vane which takes up a position corresponding to the relative strength of the permanent, and the electro-magnetic poles. The shaft carries the usual pointer which indicates the value of the current on a dial. The movement is so balanced that car shocks or swaying will not cause the pointer to swing.

This peculiar construction, which was made possible by the development in the Westinghouse laboratories of the new non-residual steel alloy, reduces by more than fifty per cent the number of necessary parts and greatly increases the reliability and strength of the instrument. It also makes installation extremely simple, for, instead of wiring the meter to the car system by means of two pieces of wire or cable with connections and clips, the only operation necessary is to pass the dash board cable through the opening in the back of the instrument. Other important advantages of this new construction are that all possibility of ground is eliminated; there can be no short circuits or burn-outs; no amount of overload will injure the meter; and no loosening of connections.

## New Broadcasting Map

The Radio Section of the Department of Commerce has found it necessary to use a larger broadcasting map, the old one having become too small for practical use in locating the 564 broadcasting stations now in existence. The new map, which is 5 by 7 feet in size, is divided into radio districts, and each station is located in position.

# Corrected List of U. S. Stations Alphabetically by Call Signals

- KDKA**, E. Pittsburgh, Pa., 100 and 485 only. 2,000 ml. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 10-10:15 am, 12:30-1 pm, music; 3:00, sports; 7:00-9, news, features, markets, entertainments; 9-9:55, concert; 9:55-10 pm, time. Sun, 10:45 am, church service; 2:45 pm, Bible story; 3 pm, 7:30, church service. Eastern.
- KDN**, San Francisco, Calif. 485, 510 also. 500 ml. Leo J. Meyberg Co. Fairmont Hotel. Daily, 1-2 pm, 8:30-9, 4:30-5:30, 7:15, music, reports, concert, Pacific.
- KDOW**, New York, N. Y. S. S. America. Home port is New York.
- KDPM**, Cleveland, O. Westinghouse Elec. & Mfg. Co.
- KDPT**, San Diego, Calif. 250 ml. Southern Elec. Co. Daily 7:30-9 pm, news, weather, concerts, lecture. Pacific.
- KDYL**, Salt Lake City, Utah. 485 also. 500 ml. Telegraph Pub. Co.
- KDYM**, San Diego, Calif. Savoy Theater.
- KDYN**, Red Wood City, Calif. Great Western Radio Corp.
- KDYO**, San Diego, Calif. Carlson & Simpson.
- KDYQ**, Portland, Ore. Oregon Inst. of Technology.
- KDYS**, Pasadena, Calif. Pasadena Star-News Pub. Co.
- KDYS**, Great Falls, Mont. 485 also. 1,000 ml. Great Falls Tribune. Daily 12 ml, weather, time. Daily ex Sun, 8-10 pm, concert, etc. Sun, 4 pm, church services. Mountain.
- KDYU**, Klamath Falls, Ore. Herald Pub. Co.
- KDYV**, Salt Lake City, Utah. Cope & Cornwall Co.
- KDYW**, Phoenix, Ariz. Smith, Hughes & Co.
- KDYX**, Honolulu, T. H., Hawaii. 500 ml. Honolulu Star-Bulletin Co. Ltd. Daily ex Sun, 12:15-1:15 pm, reports; 6:30-7:30 pm, entertainment, music, talks, Sun, 11 am-12:15 pm, 5-6, church services. 120th Meridian.
- KDZA**, Tucson, Ariz. Arizona Daily Star.
- KDZB**, Bakersfield, Calif. Frank E. Siefert.
- KDZC**, Los Angeles, Calif. W. R. Mitchell.
- KDZE**, Seattle, Wash. 300 ml. Rhodes Co. Daily ex Sun, 10:30-11 am, news, 3:30-4:30 pm, style talks, music. Mon, Wed, Fri, 7:15-8:15 pm, concert. Pacific.
- KDZF**, Los Angeles, Calif. Automobile Club of Southern California.
- KDZG**, San Francisco, Calif. Cyrus Pierce & Co.
- KDZH**, Fresno, Calif. 485, also. 50 ml. The Herald-Examiner Co. Daily ex Sun, 8:15 am, 4-5 pm, news, reports. Daily ex Tues, Fri, 7-8 pm, reports, music. Tues, Fri, 8-9 pm, Pacific.
- KDZI**, Seattle, Wash. Seattle Radio Assn.
- KDZJ**, Eugene, Ore. Excelsior Radio Mfg. Co.
- KDZK**, Reno, Nev. 50 ml. Nev. Mehy. & Elec. Co. Wed, Fri, Sat, Sun, 8-9 pm, music, entertainment. Pacific.
- KDZL**, Ogden, Utah. Rocky Mountain Radio Corp.
- KDZM**, Centralia, Wash. 50 ml. Hollingsworth Hdw. & Radio Supply Store. Daily ex Sat & Sun, 8-9 pm, music. Pacific.
- KDZP**, Los Angeles, Calif. Newberry Elec. Corp.
- KDZQ**, Denver, Colo. 500 ml. Wm. D. Pyle. Daily ex Sun, 6:45-7:15 pm, news, 9-10 pm, concert. Mountain.
- KDZR**, Bellingham, Wash. 200 ml. Bellingham Pub. Co. Daily ex Sun, 7-8 pm, 8:30-9 pm, music, news, sports, reports. Sun, 7-8 pm, church service. Pacific.
- KDZT**, Seattle, Wash. Seattle Radio Assn.
- KDZW**, San Francisco, Calif. Glad Tidings Tabernacle.
- KDZX**, San Francisco, Calif. Glad Tidings Tabernacle.
- KDZZ**, Everett, Wash. 50 ml. Kinney Bros. & Supply. Daily ex Sun, 2:30-3:30 pm, 4:30-5:30, 8:15-9:15. Pacific.
- KFAB**, Portland, Ore. Pacific Radiofone Co.
- KFAC**, Glendale, Calif. 355 and 485. 250 ml. Daily Press. Daily ex Sun, 4:15-5:15 pm, news etc. Mon, Wed, Fri, 7-8 pm, concert. Pacific.
- KFAD**, Phoenix, Ariz. 485 also. 100 ml. Mon, Wed, Fri, 8-9:15 pm, concert, weather, stocks, markets. Sun, morning, church service. Mountain.
- KFAE**, Pullman, Wash. 200 ml. State College of Wash. Program irregular.
- KFAF**, Denver, Colo. 1,000 ml. Western Radio Corp. Daily ex Thurs & Sun, 8-9 pm, music, reports, news. Mountain.
- KFAJ**, Boulder, Colo. 250 ml. Univ. of Colo. No definite schedule. Mountain.
- KFAN**, Moscow, Idaho. The Elec. Shop.
- KFAP**, Butte, Mont. Standard Pub. Co.
- KFAQ**, San Jose, Calif. City of San Jose.
- KFAR**, Hollywood, Calif. Studio Lighting Service Co.
- KFAS**, Reno, Nev. 300 ml. Reno Motor Supply Co. Mon, Tues, Thurs, 8-9 pm, music.
- KFAT**, Eugene, Ore. 100 ml. Pac. Radio Co. Tues, Thurs, Sat, 7-8 pm, music. Sun, 8:45-9:15 pm, church service.
- KFAU**, Boise, Ida. 485 also. 200 ml. Boise H. S. Mon, Wed, Fri, 9:30-10 am, 2:30-3:00 pm, reports, news, 8:15-9 pm, concert. Tues, Thurs, Sat, 9:30-10 am, 2:30-3:00 pm, reports, news, 7:45-8:15 concert. Mountain.
- KFAV**, Venice, Calif. Abbott Kinney Co.
- KFAW**, Santa Ana, Calif. 485 also. 100 ml. Radio Den. Daily ex Sun, 4-4:30 pm, news, reports, music. Mon, Thurs, 8-9 pm, concert. Pacific.
- KFAY**, Central Point, Ore. 500 ml. W. J. Virgin Milling Co. Mon, Fri, 9-10 pm, Wed, 9-12 pm. Special programs other days. Pacific.
- KFBA**, Lewiston, Idaho. Ramey & Bryant Radio Co.
- KFBB**, Havre, Mont. F. A. Buttrey & Co.
- KFBC**, San Diego, Calif. 100 ml. W. K. Azbill. Thurs, Sat, Thurs.
- KFBD**, Hanford, Calif. 100 ml. Calif. Radio Lab. Daily ex Sun, 3-4 pm, 8-9. Sun, 5-6 pm. Pacific. Clarence V. Welch.
- KFBE**, San Luis Obispo, Calif. R. H. Horn. Daily ex Sun, 4-5 pm, 7-8. Pacific.
- KFBG**, Tacoma, Wash. First Presbyterian Church.
- KFBH**, Marshfield, Ore. Thomas Musical Co.
- KFBI**, Boise, Idaho. 170 ml. Bolso Radio Supply Co. Daily ex Sun, 5-5:30 pm, police reports, music. Mon, Wed, Fri, 7:45-8:15 pm, concert. Tues, Thurs, Sat, 8:15-9 pm, concert. Mountain.
- KFBK**, Sacramento, Calif. 300 ml. Kimball-Upton Co. Daily ex Sun, 3-4 pm, 6-6:30, concert, news. Sun, 8-9 pm, church service. Pacific.
- KFBL**, Everett, Wash. Leese Bros.
- KFBM**, Astoria, Ore. Cook & Foster.
- KFBN**, Calif. Borch Radio Corp. (Portable).
- KFBP**, Prescott, Ariz. Savage Elec. Co.
- KFBQ**, Laramie, Wyo. Bishop N. S. Thomas.
- KFBV**, Colorado Springs, Colo. Clarence O. Ford.
- KFC**, Seattle, Wash. 700 ml. Northern Radio & Electric Co. Daily, eight hours, miscellaneous. Pacific.
- KFCB**, Phoenix, Ariz. 500 ml. Nielsen Radio Supply Co. Mon, Wed, Fri, 8-9 pm, music. Tues, 8-10, sports. Mountain.
- KFCC**, Wallace, Ida. 380 only. 100 ml. Auto Supply Co. Daily, 7:30-8:30. Pacific.
- KFCD**, Salem, Ore. 100 ml. F. S. Barton. Daily ex Sun, 12-1 pm, 8-9, music, news. Sun, 3-4 pm, church service. Pacific.
- KCFE**, Walla Walla, Wash. Frank A. Moore.
- KFCH**, Billings, Mont. Elec. Service Station.
- KFCJ**, Colorado Springs, Colo. Colorado Springs Radio Co.
- KFDA**, Baker, Ore. Adler's Music Store.
- KFDB**, San Francisco, John D. McKee.
- KFDD**, Boise, Ida. St. Michaels Cathedral.
- KFDS**, San Francisco, Calif. John D. McKee.
- KFEB**, Taft, Calif. City of Taft.
- KFEC**, Portland, Ore. Meler & Frank Co.
- KFEA**, San Diego, Cal. Dr. R. C. Shelton.
- KFED**, Polytechnic, Mont. Billings Polytechnic Institute.
- KFEE**, Pendleton, Ore. Eastern Oregon Radio Co.
- KFEF**, Los Angeles, Calif. 500 ml. Earle C. Anthony, Inc. Daily ex Sun, 1-1:30 pm. Daily ex Mon & Fri, 7:40-8:20 pm, Tues, Sat, 2-3 pm. Sun, 10:45-11 am, 4-5 pm, 7:40-8:20. Pacific.
- KFEV**, Yakima, Wash. 250 ml. Foster-Bradbury Radio Store. Daily ex Sun, 3-4 pm. Mon, Wed, Fri, 8-9 pm. Pacific.
- KFEW**, Spokane, Wash. 300 ml. Doerr Mitchell Elec. Co. Tues, Wed, Fri, Sat, 7-8:30 pm, music, etc. Pacific.
- KFGB**, Tacoma, Wash. 200 ml. Tacoma Daily Ledger-William A. Mullins Elec. Co. Daily ex Sun, 7-9 pm. Sun, 5-7:30 pm. Entertainment, news, weather, tides, police reports. Pacific.
- KFG**, Pomona, Cal. 150 ml. Pomona Fixture & Wiring Co. Thurs, 7:30-8:15 pm, news, markets, concert. Mountain.
- KGG**, Portland, Ore. 500 ml. Hallock & Watson Radio Service. Daily ex Sun, 5-6 pm, music, entertainment, 7:30-8 pm, reports. Sun, 9-10, music. Pacific.
- KGN**, Portland, Ore. 100 ml. Northwestern Radio Mfg. Co. Irregular schedule.
- KGD**, Altadena, Calif. 350 only. 300 ml. Altadena Radio Lab. Mon, Wed, Fri, 5:15-6 pm, reports, code lessons, agriograms. Tues, Thurs, 7:40-8:20 pm, concerts. Sat, 7:40-9 pm, concert. Sun, 2-3 pm, church service. Pacific.
- KGU**, Honolulu, Hawaii. 485 also. 150 ml. The Honolulu Advertiser. Daily, 7:30-9 pm. Tues, Thurs, Sat, special program. 150th meridian. (Three hours later than Pacific.)
- KGW**, Portland, Ore. 200 ml. Silo Owners Radio Service Inc. (Daily Oregonian). Daily, 3:30-4:30 pm, news etc. Mon, 7:30-8:30 pm, concert. Wed, 8-10 pm, concert. Fri, 8-9 pm, concert. Sun, 7-8 pm, church service. Pacific.
- KGY**, Lacey, Wash. 50 ml. St. Martins College. Tues, Fri, Sun, 8:30-9:30 pm, news, concert, bedtime story. Pacific.
- KHD**, Colorado Springs, Colo. 485 also. 50 ml. Daily ex Sun, 8:15 am, weather. Daily ex Sun, Mon, 7-7:30 pm, music. Mountain.
- KHJ**, Los Angeles, Calif. 485 also. 500 ml. Times Mirror Co. 400 also. Daily ex Sat & Sun, 1:30-2:15 pm, 6:40-7:20. Sat, 6:40-7:20 pm. Sun, 10-10:45 am. Pacific.
- KHJ**, Seattle, Wash. Louis Wasmer.
- KHK**, Los Angeles, Calif. 100 ml. Standard Radio Co. Barker Bros. Daily ex Sun, 11:30-12 noon. Mon, 10-11 am. Wed, 9-10 am. Sun, 1-2 pm, 5-6 Pacific.
- KHJ**, Sunnyvale, Calif. 500 ml. Radio Shop. Tues, 8:15-9 pm. Fri, 7:30-8:15 pm. Pacific.
- KHJ**, Stockton, Calif. C. O. Gould.
- KJR**, Seattle, Wash. 200 ml. Northwest Radio Service Co. Daily ex Sun, 8-9 pm, miscellaneous. Pacific.
- KJS**, Los Angeles, Calif. 100 ml. Bible Inst. of Los Angeles. Tues, Wed, 12-12:30 pm, sacred music, lecture. Sun, 11:30-12:30 pm, sacred music, sermon. Pacific.
- KLB**, Pasadena, Cal. 300 ml. J. J. Dunn Co. Mon and Fri, 7:30-8:15 pm, concert. Sun, 3-4 pm and 8-9, concert. Pacific.
- KLN**, Del Monte, Calif. Monterey Elec. Shop. Daily, 12-1 pm, weather, markets, news; 7-8 pm, concerts. Pacific.
- KLP**, San Francisco, Calif. 500 ml. Collin B. Kennedy Corp. Mon, 7:30-8:30 pm. Thurs, 8:30-9 pm. Sun, 4-5 pm. Pacific.
- KLS**, San Francisco, Calif. 390 ml. Warner Bros. Radio Supply Co. Daily, 12-1 pm. Sat, 7:30-8:15 pm. Pacific.
- KLX**, Oakland, Calif. 500 ml. Oakland Tribune. Daily ex Sun, 7:15-7:30 pm, news, entertainment, Tues, 7:30-8:15 pm, Fri, 8:15-9 pm, and Sun, 3-4 pm, concert. Pacific.
- KLZ**, Denver, Colo. 485 also. 200 ml. Reynolds Radio Co. Daily ex Sun, 7:30 pm on, news, markets, bedtime story, concert. Sun, 8-9 pm, church service. Mountain.
- KMAZ**, Mercer Univ. Macon, Ga.
- KMC**, Redkey, Calif. 100 ml. Lindsay-Weatherill & Co. Mon, Wed, Fri, 8:30-9 pm, concert. Pacific.
- KMJ**, Fresno, Calif. 200 ml. San Joaquin Lt. & Pr. Corp. Tues, Fri, 7-8 pm, music. Sun, 5-6 pm, music. Pacific.
- KMO**, Tacoma, Wash. 200 ml. Tacoma Times. (Love Electric Co.) Daily ex Sun, 11-11 pm, 6-7, 9:15-10, concert, news, lecture. Pacific.
- KM**, Bureka, Calif. T. W. Smith.
- KNJ**, Roswell, New Mex. 485 also. 750 ml. Roswell Public Service Co. Daily, 8 pm, news, reports, concerts. Mountain.
- KNN**, Los Angeles, Calif. 100 ml. Bullock's. Mon, 2:30-3:30 pm. Wed, 2:15-3 pm. Thurs, 4-5 pm. Pacific.
- KNT**, Aberdeen, Wash. 400 ml. Grays Harbor Radio Co. Daily, 5-5:30 pm, 7:30-8:15, news, concert. Pacific.
- KNV**, Los Angeles, Calif. Radio Supply Co.
- KNX**, Los Angeles, Calif. Elec. Lighting Supply Co.
- KOB**, State College, N. M. 485 also. 500 ml. N. M. College Agri. & Mech. Arts. Daily ex Sun, 11:55-12 pm, reports. Mon, Wed, Fri, 7:30-8:30 pm, concert. Mountain.
- KOG**, Los Angeles, Calif. 300 ml. Western Radio Elec. Co. Daily ex Sun, Wed, 5-5:30 pm, code, news. Mon, Fri, 7:40-8:20 pm, music. Wed, 4:30-5 pm, code, 8:20-9 pm, music. Pacific.
- KON**, Los Angeles, Calif. 200 ml. Holzvasser Inc. Daily ex Sun, 4-5 pm and 8:15-9, concert, news. Sun, 10-11 am, 4-5 pm and 8:15-9, church service. Pacific.
- KOP**, Detroit, Mich. Detroit Police Dept.
- KPO**, San Francisco, Calif. 300, 600 also. 500 ml. Hiale Bros., Inc. Daily ex Sun, 11-12 m, 3:30-4:30 pm, concert. Wed, 7:30-8:15 pm, concert. Sun, 11-12:15 pm, church service. Pacific.
- KQP**, Berkeley, Calif. Univ. of Calif.
- KQP**, Hood River, Ore. 360 only. 50 ml. Hood River News. Daily ex Sat, Sun, 7-8 pm, news. Tues, Fri, Sun, 8:30-9:30 entertainment. Pacific.
- KQV**, Pittsburgh, Pa. 300 ml. Doubleday-Hill Elec. Co. Daily ex Sun, 12-12:30 pm, 2:30-3, music, lectures. Mon, Wed, Fri, 10-11 pm, music, entertainment. Eastern.
- KQW**, San Jose, Calif. 345 also. 500 ml. Chas. D. Herrold. Daily ex Sun, 1-1:30 pm. Wed, 8:15-9 pm, concert. Pacific.
- KQY**, Portland, Ore. 200 ml. Stubbs Elec. Co. Daily, 1-2 pm, 6-7. Pacific.
- KRE**, Berkeley, Calif. 200 ml. Maxwell Elec. Co. Every other Sat, 8:15-9 pm. Sun, 1-2 pm, 6-7. Pacific.
- KSD**, St. Louis, Mo. 360 & 485 only. 1,500 ml. St. Louis Post-Dispatch. Daily ex Sun, 9:40 am, 10:40, 11:40, 12:40 pm, 1:40, 2:40, 4, 8. Sun, 8:15 pm. Central.
- KSL**, San Francisco, Cal. 50 ml. The Emporium. Daily ex Sun, 10-11 am, concert, news; 2-3 pm, concert, educational talk. Sun, 2-3 pm, concert and educational talk. Pacific.
- KSS**, Long Beach, Calif. 25 ml. Prest & Dean Radio Research Lab. Daily ex Sun, 3:30-4:30 pm, news, concert. Pacific.
- KSU**, Wenatchee, Wash. 360 and 485.
- KTW**, Seattle, Wash. 500 ml. First Presbyterian Church. Sun, 11-12:30 pm, 3-4-30, 7-9-30, church service. Pacific.
- KUO**, San Francisco, Calif. 485, 525 also. 1,500 ml. San Fran. Examiner. Daily ex Sun, 9-10 am, concert, chat to housewives; 11-12, reports; 3-3-30 pm, lecture, news; 5:30-6:15 pm, concert; 9 am, 12 m, 6:15 pm, weather report. Wed, 3:30 pm, health bulletins. Sun, 9-10 am, concert; 5-6 pm, concert, news. Pacific.
- KUS**, Los Angeles, Calif. City Dye Works & Laundry Co.
- KUY**, El Monte, Calif. 500 ml. Coast Radio Co. Daily ex Sun, Sat, 4-4:45 pm. Mon, Thu, 8:20-9 pm. Sat, 3-4 pm. Pacific.
- KVQ**, Sacramento, Calif. 300 ml. James McClatchy. Daily ex Sun, 6:30-7:30 pm, news, reports, music. Sun, 6-7 pm, reports, music. Pacific.
- KWG**, Stockton, Cal. 1,500 ml. Portable Wireless Telephone Co. Daily ex Sun, 4-5 pm, news, concert, markets. Tues and Fri, 8-9 pm, concert. Sun, 2-3 pm, concert. Pacific.
- KWH**, Los Angeles, Calif. 485 also. 250 ml. Examiner. Daily ex Sun, 1:30-1:40 pm, 5:30-6, 6-6:15, 8:20-9, reports, entertainment. Sun, 8:30-9 pm, church service. Pacific.
- KXD**, Modesto, Calif. Herald Pub. Co.
- KXS**, Los Angeles, Calif. Bearl Corp.
- KYF**, San Diego, Calif. Theatre Music Co.
- KYG**, Portland, Ore. Radio Service Bureau, Inc.
- KYL**, Bakersfield, Calif. Bakersfield, California. (Alfred Harrell.)
- KYJ**, Los Angeles, Cal. 485 also. 1,000 ml. Leo J. Meyberg Co. (Hamburgers). Daily ex Sun, 4-5 pm, concert, markets, weather, news. Mon, Thurs, Sat, 8-9 pm, same program. Pacific.
- KYQ**, Honolulu, T. H. Electric Shop.
- KYW**, Chicago, Ill. 400, 485 only. 1,500 ml. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 9:35 am-1:20 pm, market quotations every half hr; 2:15, news, markets; 4:15, Pacific 6:30 pm, news, final markets and stocks; 7:30, bedtime story; 7:45, feature; 8-9, concert; 9, news. Sun, 3:30 pm, church service. Central.
- KYY**, San Francisco, Calif. The Radio Telephone Shop.
- KZC**, Seattle, Wash. 100 ml. Public Market & Department Store Co. Daily ex Sun, 6:45-7:15 pm, music, news, agriograms. Pacific.
- KZM**, Oakland, Cal. 200 ml. Western Radio Institute (Hotel Oakland). Daily ex Sun, 6:45-7 pm, news. Pacific.
- KZN**, Salt Lake City, Utah. 485 also. 1,000 ml. Desert News. Daily ex Sun, 3-4 pm, reports, music, 8-9:30 pm, music, news, bedtime stories etc. Mountain.
- KZY**, Wenatchee, Wash. Wenatchee Battery & Motor Co.
- KZY**, San Francisco, Calif. Atlantic-Pacific Radio Supplies Co.
- NDF**, Anacostia, D. C. 412 only. 600 ml. U. S. Navy Dept. Mon, Tues, Thur, 7:15-7:30 pm, lecture. Mon, Thurs, 6:45-7 pm, lecture. Tues, Thurs, 7:45-8 pm, health lecture. Wed, Fri, 8:30-9:45 pm, hand concert. Eastern.
- PWX**, Havana, Cuba, Cuban Telephone Co.
- WAI**, Dayton, O. McCook Field, U. S. Army.
- WAAB**, New Orleans, La. Valdemar Jensen.
- WAAC**, New Orleans, La. Tulene Univ.
- WAAD**, Cincinnati, O. 200 ml. Ohio Mechanics Inst. Fri, 2:30-4:30 pm, and Sat, 8:15-10:15 pm. Cincinnati Symph. Orchestra concert. Central.
- WAFF**, Chicago, Ill. 485 only. 300 ml. Chl. Daily Drivers Journal. Daily ex Sat & Sun, 8:30 am, 10:30, 10:45, 12:30 pm, 3, 4:30, stock reports. Central.
- WAAG**, Shreveport, La. 50 ml. Bordeaux Co. Daily ex Sun, 7:30-9 pm, sports, concert. Central.
- WAAM**, St. Paul, Minn. 200 ml. Commonwealth Elec. Co. Mon, Fri, 12-12:45 pm, concert. Mon, Tues, 8-9:30, music. Wed, 1-1:45 pm, lecture. Sun, 3:30-4:30 pm, concert. Central.
- WAA**, Boston, Mass. 50 ml. Eastern Radio Inst. Mon, Wed, Fri, 9-10 pm, music. Eastern.
- WAAM**, Milwaukee, Wis. 485 also. 300 ml. Gimbel Bros. Daily ex Sun, 10 am, markets, weather; 11, markets; 12:10 pm, markets; 1:25, closing markets; 2, and every hr. after, concert, test; 7, weather; 7:15, baseball; 7:30, concert. Central.
- WAAW**, New York, N. Y. 300 ml. I. R. Nelson Co. Daily ex Sun, 11-11:55 am, 3-4 pm, music. Wed, 8-9 pm, special program. Eastern.

# Corrected List of U.S. Stations Alphabetically by Call Signals

- WAAN, Columbia, Mo. Univ. of Missouri.  
 WAAD, Charleston, W. Va. 40 m. Radio Service Co. Daily ex Sun, 6:45-7:45 pm, music, news, weather, baseball. Eastern.  
 WAAP, Wichita, Kan. 200 m. United Elec. Co. Daily, 12-1:30 pm, music, news; 5, weather; 7:15-7:30, sports, markets; 9:45-12, talks, music, and code on C. W.; 10:30, weather. Tues, Fri, 8 pm on concert, etc. Central.  
 WAAQ, Greenwich, Conn. 600 m. New England Motor Sales Co. Daily ex Sun, 9:30 am-5:30 pm, every half hr. Eastern.  
 WAAR, Huntington, W. Va. Groves-Thornton Hdw. Co. WAAS, Decatur, Ga. Georgia Radio Co.  
 WAAT, Jersey City, N. J. 70 m. Jersey Review. Wed, 7-8 pm, concert, lecture. Sun, 7-8, church service, concert. Eastern.  
 WAAV, Athens, O. 500 m. Athens Radio Co. Daily, 7-9 pm, miscellaneous. Central.  
 WAAW, Omaha, Neb. 485 also. 500 Omaha Grain Exchange. Daily ex Sun, 9:45, 10:45, 11:45, 12:45, 1:20, 8 pm, market reports. 8:15-9 pm, music. Central.  
 WAAX, Crafton, Pa. Radio Service Corp.  
 WAAY, Youngstown, O. 500 m. Yoehring Rayner Music Co. Daily ex Sun, 5:30 pm, reports; 8:15-9 pm, music. Eastern.  
 WAAZ, Empira, Kans. 250 m. Hollister-Miller Motor Co. Daily ex Sun, 7-8 pm, weather, entertainment. Central.  
 WAH, El Dorado, Kans. Midland Refining Co.  
 WAJ, Marshall, Mo. Kelly-Yawter Jewelry Co.  
 WAJU, Yankton, S. D. Yankton College.  
 WBA, W. Lafayette, Ind. 50 m. Purdue University. Fri, 7:15-7:30 pm, educational lecture. Central.  
 WBAB, Syracuse, N. Y. 1,000 m. Syracuse Radio Tel. Co. Mon, Wed, Sat, 7:30-9:30 pm, concert, acrobatics etc. Eastern.  
 WBAD, Minneapolis, Minn. Sterling Elec. Co. (Journal Printing Co.)  
 WBAE, Peoria, Ill. Bradley Polytechnic Inst.  
 WBAF, Moorestown, N. J. Fred M. Middleton.  
 WBAG, Bridgetown, Pa. 485 also. 300 m. Diamond St. Fibre Co. Daily, 11:45-12 m, markets, weather. Eastern.  
 WBAH, Minneapolis, Minn. 200 m. The Dayton Co. Daily ex Sun, 1-1:30 pm, 3-3:30, 5-5:30, 9:30-10, Sat, 11-11:30 am, Wed, 8-10 pm, Central.  
 WBAI, Toledo, O. 300 m. Marshall-Gerken Co. Daily ex Sun, 12:05-2 pm, 6-7:30, news, music, reports, Tues, Thur, Sat, 8-9 pm, concert. 485 also, Eastern.  
 WBAN, Paterson, N. J. 100 m. Wireless Phone Corp. Daily ex Sun, 10:30 am, on the hour to 9:30 pm, concert, baseball, Eastern.  
 WBAD, Decatur, Ill. James Millikin Univ.  
 WBAQ, Mishawaka, Ind. 200 m. Lyrdon, Mfg. Co. Tues, Thur, Sat, 7 pm, Sun, 2 pm, Central.  
 WBAP, Fort Worth, Texas. 400 and 485 only, 1,500 m. Ft. Worth Star Telegram. Daily ex Sun, 9:45-10 am, 11-11:30, 3-3:30 pm, 3:45-4, 5:15-5:30, 6:30-6:45, 9:30-10:30, news, reports, concert. Central.  
 WBAU, Hamilton, O. Republican Pub. Co.  
 WBVA, Columbus, O. 485 also. 300 m. Erner & Hopkins Co. Daily ex Sun, 12:30 pm, news, weather. Mon, 7 pm, music. Central.  
 WBWA, Marietta, Ga. Marietta College.  
 WBAX, Wilkes-Barre, Pa. 200 m. John H. Stenger, Jr. Three nights of week, not regular.  
 WBAY, New York, N. Y. 400 only, 1,500 m. A. T. & T. Co. Daily, 11-12 am, 4:30-5:30 pm, Thurs, 7:30 pm on Eastern daylight saving.  
 WBL, Anthony, Kans. 200 m. T & H Radio Co. Mon, Wed, Fri, 10-11 pm, concert, lecture. Sat, 11-12 pm, concert. Sun, 10 am, 4-5 pm, church service. Central.  
 WBS, Newark, N. J. 100 m. D. W. May, Ind. Mon, Wed, Thur, 7:30-8:30 pm, reports, music. Sun, 9-10:30 am, 1-3 pm, church service. Eastern.  
 WBT, Charlotte, N. C. 485 also. 500 m. Southern Radio Corp. Daily ex Sun, 11 am, reports, 8 pm, music. Sun, 7:30 pm, church service. Eastern.  
 WBU, Chicago, Ill. City of Chicago.  
 WBZ, Springfield, Mass. 400 only. 500 m. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 7:30 pm, children's hour; 7:15, markets, weather, lecture; 8-9, concert. Sun, 3 and 8, church service. Eastern.  
 WCA, Newburgh, N. Y. 150 m. Newburgh Daily News. Daily ex Sun, 1, 2, 3, 7, Mon, Fri, 10:30 pm, Eastern.  
 WCA, Fort Smith, Ark. 500 m. John Fink Jewelry Co. Fri, Sun, 8-10 pm, music, talks, sermon. Central.  
 WCAD, Canton, N. Y. 200, 480 also. 300 m. St. Lawrence Univ. No regular schedule. Eastern.  
 WCAE, Pittsburg, Pa. Kaufman & Haer Co.  
 WCAH, New Orleans, La. Daily States Pub. Co.  
 WCAI, Columbus, O. 150 m. Entreklin Elec. Co. Tues, Fri, 7-9 pm, music. Wed, Thur, Sat, 7-8 pm, music. Sun, 10-12:30, church service. Central.  
 WCAJ, San Antonio, Tex. Southern Equipment Co.  
 WCAK, Erie, Pa. 485 also. 100 m. W. Wesleyan Univ. Daily ex Sun, 11 am, weather, news. Wed, 9 pm, music, lecture. Central.  
 WCAK, Houston, Tex. 100 m. Alfred P. Dantel. Daily ex Sun, 7-7:15 pm, music. Wed, 8-9:15, concert. Sun, 3-4:30 pm, concert. Central.  
 WCAL, Norfolk, Minn. 500 m. St. Ofa College. Thur, 11 pm, music. Sun, 8:30 pm, music, concert, lecture. Central.  
 WCAM, Villanova, Pa. Villanova College.  
 WCAO, Baltimore, Md. 100 m. Sanders & Stayman Co. Daily ex Sun, 12-12:30 pm, 5-5:20. Mon, Wed, 7:30-8:30 pm, Eastern.  
 WCAP, Decatur, Ill. Central Radio Service. Also 485. WCAQ, Defiance, O. 200 m. Tri-State Radio Mfg. Co. Daily, 11:30-12:30 pm, 3, baseball; 6-6:30, baseball, concert; 8, special program. Central.  
 WCAR, San Antonio, Tex. 200 m. Alamo Radio Elec. Co. Mon, Thurs, Sat, 8:30-9:30 pm, concert. Sun, 11 am, church service. Central.  
 WCAS, Minneapolis, Minn. 200 m. Wm. H. Dunwoody Industrial Inst. Mon, 8-8:45 pm, music, lectures. Central.  
 WCAT, Rapid City, S. Dak. 485 also. 300 m. S. Dak. School of Mines. Daily ex Sun, 9:30-12:30 pm, weather. Mountain.  
 WCAU, Philadelphia, Pa. Phila. Radiophone Co. 485 also.  
 WCAV, Little Rock, Ark. J. C. Dice Elec. Co.  
 WCAX, Burlington, Vt. Univ. of Vt.  
 WCAY, Milwaukee, Wis. Kesselman O'Driscoll Co.  
 WCAZ, Quincy, Ill. Whig-General.  
 WCE, Minneapolis, Minn. Findley Elec. Co.  
 WCI, New Haven, Conn. 400 m. A. C. Gilbert Co. Mon, Wed, Thur, 7:30-8:30 pm, news, music. Eastern.  
 WCK, St. Louis, Mo. 485 also. 50 m. Stix Baer & Fuller (Grand Leader). Mon, Wed, Fri, 6:45-8 pm, concert, lecture, bedtime story. Central.  
 WCM, Austin, Tex. Univ. of Texas.  
 WCN, Worcester, Mass. 485 also. 100 m. Clark Univ. Daily, 11:15 am, 5:15 pm, weather. Evening program irregular. Eastern.  
 WCX, Detroit, Mich. Detroit Free Press.  
 WDA, Nashville, Tenn. Ward Belmont School.  
 WDAE, Springfield, Ill. Ill. Watch Co.  
 WDAF, Tampa, Fla. 485 also. 500 m. Tampa Daily Times. Wed, Fri, 8-10 pm, music, lecture. Eastern.  
 WDAF, Kansas City, Mo. 400 and 485 only. 500 m. Kansas City Star. Daily ex Sun, 3-4 pm, reports, music; 6-7, educational, bedtime story, etc. Mon, Wed, Fri, 8-10 pm, concert. Sun, 3:30-5:30 pm, music. Central.  
 WDAG, Amarillo, Tex. K. Laurance Martin.  
 WDAH, El Paso, Texas. 485 also. 300 m. Mine & Smelter Supply Co. Daily ex Sun, 10 am, news, reports. Tues, Thurs, Sat, 7:30-8:30 pm, music. Mountain.  
 WDAI, Syracuse, N. Y. 485 also. 200 m. Hughes Radio Corp. Daily ex Sun, 12 m, reports. Wed, Sat, evening concert.  
 WDAJ, College Park, Ga. 485 also. 300 m. A. & W. R. B. Co. Daily, 9-10 pm, concert etc. Central.  
 WDAK, Hartford, Conn. 150 m. Hartford Courant. Daily ex Sun, 2:30 pm, 3:30, 4:30, 5:30, music, 7:40, bedtime story; 8:15, concert. Eastern.  
 WDAL, Jacksonville, Fla. 485 also. 250 m. Florida Times Union. Daily, 11 am, time, weather, 3-3:15, 4-4:15, 5-5:15, 8-9:30 music. 10:05-10:20 pm, reports. Eastern.  
 WDAN, Shreveport, La. Centenary College and Glenwood Radio Corp.  
 WDAO, Dallas, Tex. Automotive Elec. Co.  
 WDAP, Chicago, Ill. Midwest Radio Central. 485 also; 1000 m. 11:45-12 M, Ampico Selections on Plano; 1:45-2:15 latest phonograph selections; 3:15-3:30, closing quotations on Chicago Stock exchange. 6:00-6:15 pm, latest news bulletin, daily except Saturday and Sunday. Saturdays 11:45-12 Concert; 1:15-1:30 pm, Closing quotations Chicago Stock Exchange. Tues, and Thurs, 10:00-1:00, regular concert; Saturday, 10 pm to 2 am, dance program; Sunday night, 8:30-11:00, concert.  
 WDAQ, Brownsville, Pa. 200 m. Hartman-Riker Elec. Co. Daily ex Sun, 10:30-10:50 m, music. 12:50-1:10 pm, music, news, weather; 5:05-5:30 music. Tues, Thurs, Fri, 9:15-10 pm, concert. Sun, 5 pm, chapel. Eastern.  
 WDAK, Philadelphia, Pa. Lit Bros.  
 WDAK, Worcester, Mass. Samuel A. Waite.  
 WDAK, New Bedford, Mass. Wm. M. Slocum & Kilburn. Mon, Wed, 7-9 pm, concert, etc. Eastern.  
 WDAV, Muskogee, Okla. Daily Phoenix.  
 WDAW, Atlanta, Ga. 485 also. 500 m. Georgia Ry. & Power Co. Daily ex Sun, 6-7 pm; 9-9:55. Sun, 3:30-4:30 pm, Central.  
 WDAZ, Centerville, Iowa. 500 m. First Nat'l Bank. Daily, 11:30 am, reports, news. Mon, Thur, 7:30-9 pm, concert.  
 WDAY, Fargo, N. D. 485 also. 300 m. Daily ex Sun, 12:15-12:30 pm, 7:30-8:15, reports, news, music. Central.  
 WDM, Washington, D. C. 50 m. Church of the Covenant. Sun, 10:30 am, church service; 3 pm, lecture; 7:30, church service. Eastern.  
 WDT, New York, N. Y. Ship Owners Radio Service.  
 WDV, Omaha, Neb. 100 m. John O. Yelzer, Jr. Daily 7-8 pm, Tues, Sat, 12-1 am, Fri, 10-10:45 pm, Sun, 2-4 pm, Music. Central.  
 WDY, Roselle Park, N. J. Radio Corp. of America.  
 WDE, Tuscola, Ill. 70 m. James L. Bush, Daily ex Sun, every half hr., 8:30 am-12:15, Chicago Board of Trade quotations. Tues, Fri, 7-8 pm, concert, entertainment. Central.  
 WEA, Flint, Mich. Fallain & Lathrop.  
 WEAB, Fort Dodge, Ia. 600 m. Standard Radio Equip. Co. Daily ex Sun, 9:40 am, 10:40, 11:40, 1:40 pm, 5:15, market reports; 6:30 pm, sports; 7:30-8:45 pm, music. Sun, 10:45 am, church service; 7:30-8:45 pm, music. Central.  
 WEAC, Terre Haute, Ind. Baines Elec. Service Co. 485 also.  
 WEAD, Atwood, Kan. 485 also. 150 m. N. W. Kansas Radio Supply Co. Daily ex Sun, 11-11:30 am, market reports, 12, markets; 1:45 pm, markets, on half hour 3:15 to 5:45, news sports. Tues, Wed, Thurs, Sat, 7:30-9, concert. Sun, 11 am, church service; 3 pm, sacred music; 7:30, church service. Central.  
 WEAE, Blacksburg, Va. Polytechnic Inst.  
 WEAF, New York City, N. Y. 400 only. 1,500 m. Am. Tel. & Tel. Co. Daily ex Sun, 4:30-5:30 pm. Mon, Wed, Thur, Sat, 8-10 pm, concert. Eastern.  
 WEAG, Edgewood, R. 1. Nichols-Hineline-Bassett Lab.  
 WEAH, Wichita, Kan. 485 also. 500 m. Lander Radio Co. Daily ex Sun, 9:40 am, 10:40, 11:40, 12:30 pm, 1:30, 3:15, reports. Wed, Sat, 8 pm, concert. Every third Sun, 11 am, concert. Central.  
 WEAL, Hinnah, N. Y. Cornell Univ.  
 WEAJ, Chicago, Ill. The Benson Co.  
 WEAK, St. Joseph, Mo. 100 m. Julius B. Abercrombie. Thur, 8-9:45 pm, concert. Central.  
 WEAM, North Plainfield, N. J. 75 m. Borough of N. Plainfield. Daily, 7:30-8 pm, music, police news, etc. Eastern.  
 WEAN, Providence, R. I. 50 m. The Shepard Co. Daily ex Sun, 3-5 pm, 6-8, music, bedtime stories. Mon, Wed, 8-10 pm, concert. Eastern.  
 WEAO, Columbus, Ohio. Ohio State Univ.  
 WEAP, Mobile, Ala. 485 also. 50 m. Mobile Radio Co. Daily, 4-5 pm, 7-8:55. Central.  
 WEAQ, Berlin, N. H. C. A. American.  
 WEAR, Baltimore, Md. Balt. American & News Pub. Co.  
 WEAS, Washington, D. C. 150 m. The Hecht Co. Daily ex Sun, 3-4 pm, Wed, Sat, 7-8 pm, Eastern.  
 WEAT, Tampa, Fla. John J. Forarty.  
 WEAT, St. Louis, Mo. 100 m. Davidson Bros. Co. Daily ex Sun, 9 am, 10, 11, 1 pm, reports, news. Mon, Wed, Fri, 8:30 pm, concert. Central.  
 WEAV, Ruxville, Nebr. 200 m. Sheridan, Elec. Service Co. Wed, Fri, Sun, 8-9 pm, concert, news, etc. Mountain.  
 WEAW, Anderson, Ind. Arrow Radio Lab.  
 WEAX, Little Rock, Ark. T. J. M. Daly.  
 WEAY, Houston, Tex. Will Horwitz, Jr.  
 WEAZ, Waterloo, Ia. 100 m. A. C. Sweetman. Mon, Thurs, Sat, 7-8 pm, news, concert, lecture. Central.  
 WEB, St. Louis, Mo. 800 m. The Benwood Co., Inc. Daily ex Sun, 9-9:40 am, 12-12:45 pm, 3-4. Wed, 7-9 pm, Central.  
 WEH, Tulsa, Okla. (300 S. Main St., Eldorado, Kans.) Midland Refining Co.  
 WEV, Houston, Tex. 485 also. 500 m. Hurlburt-Still Elec. Co. Daily ex Sun, 10 am, 5:30 pm, weather, roads. Tues, Thur, 8 pm, concert. Central.  
 WEW, St. Louis, Mo. 485 also. 100 m. St. Louis Univ. Daily ex Sun, 9 am, 10, 2 pm, reports. Central.  
 WEY, Wichita, Kan. 485 also. 500 m. Cosraddo Co. (Wichita Beacon) Daily ex Sun, hourly, 8:40 am-12:40 pm, stock markets. Daily, 10:45 am and 4:30 pm, weather; 8-10 pm, sports, concert, lecture; 10:45 weather. Sun, 8:10 pm, church service, concert. Central.  
 WFAA, Dallas, Texas. 400 and 485 only. 250 m. A. H. Belo & Co. Daily, 10:15 am, reports; 12:30-1 pm, address; 6:45-7, bedtime story; 8-8:30, music. Tues, Thur, Sat, 11-12 pm, music. Central.  
 WFAB, Syracuse, N. Y. 100 m. C. F. Woese. No definite schedule.  
 WFAC, Superior, Wis. 400 m. Superior Radio Co. Daily, 7-7:45 pm, news. Central.  
 WFAD, Salina, Kan. 250 m. Watson Weldon Motor Supply Co. Daily ex Sun, 8:45 am, 9:45, 10:45, 11:45-1:30 pm, reports. Tues, Thur, Fri, 8 pm, concert. Sun, 11 am, church service; 8 pm, concert. Central.  
 WFAF, Poughkeepsie, N. Y. 200 m. H. C. Spratley Radio Co. Daily ex Sun, 10-10:30 am, 11:30-11:45, 1:30-2 pm, 4-4:15. Tues, Thurs, Sat, 8:15 pm, feature program. Eastern.  
 WFAH, Waterford, N. Y. 340 only. 300 m. Radio Engineering Lab. Wed, Sat, 7:45-10 pm, concert. Sun, 2-4 pm, church service. Eastern.  
 WFAH, Port Arthur, Tex. Elec. Supply Co.  
 WFAI, Asheville, N. C. Hi-Grade Wireless Instrument Co.  
 WFAK, Brentwood, Mo. Domestic Electric Co.  
 WFAL, Houston, Tex. Chronicle Pub. Co.  
 WFAM, St. Cloud, Minn. 485 also. 100 m. Granite City Elec. Co. and Times Publishing Co. Daily ex Sun, 3:30-4:00 pm, markets; 7:30-9, entertainment. Central.  
 WFAN, Hutchinson, Minn. 485 also. 500 m. Hutchinson Electric Service Co. Daily ex Sun, 1 pm, markets etc. Central.  
 WFAP, Peoria, Ill. 200 m. Radio School of Browns Business College. Daily ex Sun, 10:25 am, reports; 12-12:15 pm, concert; 1:40 reports; 4:25, business lessons; 7:45, concert. Central.  
 WFAQ, Cameron, Mo. Cameron Radio Co. and Mo. Western College.  
 WFAH, Sanford, Me. Hall & Stubbs.  
 WFAH, Fort Wayne, Ind. United Radio Corp.  
 WFAT, Sioux Falls, S. Dak. 485 also. 400 m. Argus Leader. Daily ex Sun, 10:15-12:15 pm, 2:15, reports; 7:30 pm, music. Tues, 8-9 pm, concert. Central.  
 WFAU, Peoria, Ill. 200 m. Radio School of Browns Business College. Daily ex Sun, 10:25 am, reports; 12-12:15 pm, concert; 1:40 reports; 4:25, business lessons; 7:45, concert. Central.  
 WFAV, Lincoln, Nebr. 485 also. 800 m. Univ. of Nebr. Daily ex Sun, 10:10 am, weather, markets. Sat, 9:00 pm, concert. Central.  
 WFAW, Miami, Fla. Daily Metropolis.  
 WFAZ, Birmingham, N. Y. 75 m. Arthur L. Kent. Daily, 5-5:30 pm, music. Eastern.  
 WFAZ, Independence, Kan. 500 m. Daniels Radio Supply Co. Daily ex Sun, 12 m, 4 pm, news. Mon, Tues, Wed, 7:30-8 pm, entertainment. Thur, Fri, 7-8:30 pm, Sat, 7-9 pm, music. Sun, 11 am, church services. Central.  
 WFAZ, Charleston, S. C. 400 m. S. C. Radio Shop. Daily ex Sun, 12 m, reports, news, music. Tues, Thur, 8-10 pm, Eastern.  
 WFI, Philadelphia, Penn. 400 and 485 only. 350 m. Strawbridge & Clothier. Daily ex Sun, 1:16 pm, news; 3:30-4:30, concert; 5:30-6, sports. Mon, Fri, 6:30-7 pm, Radio talk. Wed, Fri, Sat, 7:30-8:30 pm, concert. Fri, Sat, (alternate weeks) 7:30 pm, concert at 8:30 pm. Sun, 4 pm, church service. Eastern.  
 WFO, Detroit, O. 485 also. 300 m. Rike-Kumler Co. Daily ex Sun, 9 am, 11, 4 pm, music, news, reports. Mon, Wed, Fri, 8 pm, concert. Sat, 11:30 pm, concert. Central.  
 WGAB, Houston, Tex. 250 m. GRV Radio Co. Daily ex Sun, 8:30-9 am, police reports; 1:30-2:30 pm, concert, address; 4:45, concert; 8 pm, police reports. Central.  
 WGAC, Brooklyn, N. Y. Orpheum Radio Stores Co.  
 WGAD, Ensenada, Porto Rico, 250 m. Escuela Hispano Americana de Radio Telegrafia, Inc. Sat and Sun eve.  
 WGAF, Tulsa, Okla. Goller Radio Service.  
 WGAH, New Haven, Conn. New Haven Elec. Co.  
 WGAH, Shenandoah, Ia. V. C. police reports. Central.  
 WGAK, Macon, Ga. Macon Elec. Co.  
 WGAL, Lancaster, Pa. 35 m. Lancaster Elec. Supply & Construction Co. Mon, Wed, Fri, 7-8 pm, concert, lecture. Sun, 3-3:30 pm, church service. Eastern.  
 WGAM, Orangeburg, S. C. 150 m. Orangeburg Radio Equipment Co. Daily ex Sun, 10 am, markets, weather; 11:55, 12:45, 4:30-4:45, reports. Wed, Fri, 10-11 pm, music. Central.  
 WGAT, Lincoln, Nebr. 100 m. Am. Legion, Dept. of Nebr. Mon, Wed, 9 pm, announcements. Fri, 9-10 pm, patriotic program, concert. Sun, 3-5 pm, sermon. Central.  
 WGAU, Wooster, O. Marcus G. Limb.  
 WGAU, Savannah, Ga. B-H Radio Co.  
 WGAW, Altoona, Pa. Ernest C. Albright.  
 WGAZ, Washington H. O. 75 m. Radio Elec. Co. Daily ex Sun, 9 am, 2 pm, music, news. Mon, Wed, Fri, 9:30 pm, concert, news. Sun, 10:30 pm, sermon. Central.

# Corrected List of U. S. Stations Alphabetically by Call Signals

WGAY, Madison, Wis. 100 mi. North Western Radio Co. Daily ex Sun, 9-10 am, financial news; 11:30, news, opening markets; 4 pm, news, closing markets. Mon, Wed, Thurs, Sat, 7:30-8:30 pm, concert. Sun, 10:30-12 am, sermon. Central.

WGAZ, South Bend, Ind. 200 mi. South Bend Tribune. Daily ex Sun, 9-9:30 am, household hints, menus; 2-3 pm, music. Central.

WGF, Des Moines, Iowa. 485 also. 300 mi. Register and Tribune. Tues, Fri, 7:30 pm, entertainment. Sun, 5 pm, church service. Central.

WGI, Medford Hillside, Mass. 485 also. 200 mi. Am. Radio and Research Corp. Daily ex Sun, 7 am, setting up exercises; 9:30, 11:30, 3:25 pm, music; 10:30 am, 1:30 pm, 3, 6, 6:30, reports, news. Mon, Wed, 7 pm, entertainment. Tues, 8:30 pm, fashion talks. concert. Thur, Fri, 9 pm, concert. Sat, 8 pm, concert. Sun, 4 pm, concert; 6:30 pm, reports; 7:30, church service; 8:30 concert. Eastern.

WGL, Philadelphia, Pa. 2,000 mi. Thos. F. J. Howlett. Tues, Thurs, Sat, 7:45-11:30 pm, concert. Eastern.

WGM, Atlanta, Ga. 400 only. Atlanta Constitution.

WGR, Buffalo, N. Y. 485 also. 300 mi. Federal Tel. & Tel. Co. Daily ex Sat and Sun, 12:15 pm, weather, agriograms; 2, music; 3, lecture; 4, music; 5:30, reports; 7:30, bedtime stories; 8:10, concert. Eastern.

WGV, New Orleans, La. Interstate Elec. Co. 485 also. WGY, Schenectady, N. Y. 400 and 485 only. 1,000 mi. General Elec. Co. Daily ex Sun, 11:55 am, 12:30 pm, 6, 10, reports, time, sports. Mon, Tues, Thur, Fri, 2-2:30 pm, 7:45, concert. Fri, 10:30 pm, special. Sun, 10:30 am, 4:30 pm, church service. Eastern.

WHA, Madison, Wis. 485 also. 600 mi. Univ. of Wis. Daily ex Sun, 12:30-1 pm, weather, markets. Tues, Thurs, Fri, Sat, 12-1 pm, weather, markets, time, 8-9 pm, concert. Fri, 9-11:15 pm, news, concert. Sat, 1-1:20 pm, instruction. Central.

WHAA, Iowa City, Ia. 200 mi. State Univ. of Ia. Daily ex Sun, 8-8:30 pm, lecture, concert, sports, news. Sun, 10:45-12 am, church service. Central.

WHAB, Galveston, Tex. 300, 485, 600 also. 500 mi. Clark W. Thompson (Fellman's Dry Goods Co.) Daily ex Sun, 9:45-10:15 am, 3 pm, 5 pm, reports, music, news. Mon, Wed, Fri, 8 pm, entertainment. Sun, 10 am, church service. Central.

WHAC, Waterloo, Ia. 150 mi. Cole Bros. Elec. Co. Daily ex Sun, 6:15 pm, news, sports. Mon, Wed, Fri, 9-30 pm, concert. Central.

WHAD, Milwaukee, Wis. 485 also. 100 mi. Marquette Univ. Daily ex Sun, 10:15 am, time; 11:20 weather. Wed, 7:30-8:30 pm, music, entertainment. Central.

WHAE, Sioux City, Ia. 200 mi. Automotive Elec. Service Co. Daily ex Sun, 12:30-5:30 pm, music, reports. Thur, 7:30 pm, music. Central.

WHAF, Pittsburgh, Pa. 200 mi. Radio Elec. Co. Daily ex Sun, 11:30-12, 3-3:30 pm, music, news. Sun, 9-10, music. Eastern.

WHAG, Cincinnati, O. 100 mi. Univ. of Cincinnati.

WHAH, Joplin, Mo. John T. Griffin.

WHAI, Davenport, Ia. 30 mi. Radio Equip. & Mfg. Co. Daily ex Sat, and Sun, 2-2:30 pm, 4:30-5:30, 10-11, Sat, 10-11 am. 2-2:30 pm, 5-5:30, 11-11:30. Central.

WHAJ, Bluefield, W. Va., Bluefield Daily Telegraph and E. K. Kitts.

WHAK, Clarksburg, W. Va. Roberts Hdwe. Co. 50 mi. No definite schedule.

WHAL, Lansing, Mich. 100 mi. Lansing Capitol News. Daily ex Sun, 9:15-9:45 am, 12:30-1 pm, 2:45-3:15, music, reports; 7:30-8:30 pm, concert. Sun, 2:30-3:30 pm, church service. Central.

WHAM, Rochester, N. Y. Univ. of Rochester.

WHAN, Wichita, Kans. Southwestern Radio Co.

WHAO, Savannah, Ga. 100 mi. Frederick A. Hill. Daily, 9:30-10 pm, Eastern.

WHAP, Decatur, Ill. 100 mi. Dewey L. Otta. No definite schedule.

WHAQ, Washington, D. C. 75 mi. Semmes Motor Co. Mon, 7-8 pm, lecture on automobile upkeep, music. Eastern.

WHAR, Atlantic City, N. J. Paramount Radio & Elec. Co.

WHAS, Louisville, Ky. 1,500 mi. Courier Journal and Louisville Times Co. Daily ex Sun, 4-5 pm, 7:30-9, Sun, 9:57-10:45 am, 4-5 pm, church service. Central.

WHAT, Yale, Okla. Yale Democrat (Yale Telephone Co.)

WHAV, Wilmington, Del. 200 mi. Wilmington Elec. Spec. Co. Daily ex Sun, 12-1 pm, music. Mon, Wed, Fri, 6-8 pm, concert. Tues, Thur, Sat, 6-7 pm, music. Eastern.

WHAW, Tampa, Fla. 50 mi. Pierce Elec. Co. Daily ex Sat, Sun, 12-1 pm, 4-5, music, agriograms. Sat, 12-1 pm, 8-10, music entertainment. Eastern.

WHAY, Huntington, Ind. 75 mi. Huntington Press. Daily ex Sun, 12 m, 3 pm, music; 1:30 pm, 6, reports, sports. Mon, Wed, Sat, 8 pm, concert. Central.

WHAZ, Troy, N. Y. 400 only. 500 mi. Rensselaer Polytechnic Inst. Mon, 8:15-9:30 pm, music. Eastern.

WHB, Kansas City, Mo. 400 and 485 only. 1,000 mi. Swencor Auto & Tractor School. Daily, 10 am, 3 pm, 5, weather. Daily ex Sun, 2 pm, ladies' hour; 7, bedtime stories. Tues, Thurs, Sun, 8-10 pm, concert. Central.

WHD, Morgantown, W. Va. 100 mi. W. Va. University. Daily, 4-6, 7-7:30, news etc. Eastern.

WHK, Cleveland, O. 300 mi. Warren R. Cox. Daily ex Sun, 1:30-2 pm, 4-4:30, 6-6:30. Tues, Thur, Sun, 8-9:30 pm. Concert. Eastern.

WHN, Ridgewood, N. Y. Times Printing & Pub. Co.

WHU, Toledo, O. 360 and 485.

WHW, East Lansing, Mich. 485 only. 150 mi. Stuart Wm. Seeley. Daily ex Sun, 11:30 am and 12:30 pm, weather and markets. Eastern.

WHX, Des Moines, Iowa. 50 mi. Iowa Radio Corp. Daily, 12:30-1 pm, 6-6:30. Sat, 3 pm, sports. Central.

WIAA, Waupaca, Wis. Waupaca Civic & Commerce Assn.

WIAB, Rockford, Ill. 50 mi. Jostlyn Automobile Co. Tues, Fri, 8:30-9:30 pm, music. Central.

WIAC, Galveston, Tex. 485 also. 100 mi. Galveston Tribune. Tues, Thurs, Sat, 7 pm on, bedtime story, evening prayer, concert. Central.

WIAD, Ocean City, N. J. 200 mi. Ocean City Yacht Club. Fri, Sat, Sun, 8-12 pm. Eastern.

WIAE, Vinton, Ia. 75 mi. Mrs. Robt. E. Zimmerman. Tues, Thurs, Sat, 9 pm, music news. Wed, 8 pm, band concert. Sun, 2:30 pm, music. Central.

WIAF, New Orleans, La. 300 mi. Gustav A. De Cortin. Sun, 10-11 am, music lecture. Central.

WIAH, Birmingham, Ala. Mathews Elec. Supply Co. WIAH, Newton, Ia. 200 mi. Continental Radio & Mfg. Co. Daily 12:30-1 pm, music, news. Mon, 7:30-8 pm, Central.

WIAI, Springfield, Mo. 100 mi. Heer Stores Co. Daily ex Sun, 10:30-11, reports, news. Tues, Thur, Sat, 7:30-8:30 pm, music. Central.

WIAJ, Neenah, Wis. Fox River Valley Radio Supply Co.

WIAK, Omaha, Neb. 485 also. 300 mi. Daily Journal-Stockman. Daily ex Sun, 7:45 am, 9:10, 10:15, 12 m, 1:50 pm, 3:50 markets, weather. Central.

WIAN, Allentown, Pa. 100 mi. Chronicle-News. Schedule irregular.

WIAO, Milwaukee, Wis. 200 also. 100 mi. School of Engineering. Mon, Tues, Thur, Fri, 10:15-10:30 am; 11:30-11:45, news; 11:45-12:10 pm, lecture; 5-6 pm, news; 7-7:15, music; 7:15-7:30, lecture. Central.

WIAP, Springfield, Mass. Radio Development Corp. 360.

WIAR, Marion, Ind. Chronicle Pub. Co.

WIAS, Paducah, Ky. 150 mi. J. A. Rudy & Sons. Daily ex Sun, 11-12 am, markets, weather news, music; 4-5 pm same and sports; 7:30-9, concert, lectures, etc. Sun, 11-12 am, church service. Central.

WIAT, Burlington, Ia. 400 mi. Hawk-Eye Home Elec. Co. Tues, Thurs, 8-9 pm, concert. Central.

WIAT, Toledo, Mo. Leon T. Noel.

WIAU, Le Mars, Ia. Am. Trust & Savings Bank.

WIAV, Binghamton, N. Y. N. Y. Radio Lab.

WIAW, Saginaw, Mich. Saginaw Radio & Elec. Co.

WIAZ, Lincoln, Neb. 200 mi. Capitol Radio Co. Thur, 8 pm, music, entertainment. Sun, 2:30 pm, 8, 9, church service. Central.

WIAX, Washington, D. C. 100 mi. Woodward & Lothrop. Daily ex Sun, 10:30-11:30 am, 2-3 pm, music. Sat, 8-10 pm, concert. Eastern.

WIB, Miami, Fla. Elec. Supply Sales Co.

WIK, McKeesport, Pa. 500 mi. K. & L. Elec. Co. Daily ex Sun, 6:30-7 pm. Tues, Thurs, 9:30-10:30 pm. Sun, 1:30-2:30 pm and 6:30-7 pm. Eastern.

WIL, Washington, D. C. 100 mi. Continental Elec. Supply Co. Daily 5:30-7 pm, music, entertainment. Eastern.

WIP, Philadelphia, Pa. 500 mi. Gimbel Bros. Daily ex Sun, 2:30-3:30 pm. Mon, Wed, Thur, 7-7:30 pm. Tues, Fri, Sat, 7-12 pm. Sun, am, pm, church service. Also 300.

WIZ, Cincinnati, O. 485 also. 200 mi. Cino Radio Mfg. Co. Daily ex Sun, 12 m, 3:30 pm, 7-8, reports, entertainment. Central.

WJAB, Lincoln, Nebr. 200 mi. American Radio Co. Mon, Wed, 8:30-9 pm. Central.

WJAC, Joplin, Mo., Redell Co., 360.

WJAD, Waco, Tex. 485 also. 500 mi. Jackson's Radio Engng. Lab. Daily ex Sun, 12:30-1 pm, markets, news, music; 3:30-4, news, music; 6-6:15, sports; 8:45-9:45, concert, news. Sun, 11-12 am, church service; 3:30-4 pm, music; 6-6:15, sports; 8:45-9:45, music. Central.

WJAE, San Antonio, Tex. 500 mi. Texas Radio Syndicate (Evening News) Mon, 9:30-10:30 pm. Tues, Thurs, Sat, 7:30-8:30 pm, concert. Central.

WJAF, Muncie, Ind. 100 mi. Muncie Press and Smith Elec. Co. Daily ex Sun, 3:30-4 pm. Mon, Wed, Fri, 7-8 pm. Sat, 6-7 pm. Central.

WJAG, Norfolk, Neb. 485 also. 150 mi. Norfolk Daily News. Daily ex Sun, 10:30 am, 12:15 pm, 3:30, 5:30, reports. Central.

WJAH, Rockford, Ill. Central Park Amusement Co.

WJAI, Dayton, O. Y. M. C. A.

WJAK, Stockdale, O. 485 also. 250 mi. White Radio Lab. Daily ex Sun, 10:30-10:50 am, music; 11:05-11:20, reports, news; 6-6:30, music, news. Wed, 8-9 pm, concert. Sun, 2-2:45 pm, church service. Central.

WJAL, Portland, Me. Victor Radio Corp.

WJAM, Cedar Rapids, Ia. 100 mi. Evening Gazette. Daily, 7-8 pm, musical program. Central.

WJAN, Peoria, Ill. 300 mi. Peoria Star and Peoria Radio Sales Co. Daily ex Sun, 11:30 am, markets, weather; 1:30 pm, closing markets, agriograms, bond news; 6:15, sports. Tues, Thurs, Sat, 9:15-9:45 pm, concert. Central.

WJAP, Duluth, Minn. 200 mi. Kelley Duluth Co. Mon, Thur, 8-9:30 pm, music. Sun, 11-12 m, pipe organ, 12-1 pm, church service.

WJAQ, Topeka, Kans. Capper Publications.

WJAR, Providence, R. I. The Outlet Co., J. Samuels & Bro.

WJAS, Pittsburgh, Pa. 150 mi. Pittsburgh Radio Supply House (Pittsburgh Leader). Daily ex Sun, 11-11:30 am, 2:30-3 pm. Mon, Tues, Fri, 7-8 pm. Eastern.

WJAT, Marshall, Mo. 100 mi. Kelley-Vawter Jewelry Co. Daily ex Sun, 2-2:30 pm, 5:35-6, concert. Central.

WJAX, Cleveland, O. 485 also. 500 mi. Union Trust Co. Daily ex Sat, pm, Sun, 9-9:15 am, 10-10:15, 2-2:45 pm, 3-3:45, music, financial reports, news. Eastern.

WJAZ, Chicago, Ill. Chicago Radio Lab.

WJD, Granville, O. 100 mi. Dennison University. Daily, 5-6 pm, concert, lecture. Central.

WJH, Washington, D. C. 100 mi. White & Rorer Co. Daily ex Sun, 1-2 pm, music. Tues, 7:45-10 pm, music. Eastern.

WJK, Toledo, O. 300 mi. Service Radio Equipment Co. Daily ex Sun, 3-4 pm, concert. Mon, Wed, Fri, 7:30-9 pm, concert, lecture, etc. Sun, 7:30-9 pm, church service, concert. Eastern.

WJL, New York, N. Y. De Forest Radio Telephone & Telegraph Co.

WJZ, Newark, N. J. 485 also. 1,500 mi. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 15 minutes hourly from 9 am to 6 pm; 12-12:30 pm; 7-10:15 pm. Miscellaneous program of highly varied nature. Sun, 8-10:15 pm, music. Eastern.

WKAA, Cedar Rapids, Ia. 485 also. 200 mi. H. F. Paar. Daily ex Sun, 12:45 pm, reports; 5:30 reports, agriograms; 6-7, music. Thur, 11-12 pm, music. Sun, 4-5 pm, church service. Central.

WKAC, Lincoln, Neb. 400 mi. Star Pub. Co. Tues, Fri, 8-9:30 pm, concert, entertainment. Central.

WKAD, East Providence, R. I. Charles Looff.

WKAF, Wichita Falls, Tex. W. S. Radio Supply Co.

WKAG, Louisville, Ky. Edwin T. Bruce, M. D.

WKAH, West Palm Beach, Fla. Planet Radio Co.

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amplify weak sounds; bring in distant stations; with clear, pleasing distinctness. A beautiful piece of workmanship with sturdy steel shell, furnished in black enamel with buffed nickel strip. \$4.50



### United Variable Condensers

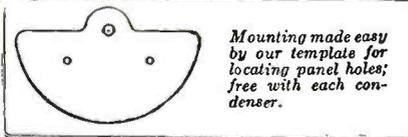
Correct in design, high grade in workmanship. Plates are held positively, so that short-circuiting is practically impossible.

#### United Variable Condenser with Vernier Attachment Dial and Knob

46 plate.....\$6.50 26 plate.....\$5.50  
Only Vernier with stop (See cut above)

#### United Variable Condensers without Vernier, Dial or Knob

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23 plate..... 4.00 3 plate..... 2.25  
11 plate..... 3.50 without dial or knob



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## United Mfg. & Distributing Co.

536 Lake Shore Drive, Chicago.

# Corrected List of U. S. Stations Alphabetically by Call Signals

**WKAJ**, Fargo, N. D. 150 ml. Fargo Plumbing & Heating Co. Daily ex Sun. 5-5:45 pm, concert, sports. Central.

**WKAK**, Okemah, Okla. Okfuskee County News.

**WKAL**, Orange, Tex. Gray & Gray.

**WKAM**, Hastings, Neb. Daily Tribune.

**WKAN**, Montgomery, Ala. 200 ml. Alabama Radio Mfg. Co. Daily ex Sun. 3:30 pm. 8:30. music, news. Eastern.

**WKAP**, Cranston, R. I. Dutee W. Flint.

**WKAQ**, San Juan, Porto Rico. Radio Corp. of Porto Rico.

**WKAR**, East Lansing, Mich. Mich. Agrl. Collere.

**WKAS**, Springfield, Mo. 100 ml. L. E. Lines Music Co. Daily ex Sun. 6:30-7 pm, sports. Mon, Fri, Sat, 8-9:15 pm, music. Central.

**WKAT**, Frankfort, Ind. Morning Times. 360 and 485.

**WKAU**, Laconia, N. H. Laconia Radio Club.

**WKAU**, Beloit, Wis. 100 ml. Turner Cycle Co. Daily 12-12:15 pm. 7-7:30, concert. Central.

**WKAU**, Bridgeport, Conn. 75 ml. Wm. A. Macfarlane.

**WKAU**, Gainesville, Ga. Brenau College.

**WKAZ**, Wilkes-Barre, Pa. 100 ml. Landau's Music Co. Sat, 8-12 pm, dance music. Sun, 11 am. 8 pm, church service. Eastern.

**WKC**, Baltimore, Md. 500 ml. Jos. M. Zamolski Co. Tues, Thurs, Sat, 7:30-9:30 pm. Eastern, daylight saving.

**WKN**, Memphis, Tenn. Riechman-Crosby Co.

**WKY**, Oklahoma City, Okla. 485 also. 500 ml. Oklahoma Radio Shop. (Daily Oklahoma.) Daily 12 m. weather; 7-7:30 pm, sports, specials; 8:30-9:30, concert; 9, weather, news. Sun, 3:30-4:30 pm, concert. Central.

**WL2**, Fairfield, O. U. S. Army.

**WLAC**, Raleigh, N. C. N. C. State College.

**WLAD**, Hastings, Neb. 150 ml. Arfanette Radio Supply Co.

**WLAF**, Lincoln, Neb. Johnson Radio Co.

**WLAG**, Minneapolis, Minn. 1,000 ml. Cutting & Walsh. Radio Corp. Daily ex Sun. 9:30-12 am, music, market reports; 1:30-3 pm, music, farm news, styles; 3:30-4:45, markets, music; 8-7:30, farm news, children's hour. Thur, Fri, Sat, 8-9:30 pm, concert. Sun, 4:30-5:30 pm, church services. Central.

**WLAH**, Syracuse, N. Y. Samuel Woodworth.

**WLAI**, Waco, Tex. 485 also. 1,000 ml. Waco Elec. Supply Co. Daily ex Sun. 9:30 am. 10:30, 2:30 pm, music, reports. Tues, Thur, Sat, 7:45-8:45 pm, music. Sun, 3 pm, church service.

**WLAK**, Bellows Falls, Vt. Vermont Farm Machine Co.

**WLAL**, Tulsa Radio Co. Tulsa, Okla.

**WLAM**, Springfield, O. 100 ml. Morrow Radio Co. Mon, Wed, Fri, 8-9:30 pm, dance music. Central.

**WLAN**, Houston, Me. Putnam Hdwe. Co.

**WLAO**, Scranton, Pa. 100 ml. 485 also. R. C. Ehrhardt and J. H. Jones. Mon, Wed, Fri, 7:15 pm, bedtime stories, reports. 8-9:30 pm, concert. 7:30 pm, music; 8:30, church services; 9:15, music, Eastern.

**WLAP**, Louisville, Ky. W. Y. Jordan.

**WLAQ**, Kalamazoo, Mich. 100 ml. A. E. Schilling. Daily, 10-12 pm, music. Central.

**WLAR**, Marshalltown, Ia. 50 ml. Melkel Music Co. No definite schedule.

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

**WLAT**, Burlington, Ia. Radio Specialty Co.

**WLAV**, Pensacola, Fla. 200 ml. Elec. Shop, Inc. Daily ex Sun. 8-9 pm, music, entertainment. Central.

**WLAW**, New York, N. Y. New York Police Dept.

**WLAX**, Greencastle, Ind. Greencastle Community Broadcasting Station. (Putnam Elec. Co.)

**WLAY**, Fairbanks, Alaska. Northern Commercial Co.

**WLAZ**, Warren, O. Hutton & Jones Elec. Co.

**WLB**, Minneapolis, Minn. Univ. of Minn. 100 ml. Daily ex Sun. 12-12:30 pm. 7:30-7:50. Central.

**WLK**, Indianapolis, Ind. 485 also. 500 ml. Hamilton Mfg. Co. Daily ex Sun. 11-11:30 am. 12-12:30 pm. 2-2:30, 3-3:30, 5-5:30, reports. Tues, Thur, 8:30-10 pm, concert. Sun, 8-10 pm, 8-10 pm, Central.

**WLW**, Cincinnati, O. 485 also. 500 ml. Crosby Mfg. Co. Daily ex Sun. 10 am-3 pm, music, reports. Tues, Thur, Fri, 8-10:30 pm, music, news. Sun, 11 am, church service. Central.

**WMA**, Anderson, Ind. 25 ml. Arrow Radio Lab. Mon, Wed, Fri, 7:30-8:30 pm, concert, news, etc. Central.

**WMAB**, Oklahoma City, Okla. 500 ml. Radio Supply Co. Daily ex Sun. 9:30-10:30 pm, music. Fri, 11:30-12:30 pm, Central.

**WMAC**, Cazenovia, N. Y. 330, 250, 275 only. 500 ml. C. B. Meredith. No definite schedule.

**WMAD**, Atchinson County Mall, Rock Port, Mo.

**WMAF**, Dartmouth, Mass. Round Hills Radio Corp.

**WMAH**, Liberal, Kan. 75 ml. Tucker Elec. Co. Daily ex Fri, Sun. 7:30-8:30 pm, music, news. Fri, 8-9 pm, concert. Central.

**WMAI**, Lincoln, Neb. 100 ml. General Supply Co. Daily ex Sun. 2:15 pm, music, news. Mon, Wed, Thur, 7:30 pm, music. Sun, 2:30, music, news. Central.

**WMAJ**, Kansas City, Mo. 485 also. 600 ml. Daily Drivers Telegram. Daily ex Sun. 8:15 am. 9:15-10:15, 11:15, 1:15 pm. 2:30, weather, markets. Central.

**WMAK**, Lockport, N. Y. Norton Labs.

**WMAI**, Trenton, N. J. 100 ml. Trenton Hdwe. Co. Mon, Thur, 7:30-9 pm, music, lecture. Eastern.

**WMAW**, Beaumont, Tex. Beaumont Radio Equipment Co.

**WMAN**, Columbus, O. 50 ml. First Baptist Church. Sun. 10:30-12 m. 7:30-9 pm, church services. Central.

**WMAP**, Easton, Pa. Utility Battery Service.

**WMAQ**, Chicago, Ill. 1,500 ml. Chicago Daily News. Daily, 7-7:30 pm. 9:30-10. Central.

**WMAR**, Waterloo, Ia. Waterloo Elec. Supply Co.

**WMAT**, Duluth, Minn. Paramount Radio Corp.

**WMAV**, Auburn, Ala. Polytechnic Inst.

**WMAW**, Wahpeton, N. D. 50 ml. Wahpeton Elec. Co. Daily, 7-7:30 pm, music, sports, news. Central.

**WMAU**, Shreveport, La. La. State Fair Assn.

**WMAX**, Ann Arbor, Mich. K. & K. Radio Supply Co.

**WMAZ**, St. Louis, Mo. Kingshighway, Presby. Church.

**WMAZ**, Macon, Ga. Mercer Univ.

**WMB**, Auburn, Me. Auburn Elec. Co.

**WMC**, Youngstown, O. 500 ml. Columbia Radio Co. Mon, Wed, Fri, Sat, 8:30-9:15 pm, concert, address, etc. Eastern.

**WMI**, Cincinnati, O. 485 only. 500 ml. Precision Equipment Co. Daily ex Sun. 11 am, 4 pm, reports. Mon, Wed, Sat, 8:15 pm, entertainment. Central.

**WMU**, Washington, D. C. 100 ml. Doubleday-Hill Elec. Co. Daily, 4:30 pm, concert, sports. Thurs, 8-9, concert. Eastern.

**WNA**, Bowling Green, Ky. Park City Daily News.

**WNA**, Boston, Mass. 200 ml. Shepard Stores. Daily ex Sun, 4-5 pm, dance music. Mon, Tues, Thur, 10-11 pm, concert. Wed, Fri, Sat, 7-8 pm, 8-9, concert. Sun, 11-12 am, 6:30-8:30 pm, church service. Eastern.

**WNA**, Norman, Okla. 200 ml. Okla. Radio Engineering Co. Daily ex Sun. 7:45-8:15 pm, news. Central.

**WNAF**, Enid, Okla. Enid Radio Dist. Co.

**WNAH**, Cresco, Ia. Rothert Radio and Electric Shop.

**WNAH**, Manhattan, Kan. Manhattan Radio Supply Co.

**WNAJ**, Chicago, Ill. Benson Co.

**WNAK**, Manhattan, Kas. Manhattan Radio Supply Co.

**WNAI**, Omaha, Neb. R. J. Rockwell.

**WNAJ**, Syracuse, N. Y. Syracuse Radio Telephone Co.

**WNAK**, Springfield, O. Wittenberg College.

**WNAQ**, Charleston, S. C. Charleston Radio Electric Co.

**WNAS**, Austin, Tex. Radio Corp. (Austin Statesman).

**WNAU**, Phila., Pa. Lendig Bros. Co.

**WNAU**, Knoxville, Tenn. Wopco Tel. & Tel. Co.

**WNAW**, Baltimore, Md. Shipowners' Radio Service.

**WNAW**, Yankton, S. D. Dakota Radio Apparatus Co.

**WNAW**, Fortress Monroe, Va., Henry Kunzmann.

**WNJ**, Albany, N. Y. 60 ml. Shotton Radio Mfg. Co. Inc. Daily ex Sun. 10-10:15 am, market reports. Wed, 3:15-10 pm, concert. Eastern.

**WNJ**, Jersey City, N. J. Wireles Telephone Co. of Hudson Co. N. J.

**WNA**, Ardmore, Okla. Dr. Walter Hardy.

**WNA**, Lima, O. Maus Radio Co.

**WNA**, Fremont, Neb. Medland College.

**WNA**, Tyler, Tex. Tyler Commercial College.

**WNA**, San Antonio, Tex. 485 also. 1,000 ml. Southern Equip. Co. Daily ex Sun, 9:30 am, 12:15 pm, 8, 6, 4, 2, markets. Wed, 7:30-8:30 pm, concert. Sun, 7-8:30 pm, concert. Central.

**WNA**, Parsons, Kans. Erving's Electrical Co.

**WNA**, Erie, Pa. Penna. Nat'l Guard.

**WOC**, Davenport, Ia. 400 and 485 only. 500 ml. Palmer School of Chiropractic. Daily ex Sun, 10:55 am, time; 11, weather; 12 m, chimes; 1:30 pm, markets; 2:30, talk; 3:45, 5:45, 7:30, sports; 7, concert. Sun, 9 am, chimes; 1 pm, 6, concert; 7, church service; 8, concert. Central.

**WOE**, Akron, Ohio. 100 ml. Buckeye Radio Service Co. Mon, Wed, Fri, 7-8:15 pm, music, ariograms, reports. Sat, 4-4:30 pm, music, sports. Eastern.

**WOH**, Indianapolis, Ind. 1,000 ml. Hatfield Elec. Co. (Indianapolis Star). Daily ex Sun. 10-11 am, music; 10:15, financial, markets; 1-2 pm, music; 1:20, markets; 4-5 pm, music; 4-15, police news; 4:50, sports. Mon, Wed, Sat, 8:30-10 pm, concert. Central.

**WOL**, Ames, Ia. 485 also. 200 ml. Iowa State College. Daily ex Sun. 9:30 am, 12:45 pm, 9:30, music, weather. Central.

**WOM**, Mine Bluff, Ark. 485 also. 500 ml. Ark. Light & Power Co. Tues, Fri, 8-9:30 pm, concert. Sun, 10-12 am, 7-9 pm, church services. Central.

**WOO**, Philadelphia, Pa. 400 and 485 only. 500 ml. John Wanamaker.

**WOP**, Kansas City, Mo. 485 also. 1,000 ml. Western Radio Co. Mon, Tues, Wed, Thur, 9:45 am, 10:55, 11:30, 2:30, 12:30 pm, 1:30, line signals, sports, etc.; Fri, 1:15 pm, sacred service. Sat, 8 pm, concert. Sun, 7 pm, concert.

**WOR**, Newark, N. J. 400 only. 150 ml. L. Bamberger & Co. Daily ex Sun. 20 minutes on half hour from 10:30 am to 8:30 pm, miscellaneous. Eastern, daylight saving.

**WOS**, Jefferson City, Mo. 485 also. 1,500 ml. Mo. State Marketing Bureau. Daily ex Sun. 9:30 am, 11:30, 2 pm, weather, markets. Mon, Wed, Fri, 5 pm, markets, 8-9 pm, concert. Central.

**WOW**, Omaha, Neb. R. B. Howell.

**WOW**, Omaha, Neb. Metropolitan Utilities.

**WOW**, Richmond, Va. 485 also. 500 ml. Palladium Printing Co. Daily ex Sun, 12-12:25 pm, 4-5, 6:30-7, music, markets. Central.

**WPA**, Fort Worth, Tex. 485 also. 500 ml. Fort Worth Record. Daily ex Sun, 11:30 am, 2:30-3 pm, 6-6:15, 7:15-7:30; 9-9:30, Sun, 3-3:30 pm, 6:30. Central.

**WPA**, Wahoo, Neb. Anderson & Webster Elec. Co.

**WPA**, State College, Pa.

**WPA**, Chicago, Ill. Weiboldt & Co.

**WPAF**, Council Bluffs, Ia. Peterson's Radio Co.

**WPAL**, Columbus, O. Superior Radio & Tel. Equip. Co.

**WPAN**, Topeka, Kans. Awerbach & Guettel.

**WPAN**, Houston, Tex. 300, 600 also. 50 ml. Levy Bros. Dry Goods Co. Daily ex Sun, 10:30-11 am, fashion talks, beauty hints. Central.

**WPA**, Kansas City, Mo. 300 ml. Central Radio Co. Mon, Fri, Sun. 7:45 pm, concert. Sun, 8:15 pm, sermonette. Daily, afternoon, sports, scores. Central.

**WPG**, New Lebanon, Ohio. 485 also. 500 ml. Nushawa Poultry Farm. Daily ex Sun, 8-9 am, 3-4 pm, music, markets. Tues, Thur, Sat, 7:30-9:45 pm, music. Central.

**WPI**, Clearfield, Pa. Elec. Supply Co.

**WPI**, Philadelphia, Pa. 30 ml. St. Joseph's College. Daily ex Sun, 2:30 pm, 8:30, sports, news. Sun, 10:45-12 noon, 7:45-8:30 pm, church service. Eastern.

**WPM**, Washington, D. C. 200 ml. Thos. J. Williams, Inc. (Washington Daily News.) Daily ex Sun, 12:30 pm, news. Mon, 8 pm, concert. Eastern.

**WPM**, Memphis, Tenn. 100 ml. United Equip. Co. Daily, 7:15-8:15 pm, music. Central.

**WQAP**, Lincoln, Neb. Am. Radio Co.

**WQAQ**, Abilene, Tex. West Tex. Radio Co.

**WQX**, Chicago, Ill. Riverview Park, Walter A. Kuehl.

**WRAU**, Amarillo, Tex. Daily News.

**WRAY**, Scranton, Pa. Radio Sales Corp.

**WRK**, Hamilton, O. 1,000 ml. Doron Bros. Elec. Co. Tues, Thur, 9-10:30 pm, music, lecture. Sun, 10:30 am, church service. Central.

**WRL**, Schenectady, N. Y. 800 ml. Union College. Sun, 7:30 pm, sacred concerts, speeches, etc. Irregular, miscellaneous weekdays program. Eastern.

**WRB**, Dallas, Tex. 485 also. 200 ml. City of Dallas. Daily ex Sun, 12-12:30 pm, weather; 3-3:30, sports, markets, news; 7-7:15, police news; 8:30-9, music. Sun, 11 am, church service; 7-8 pm, police news, church service. Central.

**WRP**, Camden, N. J. 250 ml. Federal Inst. of Radio Talk. Daily ex Sat, Sun, 10-10:45 pm, music, news, ariograms. Eastern.

**WRB**, Dallas, Tex. 485 also. 200 ml. City of Dallas. Daily ex Sun, 12-12:30 pm, weather; 3-3:30, sports, markets, news; 7-7:15, police news; 8:30-9, music. Sun, 11 am, church service; 7-8 pm, police news, church service. Central.

**WRW**, Tarrytown, N. Y. 500 ml. Koenig Bros. Daily ex Sun. 6:15-7 pm, 10:30-12. Mon, Wed, Sat, 5-5:30 pm. Tues, Fri, 2:30-3 pm. Sun, 1-3 pm. Eastern.

**WSA**, Lincoln, Neb. State of Neb.

**WSAV**, Houston, Tex. 300 ml. C. W. Vick Radio Const'n Co. Tues, Fri, 8-10 pm, concert, entertainment. Central.

**WSB**, Atlanta, Ga. 400 and 485 only. 1,500 ml. Atlanta Journal. Daily ex Sun, 12-1 pm, music; 2:30, reports; 4-4:45 pm, music, reports; 5-6 pm, 7-8, 10:45-11, 12:45-1, 10:45 am, 5-6 pm, 7:30-9, church services. Central.

**WSL**, Utica, N. Y. 500 ml. J. & M. Elec. Co. Daily ex Sat, Sun, 11-11:30 am, 2-2:30 pm. 3-3:30, 4-4:30, 5-5:30, music, news. Mon, Wed, 8-9 pm. Sat, 11-11:30 am, 5-6 pm, 8-9. Sun, 10:30-12 m. 7:30-9 pm. Eastern.

**WSN**, Norfolk, Va. 100 ml. Shipowners' Radio Service Inc. Mon, Wed, Sat, 8:15-9:30 pm, concert. Eastern.

**WSV**, Little Rock, Ark. L. M. Hunter & G. L. Carrington.

**WSX**, Erie, Pa. 75 ml. Erie Radio Co. Tues, Thurs, Sat, 10-10:55 pm, news, concert, lecture. Sun, 12:15-1:30 pm, sermon. Eastern.

**WTL**, Birmingham, Ala. 500 ml. Alabama Power Co. Mon, Wed, Fri, 2:30 pm, ex Sun, and 8 pm daily, reports, concert. Sun, 8-9 pm, church service. 485 also. Central.

**WTAW**, College Station, Tex. Agricultural and Mechanical College of Tex.

**WTG**, Manhattan, Kan. 485 only. 75 ml. Kan. State Agrl. College. Daily ex Sun, 9:55 am, weather (code). Central.

**WTK**, Paris, Tex. 300 ml. Paris Radio Elec. Co. Daily ex Sun, 10 am to 5 pm, 7-11 pm, miscellaneous. Sun, 11 am to 8 pm. Central.

**WTP**, Bay City, Mich. 75 ml. Ra-Do Corp. Mon, Wed, Fri, 1:30-2 pm, reports, news; 6:30-7:30 pm, concert. Central.

**WVP**, New York, N. Y. Signal Corps, U. S. Army.

**WWAC**, Waco, Tex. Sanger Bros.

**WWAX**, Laredo, Tex. Wexman Bros.

**WWB**, Canton, O. Daily News Printing Co.

**WWI**, Dearborn, Mich. 200 ml. Ford Motor Co. Wed, 10-11 pm, music, lectures. Eastern.

**WWJ**, Detroit, Mich. 400 and 485 only. 1,500 ml. Evening News. Daily ex Sun, 9:30-9:40 am, household hints; 9:40-10:25, entertainment; 10:25-10:30 am, 11:55-12 pm, 12:05-12:45 pm, reports, music; 3-3:30, music; 3:30-3:35, reports; 3:35-4:15, markets; 5-6, sports; 7:30-10, entertainment. Sun, November 11 and every other week, 11 am, 4 pm, church services. Sun, fill in weeks, 2 pm, 7:30, church services, special. Eastern.

**WWL**, New Orleans, La. Loyola Univ.

**WWX**, Washington, D. C. 1,160 only. 600 ml. Post Office Dept. Daily ex Sun, 10 am, weather; 10:30, markets; 5 pm, 7:30, 8, markets; 9:50, weather. Eastern.

**WWZ**, New York City, 200 ml. John Wanamaker. Daily ex Sun, 1:15-2:15 pm. Tues, Fri, 7:30-8:30 pm. Eastern.

**1XAD**, Pawtucket, R. I. Standard Radio & Elec. Co.

**2XAI**, Newark, N. J. Westinghouse Elec. & Mfg. Co.

**2XII**, New York City, A. T. & T. Co. Test call.

**3XII**, Deal Beach, N. J. Amer. Tel. & Tel. Co.

**3XW**, Parkersburg, Pa. 373 only. 400 ml. Horace A. Beale, Jr. No definite schedule. Test station.

**3YN**, Washington, D. C. 100 ml. Nat'l Radio Inst. Daily ex Sun, 6:30-7:30 code practice, lecture. Eastern.

**9AB**, Louisville, Ky. 200 only. 200 ml. Darrell A. Downard. Mon, Wed, 8 pm, police news, concert. Central.

## Radio Routes

Official reports of new lines of radio communication between Italy and the United States, following the recent suspension of direct radio communication and pending the completion of a new high-power station at Rome, have been made to the Government here by Commercial Attache MacLean at Rome.

Radio traffic from Italy for North and South America is now being handled via the high-power stations of Germany, France and England, according to statements of the Ministry of Posts and Telegraphs at Rome. Full-rate and deferred messages and press telegrams may be sent via Nauen Transradio and Radio-France, and full rate and deferred messages via London Marconi.

Messages sent via Nauen are transmitted by radio from Rome and relayed at Nauen. Traffic handled by France or England is sent by land wires from Italy and thence by radio. Messages via France or Germany will carry a rate of 20 centimes gold less than the cable rate, in the case of full-rate telegrams. Via London, the same messages would be ten centimes gold less than the cable rate. Deferred dispatches will be charged half the above rates. Press reports may be sent via France or Germany at the same rate as deferred messages, but not handled via London.

# New Stations in 9th District

Licenses issued during month ending October 30, 1922

Call signal	Station operated and controlled by—	Location of station.
9CYC	James W. Pattie.....	505 N. Thrd St., Clear Lake, Iowa
9CYD	Laddie J. Smach.....	2530 S. Ridgeland Ave., Berwyn, Ill.
9CYE	Stuart W. Daniel.....	3812 Garfield Ave., Minneapolis, Minn.
9CYF	Willard W. Crittenton.....	1919 Lunt Ave., Chicago, Ill.
9CYG	Carl F. Myers.....	3637 S. Benton St., Kansas City, Mo.
9CYH	Marshall W. Rife.....	Meriden, Ill.
9CYI	Culver L. Lamar.....	805 S. Marion St., Carbondale, Ill.
9CYJ	Norman L. Wise.....	2805 Northwestern Ave., Indianapolis, Ind.
9CYK	Russell A. Cline.....	207 S. Buchanan St., Maryville, Mo.
9CYL	Carl R. Griesbacher.....	Route No. 1, Box 34, Dousman, Wisc.
9CYM	Lester H. Smyth.....	3605 Balsam Ave., Indianapolis, Ind.
9CYN	Arthur Ralph Bryant.....	Physics Bldg., Grinnell, Iowa
9CYO	Frank W. O'Herron.....	934 N. 5th St., Terre Haute, Ind.
9CYP	John S. Brown.....	1017 Bluff St., Fulton, Mo.
9CYQ	D. James Angus.....	310 Illinois St., Indianapolis, Ind.
9CYR	F. H. Eddy.....	Main St., Slayton, Minn.
9CYS	Frank Little.....	Auburn, Ill.
9CYT	Stewart M. Scott.....	6026a Washington St., St. Louis, Mo.
9CYU	Z. Paul Clement.....	105 Delaware St., Mason City, Iowa
9CYV	John R. Robertson.....	616 W. Eighth St., Coffeyville, Kans.
9CYW	Walter McGuire and Fred D. Rowe.....	313 W. Third St., Cambridge City, Ind.
9CYX	Cary P. Butcher.....	706-15th St. (P. O. Box 93), Golden, Colo.
9CYZ	Robert G. Bentzinger.....	1605 Arlington Ave., St. Louis, Mo.
9CZA	Harold McCollom.....	513 N. 8th St., Winterset, Iowa
9CZB	Arthur N. Gunderson.....	2035 Nebraska Ave., Chicago, Ill.
9CZC	Calvin A. Wolfe.....	159 N. 10th St., Noblesville, Ind.
9CZD	Bern McElwain.....	Blencoe, Iowa
9CZE	W. G. Shirkey.....	Richmond, Ind.
9CZF	Joseph N. Dohr.....	415 State St., Appleton, Wisc.
9CZG	William T. Gill.....	490 Lafayette Place, Milwaukee, Wisc.
9CZH	Arnold L. Wolfe.....	365 S. Pearl St., Denver, Colo.
9CZI	Crete Battery Service.....	35 S. Maine St., Crete, Ill.
9CZJ	Glenn Keller.....	501 S. Main St., Chaffee, Mo.
9CZK	Carl A. Neureuther.....	R. F. D. No. 1, Spring Valley, Ill.
9CZL	Joe D. Willoughby.....	757 Cook St., Denver, Colo.
9CZM	R. B. Horrall.....	225 Elliott St., Olney, Ill.
9CZN	Charles W. Lewis, Jr.....	323 Clara Ave., St. Louis, Mo.
9CZO	Harvey E. Roberts.....	628 Clark Ave., Webster Groves, Mo.
9CZP	Bertil A. Beck.....	Alta, Iowa
9CZQ	Radio Panel Shop.....	312 W. 14th St., Junction City, Kans.
9CZR	Alfred F. Christianson.....	University Law Bldg., Valparaiso, Ind.
9CZS	John F. Fretell.....	613 Adeline St., So. Hibbing, Minn.
9CZT	Indiana Radio Engineering Co.....	372 W. 30th St., Indianapolis, Ind.
9CZU	Charles N. Cutler.....	311 W. Johnson St., Sullivan, Ind.
9CZV	Earl L. Frease.....	919 Milliam Ave. (P. O. Box 74), Ravenna, Neb.
9CZW	Julian F. Oberg.....	7350 Union Ave., Chicago, Ill.
9CZX	Bert L. Brown.....	26 Alexandria Pike, Newport, Ky.
9CZY	Roy F. Graham.....	5343 Theodosia Ave., St. Louis, Mo.
9EAA	Theodore H. Schaefer.....	Franklin St., Slinger, Wisc.
9EAB	Alta M. Blackburn.....	672 Van Buren St., Apt. No. 9, Milwaukee, Wis.
9EAC	Harry Needham.....	R. F. D., No. 6, Virginia, Ill.
9EAD	Paul Jensen.....	4931 Hamlin Ave., Chicago, Ill.
9EAE	Joe Clark.....	326 N. Main St., Carrollton, Ill.
9EAF	Dudley Andrews.....	1721 Somerset Ave., Indianapolis, Ind.
9EAG	Ronald S. McEwen.....	619 Tillitson St., Trinidad, Colo.
9EAH	C. L. Giesler.....	5055 Geraldine St., St. Louis, Mo.
9EAI	Lawrence Jacobsen.....	c-o Western Military Academy, Alton, Ill.
9EAJ	Richard C. Wells.....	424 E. 63d St., Chicago, Ill.
9EAK	Chester C. Grey.....	610 S. 10th St., Cedar Rapids, Iowa
9EAL	Edgar R. Fawcett.....	4557 St. Louis Ave., St. Louis, Mo.
9EAM	Ernest M. Helmloerfer.....	147 N. Second St., Denver, Colo.
9EAN	Vernon H. Wallace.....	1017 Lee St., Ottumwa, Iowa
9EAO	Edwin M. Nissen.....	2544 Washington St., Denver, Colo.
9EAP	LaVerne Wilson.....	2144 Washington St., Granite City, Ill.
9EAQ	J. Norvel Saylor.....	Hopkins, Mo.
9EAR	Maurice M. Wold.....	918 East 36th St., Minneapolis, Minn.
9EAS	Joe-John's Radio Co.....	216 S. Main St., Huntsville, Mo.
	Richard Schweiger.....	709 S. Spring St., Beaver Dam, Wisc.
	Oliver P. Roisinger.....	Calumet Harbor Lighthouse, 9237 Houston St., Chicago, Ill.
	Chester E. Doerr.....	5152 N. Market St., St. Louis, Mo.
	Independent School District No. 40.....	Third and Hemlock Sts., Chisholm, Minn.
	Otto A. Buder.....	611 Commercial Ave., Cairo, Ill.
	Joseph E. Harlan.....	335 Askew St., S., Kansas City, Mo.
	Thomas M. Breen.....	2421 S. First Ave., Minneapolis, Minn.
	Hilary J. Schenk.....	417 Seventh St., Calumet, Mich.
	Vermilion High School.....	Church St., Vermilion, S. Dak.
	<b>CALLS REISSUED</b>	
9FV	Allen T. Law.....	3439 Grove St., Denver, Colo.
9HZ	George A. Sim, Jr.....	5527 Lowe Ave., Chicago, Ill.
9VY	Dale Roger Clemons.....	820 Lincoln Ave., Valparaiso, Ind.
9ATO	Edwin A. Cary.....	1290 Klneckinnic Ave., Milwaukee, Wisc.
9ATR	Hal P. Rea.....	R. F. D. No. 4, Carrollton, Mo.
9AUI	Arthur W. Peters.....	219 Rockford St., N., Rockford, Ill.
9AUS	Russell Martin.....	307 Cherry St., Mt. Carmel, Ill.
9DDZ	John Henry Grady.....	Rolla, Mo.
9DIH	Ralph A. Dickson.....	7318 Kingston Ave., Chicago, Ill.
9DNT	Oscar Larson.....	7400 Coles Ave., Chicago, Ill.
9DRV	Jack Shafer.....	713 South Dakota Ave., Sioux Falls, S. Dak.
	<b>CALLS CANCELED</b>	
9AB	Thordarson Elec. Mfg. Co.....	501 S. Jefferson St., Chicago, Ill.
9BM	Howard I. Crawford.....	515 Fourth St., Wausau, Wisc.
9BY	Electric Machine Co.....	329 W. Ohio St., Indianapolis, Ind.
9SG	Coe College.....	1st Ave. and 12th St., Cedar Rapids, Iowa
9VY	Claude P. Middleton.....	815 N. 12th St. (12th St.), DeKalb, Ill.
9ALS	Raymond L. Smith.....	5527 S. Lowe Ave., Chicago, Ill.
9APE	Lowell S. Orth.....	1412 N. Adams St., Mason City, Iowa
9ATO	Arthur B. Bryant.....	Hotel Clarke, Hastings, Nebr.
9ATR	Carl R. Griesbacher.....	R. No. 1, Box 34, Dousman, Wisc.
9AUI	Frank Little.....	N. Ninth St., Auburn, Ill.
9AUS	Robert A. Jolliff.....	3051 N. 18th St., Kansas City, Kans.
9BGJ	Thomas A. Maxwell, Jr.....	644 North 24th St., Lincoln, Nebr.
9CIX	Robert W. Carel.....	4630 Zuni St., Denver, Colo.
9DDZ	Ward H. Ingersoll.....	Buffalo, Minn.
9DDZ	Robert B. Horrall.....	225 Elliott St., Olney, Ill.

(Continued on next page.)

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CLEAR

DURABLE

**HERE'S THE CLIFTON DETECTOR**

Why not get something worth while?

1. Crystals and contact points sealed in dustproof container.
2. No catwhiskers.
3. Simple to operate.
4. No replacements.
5. First cost—last cost.

Write at once for the detector extraordinary.  
\$1.50 Postpaid

**THE CLIFTON MANUFACTURING CO.**  
NEWARK, NEW JERSEY  
*(Dealers write for proposition)*

## Radio Needs Trained Men

Radio is sweeping the country like wild fire. Thousands of dollars are being spent for expensive outfits. RADIO EXPERTS are needed everywhere to keep this equipment in order and to sell and install new outfits.

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I will train you quickly and easily in your spare time, to become a RADIO EXPERT so you can install, construct, repair and sell Radio equipment. I am a Graduate Electrical Engineer and from actual experience I will give you exactly what you must know to make the really big money in radio.

**FREE** My Consultation Service to you is FREE. This outside help which I gladly give you is, in itself, worth more than the small cost of the Complete Course.

**START NOW**

Don't let others beat you to the big money. Start now and within a few weeks' time I will train you at home, at an amazingly low cost, to become a RADIO EXPERT. Write for "Radio Facts" sent free without obligation.

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## Artistic Variometer Parts

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**Variocouplers, Rotors, Winding Forms, Stators, in Genuine Mahogany.**  
*Quick Deliveries. Write for prices.*

**Artistic Wood Turning Works**  
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**RADIO MAILING LISTS**

10,975 Radio Dealers covering U. S. by states per M.	\$ 7.50
1,320 Radio Mfrs. covering U. S. by states per list	12.50
1,325 Radio Supply Jobbers covering U. S. by states per list	12.50
260 Radio Stations per list	4.00
257 Mfrs. who mfgs and assembly complete Radio sets per list	4.00
25,000 Radio Amateurs & Managers of Radio Stations per M.	7.50
3,000 Radio Amateurs & Managers of Radio Stations in Canada per M.	7.50
20 Radio Manufacturers in Canada per list.	1.50
87 Radio Supply Jobbers in Canada per list	2.50
131 Retail Radio Dealers in Canada per list	3.00
125 Mfrs. & Jobbers & Retail Dealers in England per list	4.00

Ready to send on receipt of remittances.  
**TRADE CIRCULAR ADDRESSING CO.**  
166 W. Adams Street, Chicago.

## A Homemade Battery Charger

(Continued from page 4.)

parallel as shown will allow more current to flow. The direct current is taken off at the junction between the jars as shown. To recharge the battery, connect the positive direct current terminal to the positive terminal on the battery and the negative direct current terminal to the negative terminal of the battery.

The action of this rectifier is based upon the principle that the current will not enter the solution through the aluminum plate. It will enter the solution from the lead plate and flow out through the aluminum, however. Let us for example say that the circuit shown in Figure 2 is connected to a source of alternating current supply. If the first impulse comes in on the side of the circuit in which the lamps are placed, the current will not enter the aluminum plate in the jar on the left side, but will enter the lead plate on the right side, flowing out of the aluminum plate. It cannot enter the cell below it, because of the aluminum plate, but will flow out over the direct current terminal, through the battery and back on the negative direct current terminal, through the lower cell on the left side to the other side of the alternating current.

The next impulse is in the reverse direction and comes to the lower set of cells. The aluminum plate in the left hand cell prevents the current entering, so it takes the path through the right hand cell, coming out of the direct current positive wire again, through the battery, back into the negative direct current terminal, through the upper left hand cell, to the other side of the alternating current line. Thus it will be seen that the direct current terminal on the right side of the drawing will always be positive, no matter which way the alternating current flows.

This rectifier will give very good service and will put a good charge in the battery in twenty-four hours. A small hole should be drilled in the wooden tops to allow any gas to escape. As it will be necessary to "form" the plates before the rectifier will function properly, the two direct current posts should be connected together for about ten hours while the alternating current is on, so that perfect rectification will take place when the battery is connected in the circuit. After the plates are once formed, then the battery may be connected on the

## New Stations in 9th District

(Continued from page 27.)

9DIH	Gerald H. Bockus.....	1409 Como Ave., S. E., Minneapolis, Minn.
9DNT	Leland S. Jett.....	434 Laurel Ave., St. Paul, Minn.
9DOR	Oliver P. Robinson.....	Calumet and Harbor Lighthouse, Chicago, Ill.
9DRV	Russell Martin.....	307 Cherry St., Mt. Carmel, Ill.
9DTB	Harry Needham.....	R. F. D. No. 6, Virginia, Ill.
9DVM	John Henry Grady.....	Westgate Hotel, St. Louis, Mo.
9YAP	St. Ambrose College.....	600 W. Locust St., Davenport, Iowa
9ZAE	Palladium Printing Co.....	19 North 9th St., Richmond, Ind.
<b>CHANGES IN ADDRESS</b>		
91C	Albert E. Jeffrey.....	1159 E. 54th Place, Chicago, Ill.
9TD	Hobart D. Ashlock.....	729 S. 10th St., Noblesville, Ind.
9BBS	Anton Mix.....	910 Adams St., Waukegan, Ill.
9DX	Jay F. Carpenter.....	1124 University Ave., Denver, Colo.
9QE	Ivan J. Bulock.....	718 East Second St., Fairmont, Minn.
9EX	Julius Abercromble.....	819 N. 23d St., St. Joseph, Mo.
9DVY	Marvin Eichorst.....	858 N. 15th St., Manitowoc, Wisc.
9SL	Jay Nagle Edmondson.....	Parsons College, Fairfield, Iowa
9APZ	Everett Vogel.....	6 Beech Ave., South Gate, Ky.
9UL	Carl Sherman Tunwall.....	11th and 1st Ave., N., Ft. Dodge, Iowa
9BCA	John G. Kuesport.....	602 E. Haney Ave., South Bend, Ind.
9AFT	Eugene W. Applebaum.....	910 Addison St., Chicago, Ill.
9BWP	Edward J. Posselt.....	5317 W. 25th St., Cicero, Ill.
9KE	Edwin A. Beane.....	912 E. 61st St., Chicago, Ill.
9ON	C. Frank Smiley.....	7834 Lagoon Ave., Chicago, Ill...
9ADN	Laurence W. Franklin.....	1123 South St., Lafayette, Ind.
9DFR	Merritt Clair Haigh.....	14th and Pleasant View Drive, Des Moines, Ia.
9AEK	Harmon B. Deal.....	Iowa State College, Ames, Iowa
9AMW	Howard Hill Smith.....	603 E. Springfield Ave., Champaign, Ill.
9BEB	Linton H. Flocken.....	612 W. Illinois St., Urbana, Ill.

terminals at any time. A more efficient method is to use a toy transformer, connecting the primary directly to the alternating current mains and the secondary directly to the rectifier. The voltage of these toy transformers is usually adjustable, so that the rate of charging may be regulated by the controlling switch on the secondary of the transformer. This method will charge the battery faster, and is much more efficient.

## Panama Fans Grieve

Homesick amateurs in the Canal Zone and in Panama are protesting against an order of the U. S. Navy Department, forbidding them to operate their private broadcasting stations. Panama has granted all rights of wireless communication in that country to the United States and therefore the navy's jurisdiction is absolute. Important strategic conditions affecting the security of the canal are thought to have influenced the Navy Department in shutting off the joys of amateur experimentation.

The Panama canal is defended by a circle of big coast defense guns, some of them mounted on the mainland and some on small islands lying off the ends of the canal. These guns are considered a sound defense against a fleet attack under ordinary conditions. With a great number of wireless stations in and around the isthmus it might be possible in the confusion and jamming which usually occurs in time of battle, for land radio stations to report the observation of enemy fire and direct it upon the American guns.

To amateurs in the canal strip, however, the restrictions seem oppressive and hundreds of protests are said to have been received by the government authorities. Associations of amateurs have even offered to pay all cost of the government supervision of their stations if they could be allowed to operate.

## Receiving Equipment

(Continued from page 7.)

fect, that simultaneous adjustment of anode inductance be made with adjustment of wave length.

The design of the oscillating circuit tuning elements of a receiver is largely determined by the range of wave length desired and the regenerative scheme employed, if any, the inductance or capacity elements alone may be variable, or, to obtain a greater range of wave length adjustment, they may both be variable.

When the inductive coupling for regeneration is employed, it is usually desirable that at least the inductance element in the oscillating circuit be varied for adjustment of resonant wave length, as by this means the proper coupling between the resonant circuit inductance and the feed-back coupling coil for constant regeneration at various wave lengths can be obtained.

The foregoing remarks mainly cover questions of design affecting the tuning elements of the receiver, and on the general assumption that a three-element vacuum tube receiving system of the requisite sensitivity is employed.

The problems which may be presented for future development will be influenced largely by the condition imposed on the operation of the transmitting stations. With the transmitters grouped in one band of wave length, the possibilities of improvement are very remote. With the separation of transmitting waves, the ease of solution of the interference problem increases with the extent of this separation. The logical solution would appear to be a separation which would correspond to the possibilities of available receiving apparatus, and it is probable that, as the number of transmitters continues to increase, with a corresponding reduction of wave separation, the development of receiving apparatus will keep pace with the increasing exactitude of requirements.

# Plan to Popularize Radio

FARMERS generally and residents in small towns throughout the country still hesitate to buy radio receiving outfits because crystal sets do not pick up the nearest broadcasting station and they do not want at this time to invest in tube sets. Thus 60 per cent of the population at the present time is estimated to be out of range of broadcasting stations.

How may these isolated thousands be reached? We publish herewith an editorial from the December number of Radio News. H. Gernsbach, editor of that publication, has asked us to reprint his explanation of the plan and we do so with pleasure, in the hope that it may help to put radio back on the crest. What do you think of the plan? Write your views fully and mail at once to Radio Age, 64 West Randolph Street, Chicago.

The Radio News editorial follows, in part:

Suppose an up-to-date amateur, or business man for that matter, was told that with practically no outlay, he could make several thousand dollars a year out of radio broadcasting. Would he not jump at the chance? This is exactly what this scheme means. It is nothing less than *broadcasting broadcasting*

We know that most of the large broadcasting stations at the present time are receiving Arlington Time Signals on a special aerial on a wave-length of about 2,650 meters; a special receiving set is maintained for these time signals. At noon and at 10 p. m. these time signals are re-transmitted on a wave-length of either 360 or 400 meters. The telephone of the receiving outfit is simply held against the microphone of the sending outfit at the broadcasting station and the signals are thus re-transmitted.

Why not do the same thing with broadcasting programs? Suppose we have a small town of 3,000 inhabitants 100 miles away from the nearest broadcasting station. No one in that town unless he has a good vacuum tube outfit can possibly listen in to any entertainment, and if you canvass such a town you will find that there are not six such outfits in the whole community. Now, then, suppose some wide-awake amateur should equip himself with a first-class vacuum tube receiving set. This set should be an efficient loop set, preferably. Then he would also install a low-power radio telephone sending outfit. This outfit would not have to be rated higher than 10 watts. Such an outfit would cost less than \$200 to assemble, including the receiver. Once the modulation problem was solved, it would be a very simple matter for the amateur to re-transmit from a wave-length of 360 to 400 meters and re-broadcast the broadcast on a 200-meter wave-length. He would have

little trouble securing the necessary license from the nearest Customs House for this purpose.

Now for the best feature of the scheme: With a good 10-watt transmitter it should be possible to reach everybody within a radius of 10 miles, sufficient, in other words, to reach everybody in town. Of course, there would be needed a good transmitting aerial, but this is a matter in which we need not instruct any first-class amateurs.

The minute his station is completed, the amateur would take a simple crystal outfit, of which many can be had today for \$15, complete with aerial, and visit some of his friends. He would put up a temporary aerial and let his friends and acquaintances listen in to his evening programs.

No! He would not sell, or try to sell, the crystal set to them—and here is suggested a new idea: *HE WOULD RENT IT!* You do not buy your telephone today, but you pay so much per month to the Telephone Company. Exactly so in radio. A simple contract blank could be made out whereby the subscriber agrees that upon the installation of the outfit he will pay at the rate of \$2 per month.

Now, the wholesale price of a good crystal outfit, complete with phones, aerial, etc., can be had for from \$10 up. Furthermore, it would not be necessary for the amateur to lay out a single dollar, for if he should be able to secure anywhere from 50 to 100 subscriptions, he could take these contracts to his bank, and if the young man is at all in good standing in the community, he will have no trouble whatsoever in securing a loan from the bank with which to purchase the outfits, the bank holding the contracts as security for the loan.

Now let us see how it works out in dollars and cents:

100 Crystal Outfits, at \$10 each.....	\$1,000.00
Radiophone Transmitter.....	75.00
<b>Total Costs.....</b>	<b>\$1,075.00</b>
<b>INCOME</b>	
100 subscribers at \$2 per month for 12 months.....	\$2,400.00
Deducting the original cost.....	1,075.00
<b>Net profit.....</b>	<b>\$1,325.00</b>

And all this requires no investment! This is for only 100 subscribers. In a town of 4,000 it would be less than 3 per cent. It should be possible to get at least 10 per cent in any community, providing good results can be shown, in which case the profit will be over \$3,000 net per year, a thing not to be sneezed at these days.

At one bound, therefore, we can put the entire country in touch with the broadcasting stations where only 40 or 50 per cent are in touch now.

There is no reason at all why this scheme can not be put into use immediately and the writer will be glad to assist the first few pioneers who try in every way possible.

Tell 'em You Saw It in "Radio Age"

**Radio PLAN-O-PHONE**

**LOUD SPEAKER \$3.50**

The Plan-O-Phone is the most amazing value of any Radio Loud Speaker on the market. Remarkable acoustics. Used with any 2 stage amplifier receiving set. Fits any receiver. Made of statuary bronze—handsome, durable. Special insulating device. Nothing half so good at several times the price. Ask your dealer to show it. Mfd. and guaranteed.

**\$3.50 sent prepaid if your dealer can't supply you.**

## The Planet Radio Loud Speaker

Price each, \$40.00



Weight 2½ lb., 11 in. high, Bell diam. 6 in. Perfect Sound Reproduction

The Planet Loud Speaker marks the most advanced step in the perfection of Receiving Radio Broadcasting. Radio experts, "fans" and dealers, all are amazed at the remarkable fidelity with which the PLANET fills a room with the exact tonal qualities of the human voice, musical instruments, etc. The PLANET is a complete unit. Like a thing of magic it transforms the ordinary 2 stage amplifier receiving set into a wonderful musical instrument. Beautiful design, richly finished mahogany case and polished emitter with gold or aluminum finish, make the PLANET an ornamental attraction to any home. Loud, distinct, clear reproduction. Price \$40.00.

## The Planet Power Amplifier



Price \$27.50 (without tube)

An essential unit for receiving sets that do not produce sufficient volume. Constructed so that either a five-watt power tube or amplifying tube can be used depending upon the volume desired. An article of the highest grade. It is equipped with special units found in no other amplifier. With the Planet Amplifier you can greatly increase your volume without distortion. Every detail of construction shows the highest grade workmanship and materials.

### DISTRIBUTORS

- BOSTON—Beaudette & Graham Co., 915 Boylston St.
- BALTIMORE—Jones Elec. & Radio Mfg. Co., 118-20 E. Lexington St.
- DETROIT—E. E. Polczynski & Co., 304 Capitol Theatre Bldg.
- GRAND RAPIDS, MICHIGAN—Wolverine Elec. Corp., 21 Division St.
- KANSAS CITY, MISSOURI—Western Radio Co., 6 W. 14th St.
- PEORIA—Diamond Elec. Sup. Co.
- ST. LOUIS—The McGraw Co., 2018 Locust St.
- NEW YORK CITY—Harold M. Schwab, Inc., 419 W. 42nd St.
- NEWARK, NEW JERSEY—General Mds. Co., 142 Market St.

**Planet Radio Corporation**  
Dept. M1  
1223 S. Wabash Ave. Chicago, Ill.

## R. P. C. Midget Radio Pocket Receiver



Size 1-11-32x3½x6¾

Price \$3.00

THE R. P. C. MIDGET POCKET RECEIVING SET is designed to meet the wants of the novice (an opportunity to get acquainted with the mysteries of the RADIO ART) and who, having learned the A B C of Radio, may readily become a more serious student of this most important field of investigation.

This receiver is made of the finest material. It is mounted in a polished wooden case, fully equipped with a FIXED CONDENSER for tuning. It has a range of approximately 25 miles of clear, distinctive receiving.

THE R. P. C. MIDGET is truly the wonder of the age in size, price and quality. Not a mere toy but a scientifically built Crystal receiving set comparing favorably with many higher priced sets on the market.

Without head phones, \$3.00 post-paid everywhere.

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of America  
55 Broadway, New York, U. S. A.

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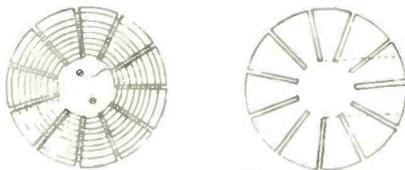
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Inductance wound complete \$2.00  
Disc Only . . . . .50

Diagram for connections free with order.

We are manufacturers of Storage Batteries for Radio A and B circuit.



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We guarantee satisfaction, or your money refunded. The adjustment feature places our phones on a par with the world's greatest makes. Our sales plan eliminates dealer's profits and losses from bad accounts, hence the low price. Better phones cannot be made. Immediate deliveries. Double 300 Ohm sets, \$3.98; 1500 Ohm single set, \$2.50. Circular free.



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Send \$1.00 to Radio Age, 64 Randolph Street, Chicago, and receive this middle-west radio periodical for six months. Regular subscription price is \$2.50 a year. Thus you will be getting one number free.

# Radio Waves Penetrate Earth

WASHINGTON, November 13.—The well-known signals of KDKA in East Pittsburgh have been heard in many places throughout the country, but it is doubtful if its call has ever been heard 100 feet below ground and at a distance of 18 miles from the station, until the Bureau of Mines experts heard it recently in a test in a mine at Bruceton, Pa.

Although the tests were hurried, only short continuous waves being used, and no attempt was made to modify the apparatus so as to try out longer waves, the experimenters found evidence that electromagnetic waves may be made to travel through solid earth.

Reporting to the Bureau, Messrs. C. L. Colburn, C. M. Bouton and H. B. Freeman, Jr., state that, in response to many requests for a device permitting the use of radio in mines in the interest of safety, especially following disasters which frequently break mine telephone systems, they recently undertook an unusual experiment, in cooperation with three engineers of the Westinghouse Electric Company.

In their official conclusions they state: "The present preliminary experiments, while unsuccessful in indicating any practical method of using wireless waves for underground communications, nevertheless indicate clearly that electromagnetic waves may be made to travel through solid strata. The 'absorption' or loss of intensity with distance is very great for the short wave lengths used in these experiments. Longer wave lengths are known to suffer less absorption and may possibly be found practically effective under certain conditions."

The preliminary experiments consisted first in receiving signals from without the mine at Bruceton by means of a receiver located inside, and second, both sending and receiving messages underground through the strata. It was found that with a receiving instrument set at a point 100 feet underground, signals from KDKA station, of the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., could be heard distinctly. About 50 feet from the receiving station used in this test was a six-inch bore-hole from the surface, lined with iron pipe and containing electric light wires which extended therefrom throughout the mine. The presence of these wires evidently assisted greatly in the reception, they report, for, when the receiving set was carried to another point removed from wires and tracks, the signals were barely audible through 50 feet of cover. "The fact that signals were detected, however, even though faintly, is sufficient evidence of transmission through the ground to encourage further experimenting," they state.

In sending waves underground the Westinghouse 20-watt B. T. model T. F. transmitter was used in such a manner as to send out continuous waves of 200 to 300 meters length, but they say that additional experiments with

waves of increased length are much to be desired. It was found that although signals could be heard distinctly through fifty feet of coal strata, the audibility fell off rapidly as this distance was increased.

In all experiments the vertical antennae was found to give the better results, the horizontal antennae giving practically no reception. A loop of a single turn was used, however, with fair results. All these experiments were tried with a wave length of 200 to 300 meters, except the reception from KDKA which was 360 meters. The strata at the experimental mine lie almost horizontal, and may have had some influence on the transmission of radio waves, but the present experiments gave no conclusive evidence on this point. They seem to agree that the degree of wetness of the strata influenced the transmission of radio waves. The mine was a comparatively dry mine, but the overburden of soil and soft shale is damp and a small stream of water is continually flowing from the mine. The underground workings of the experimental mine follow a horizontal five-foot vein of bituminous coal, and the transmission and reception inside the mine followed the course of this vein.

In order to gain a quantitative idea of the transmission of the radiated energy a milliammeter was inserted in the plate circuit of the receiving apparatus. This normally read 1.6 milliamperes, but the flow of radiant energy from the receiving antennae produced more or less depression of the current according to the intensity of the signals. This then made possible a comparison of the intensity of the reception at different points. The milliammeter was graduated in tenths of a millampere, and tenths of a division could be estimated by eye. Signals could be clearly heard when the inflowing energy was too low to be indicated by the meter; that is, the clearly distinguished words from KDKA referred to above gave no appreciable depression of the plate current.

Any dealer, jobber or manufacturer, who is not a member of the Radio Club owes it to himself and the industry in general, to at once become active in and identified with the admittedly Best Radio Club in the United States.

## Don't Wear a Truss

BE COMFORTABLE—

Wear the Brooks Appliance, the modern scientific invention which gives rupture sufferers immediate relief. It has no obnoxious springs or pads. Automatic Air Cushions bind and draw together the broken parts. No salves or plasters. Durable. Cheap. Sent on trial to prove its worth. Never on sale in stores as every Appliance is made to order, the proper size and shape of Air Cushion depending on the nature of each case. Beware of imitations. Look for trade-mark bearing portrait and signature of C. E. Brooks which appears on every Appliance. None other genuine. Full information and booklet sent free in plain, sealed envelope.



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BROOKS APPLIANCE CO., 124B State St., Marshall, Mich.

Tell 'em You Saw It in "Radio Age"

# SECOND NATIONAL RADIO EXPOSITION

FIRST REGIMENT ARMORY

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DAYS

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13th to 20th

THE TIME OF YEAR THE BUILDING AND BEST FOR PERFECT RADIO RECEPTION

14 Sound-Proof Rooms for Loud Speakers

The Holiday Season will enable Dealers to dispose of Stock.

Inventories will be taken January 1, enabling  
Dealers to buy with intelligence and safety

---

The exposition will be conducted along the same general lines that made a success of the FIRST NATIONAL RADIO EXPOSITION held in Chicago last June. We recognize that the boys are the active vehicle by which radio is carried into the home. As with the First National, the same with the Second National, we will have the various schools exhibiting and the students making radio apparatus for which many prizes will be given

Interest the Boy and he will sell Dad

WRITE TODAY FOR DIAGRAM

SECOND NATIONAL RADIO EXPOSITION

417 S. Dearborn St., Chicago, Illinois

# Broadcasting the World Series Baseball Games

By C. W. HORN

Superintendent of Radio Operations, Westinghouse Electric & Manufacturing Company

NEW YORK CITY—and in fact the entire metropolitan district—took a vacation during the World Series baseball games of 1922. Any big athletic event is unsettling to the community in which it is held, but this particular contest between the champions of the National and American Leagues differed from anything of the kind ever held before. For radio stepped in; and the excitement of the games, instead of being confined to the few acres of the Polo Grounds, was spread broadcast by famous WJZ over a radius of several hundred miles for anyone to hear.

And millions of people did hear it. Not only was almost every receiver within range in operation, but apparently every loud speaker was placed where the public could hear its voice. One could wander around New York City all afternoon and rarely get entirely out of earshot of these instruments; and the same was true of the surrounding towns, as far away as Syracuse. In front of the better loud-speaker installations, the crowds gathered hours before the opening of the games, in order to get good positions, and the police roped off the streets in order to protect the listening thousands.

As an auditory "spectacle" (or let us coin a needed word and call it an "auditorial"), this demonstration of the possibilities of radio is unsurpassed. Not only were the words of the official radio director, Grantland Rice, sports expert of the New York Tribune, giving every play in detail the moment it occurred, clearly heard, but also the music of the bands, the cries of the pop and peanut vendors, the announcements from the field, the comments of the spectators, and above all the roars of the crowds. For the first time in history, the voices of fifty thousand people were flung out into space. The effect was deafening, overpowering, dramatic in the extreme.

Again and again, the listeners heard something like this—"Two strikes and three balls on Meuse—There are three men on bases—the pitcher is winding up"—"YE-A-A-A-A!" What had happened? Was the side out, or had Meusel knocked a homer, scoring four? Were those yells from Grant or from Yankee fans? The half minute or so during which Rice's voice was utterly drowned out seemed like an hour to the waiting multitude. Then the word "Out!" would cut through, and those in the streets would add their voices to the clamor from Coogan's Bluffs.

Like all successful achievements, the thing seemed simple and easy to the audience, but it was not. The Westinghouse Electric & Manufacturing Company worked for years to accomplish it, and it then succeeded only because it received the whole-hearted cooperation

of the Western Union Telegraph Company, the National Baseball Commission and the National and American Leagues, the Radio Corporation of America and the New York Tribune.

The Western Union Telegraph Company pays a large sum annually for the exclusive right of reporting all major league baseball games. Very naturally, it has heretofore refused to permit the details of any game to be broadcast, since this would materially reduce the demand for its own bulletins. But the executives of the Western Union Company have come to recognize that broadcasting as it is now being conducted is a great public service, in which both broadcasters and artists are volunteers. They knew that they controlled something that the public ardently wanted; and so, desiring to contribute their share to the development of this new art, they gave to WJZ without charge the privilege of installing a transmitter at the Polo Grounds during the 1922 series. This was indeed a generous gift to the public.

But they did more. Application was made to the Telephone Company for the necessary wires to connect the Polo Grounds transmitter with WJZ, but it was found that the proper circuits could not be obtained. This, for the moment, threatened to end the entire project, but the Western Union Company came to the rescue and placed its entire facilities at WJZ's disposal. Of course these facilities were telegraphic and not telephonic, but after a careful investigation it was decided that a satisfactory line could be arranged between Newark and the Polo Grounds.

With the aid of E. R. Shute, T. J. Smith, and M. L. Moseley, of the Western Union Company, John Frazier of the Westinghouse Company and the writer went over every inch of the wires, testing each section, locating and connecting every ground, transposing lines, changing circuits, and installing filters, until all traces of tickers, time signals, and other line noises were eliminated. This work was started three days before the first game and it seemed as though it could not possibly be finished in time. But on the day before the opening a preliminary test was made, and before it was completed word was received from Bridgeport, Conn., and Montauk Point, Long Island, that the signals were coming in good and the speech was perfectly clear.

A speech amplifier of the Westinghouse Company was installed at a point especially assigned for the purpose by the baseball officials, who were no less enthusiastic over the broadcasting than were the broadcasters. Another amplifier was connected at the Newark end of the wires, so that all sounds picked up by the microphone at the Polo Grounds reached

the radio transmitter at WJZ in great volume. Technically, the success of this arrangement was complete. The loud-speaker range was fifty miles; and the clear reception range, in localities where the country was open and there was no interference from other stations, was several hundred miles.

The staff at the Polo Grounds consisted of baseball experts from the New York Tribune and operators and announcers from WJZ. All announcements were sent out under the direction of Grantland Rice; but, since it required considerable lung power to talk over the noise of the crowd at even its quietest moments, it was found best to change announcers after each inning, thus avoiding all traces of huskiness and vocal fatigue.

There is also another factor that must be clearly recognized as contributing to the success of this broadcasting; all other metropolitan broadcasting stations closed down and gave WJZ a clear field. This is the result of thorough mutual understanding, and clearly indicates that the Second District stations have the interests of the public, and not their own individual ends, at heart.

This event marks the highest point that broadcasting has so far reached. It demonstrated that all technical problems have been solved and any event can be now broadcasted on a national scale if desired. It gave the public a new view of radio's vast possibilities, when in competent hands; and it provided the most effective kind of an answer to those who, deceived by the inevitable summer slump, have doubted radio's vitality.

## CLASSIFIED ADVERTISEMENTS

Six cents per word per insertion, in advance. Name and address must be counted. Each initial counts as one word. Copy must be received by the 19th of month for succeeding month's issue.

### HELP WANTED.

YOU ARE WANTED. \$100 to \$195 month. U. S. Government Positions. Men—women over 17. Steady work. No strikes. Life positions. Short hours. Pleasant work. Common education sufficient. Experience unnecessary. List positions free. Write today sure. Franklin Institute, Dept. L 117, Rochester, N. Y.

### SALESMEN.

Salesmen that have been or are calling on electrical or radio trade, see Mr. Rice, 6311 N. Clark St., Chicago.

### PUBLICATIONS.

RADIO MANUAL, everything the beginner should know. How to build and operate an inexpensive receiving set. Sixty-four pages, thirty illustrations. Twenty cents. Postpaid. Raydio Publishing Company, Caxton Building, Cleveland, Ohio.

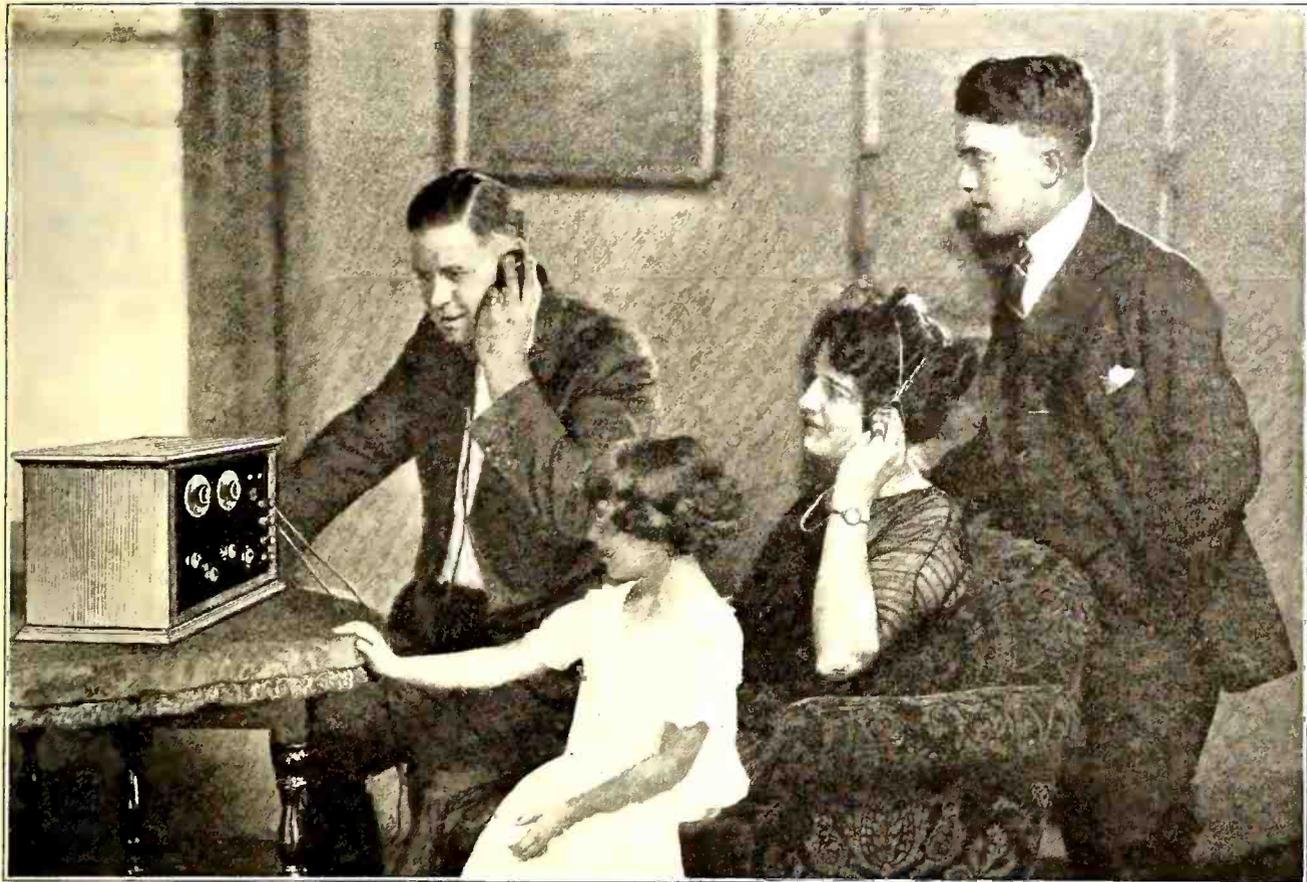
### FOR SALE

I have nine Federal Jr. crystal sets. List \$25. Will sell lot for \$100. J. M. G. Care RADIO AGE.

### CRYSTALS

TESTED GALENA CRYSTALS from our own mines shaped and tested at the mine in best standard hookup—direct to user. A real crystal—not a pinhead. Twenty-five cents postpaid, five for \$1.00 to group buyers. Ozark Crystal Co., Box 1, Morrellton, Mo.

Tell 'em You Saw It in "Radio Age"



**“SENSITONE”  
Regenerative  
Radio Receiving Set**

**\$15**

**DOWN  
AND \$10.00  
PER MONTH  
Immediate Shipment**

*Manufactured under Armstrong License, U. S. patent No. 1,113,149 and pending letters of patent No. 807,388.*

**READ THESE TESTIMONIALS!**

Harold R. Wakem & Co.      Franklinville, N. C.  
Chicago, Ill.                      November 17, 1922.

Clement Cox and I received our “Sensitone” Radio Receiving Set last Saturday evening, November 11th.

We set it up Saturday night after dark. We fastened the antenna to a large water tank 65 ft. high and to a pole fastened to the house. We have heard concerts from the following stations:

- |                           |                    |
|---------------------------|--------------------|
| KDKA Pittsburgh, Pa.      | WJZ Newark, N. J.  |
| WEAF New York City, N. Y. | WLW Cincinnati, O. |
| WGY Schenectady, N. Y.    | WOC Davenport, Ia. |
| WHAS Louisville, Ky.      | WOR Newark, N. J.  |
| WIAO Milwaukee, Wis.      | WSB Atlanta, Ga.   |

Groveton, Texas, October 15, 1922.

Gentlemen:  
Received my Radio Phone the morning of the 14th. That evening I received so many Broadcasts, I can't put them on here, although two were Davenport, Iowa, and Atlanta, Ga. Am well pleased with the machine. Heard nine stations. Yours truly, Name Furnished on Request.

Gentlemen:

F. O'Neil of Regina has a set of your wireless here, and last night I was experimenting with it and got Denver, Colorado, and Salt Lake City on the DETECTOR alone. I also picked up Dave, Mont. and Regina, Sask. Your set is sure up to what it should be. With the Two step amplifier I pick up Vancouver, Seattle, and Davenport, Iowa. We use an aerial 65 feet long and 36 ft. high. Hoping you every success in your sets I remain, Name Furnished on Request.

We also heard one at Fort Worth, Texas, but could not understand the call letters. I would like to be your representative in Randolph Co., North Carolina, if you have any. Three or four men at Franklinville said they were going to get radio sets since they have heard the one we got from you.

I also want to know the price of your amplifying set as we want to get one and a loud talker.

A merchant here wants a radio set with a loud speaker for his store. We fastened the ground wire to a lightning rod and it makes a very good ground.

You may publish this letter or any part of it if you wish.

CHAS. C. JULIAN.  
Groveton, Texas, October 16th, 1922.

Gentlemen:

I enclose you will find a post office money order for payment on my radio machine. I heard Boston, Mass., last night, the 15th, and Davenport, Iowa, also. I also heard Wichita, Kansas. Please send me a catalog. Yours truly, Name Furnished on Request.

**ONLY 500 SETS SOLD ON  
THE EASY-PAY PLAN**

We are making this rather costly investment in order to get 500 sets in the hands of that number of influential families, so that, when we put our goods in the hands of dealers, they may have enthusiastic SENSITONE boosters nearby to whom they can refer their future prospective buyers.

Fill out the coupon, attach check or money order for \$15.00. Set will be shipped at once by express. Those who delay will be too late.

**Harold R. Wakem & Co.**  
900 Washing Blvd.                      CHICAGO

HAROLD R. WAKEM & CO.,  
900 W. Washington Blvd., Chicago, Ill.

Enclosed you will find \$15.00 as first payment, upon receipt of which you will send me your complete Sensitone Radio Receiving Set, as described above. After I have used the set for thirty days, I agree to send you \$10.00 and the same amount every thirty days thereafter, until the full purchase price is paid. This set is to remain the property of Harold R. Wakem & Co. until payments are completed.

Signed.....

Street address.....

City.....

In the spaces below give the names of two references, (banks or business houses preferred).

Name and Address.....

Name and Address.....

# Burgess, the *Radio Battery* —construction fully patented

When you buy a Burgess "B" Battery you get more than long life, noiselessness, high capacity and moderate price. You get also Burgess special radio construction, perfected by wireless specialists and fully patented! This exclusive *radio* construction is found in no other battery on the market to-day.

What does this mean to users of radio batteries? It means clear receiving. It means low-

est cost per hour of service. It means long shelf life and highest current capacity. It means that Burgess "B" Batteries are the best radio batteries it is possible to produce. Don't take our word for it—ask any radio engineer.

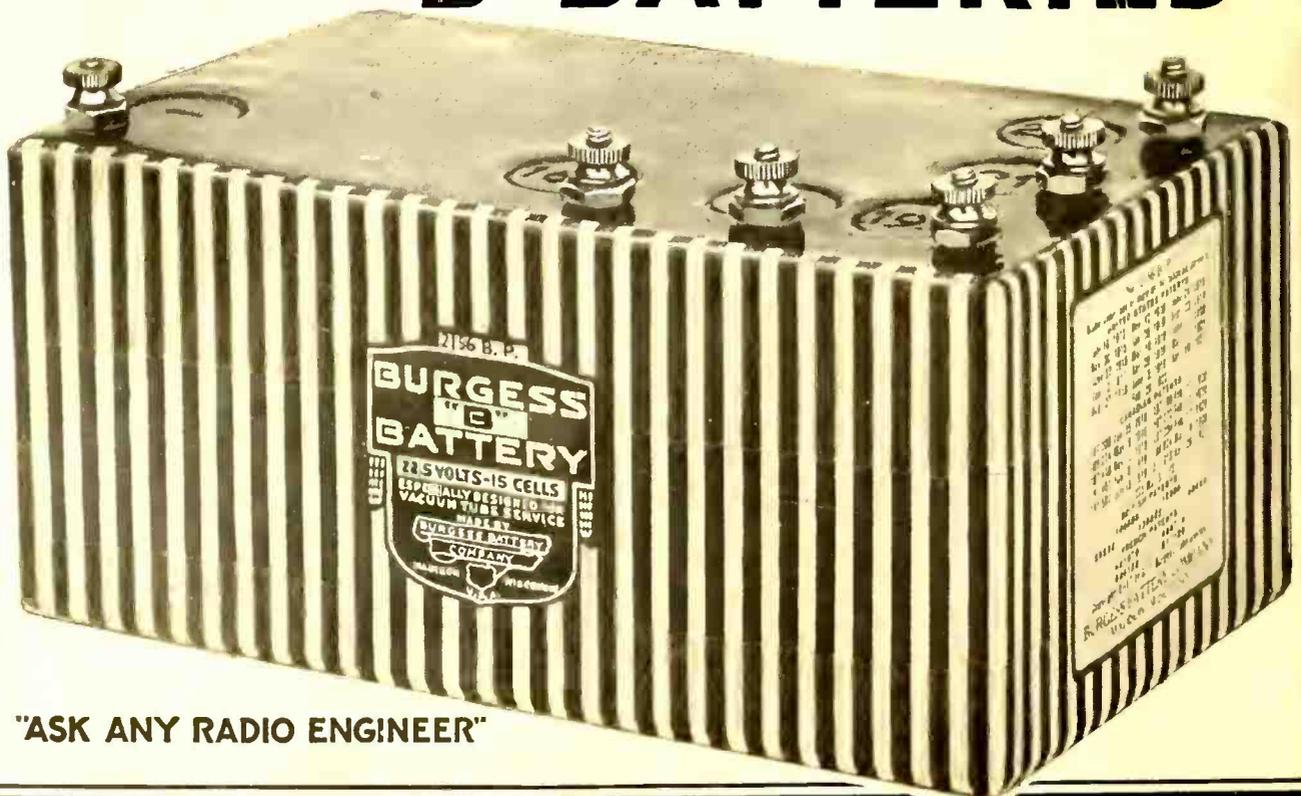
Leading manufacturers of radio equipment specify "Burgess." Burgess "B" Batteries are handled by all progressive jobbers and dealers. "Look for the Black and White Stripes." And if your dealer doesn't handle Burgess "B," just address:

## BURGESS BATTERY COMPANY

Engineers—Dry Batteries—Manufacturers

Offices and Warehouses at:  
 CHICAGO, ILL., 111 W. Monroe St. NEW YORK, N. Y., 50 Church St. BOSTON, MASS., 136 Federal St.  
 ST. PAUL, MINN., 2362 University Ave. KANSAS CITY, MO., 2109 Grand Ave. MADISON, WIS., Main and Brearly Sts.  
 In Canada: BURGESS BATTERIES, Ltd.  
 Winnipeg, Toronto, Montreal

# BURGESS "B" BATTERIES



"ASK ANY RADIO ENGINEER"

Tell 'em You Saw It in "Radio Age"