# THIRD ANNUAL VACATION NUMBER

June 6 1925 15 Cents

# RADIO WORLD

Title Reg. U.S. Pat. Off.

Vol. 7. No. 11. ILLUSTRATED Every Week

155-167

## SMOKESTACK PORTABLE A FINE 5-TUBE SET

*By Neal Fitzalan*

## HOW TO ELIMINATE BOTH "A" AND "B" BATTERIES

*By P. E. Edelman*

## OFFICIAL LIST OF STATIONS

## A STROLL DOWN RADIO LANE

*With Herman Bernard*

# Summer Static Now Overcome by Volume!

## *Enjoy Radio All the Year Around—This Way!*

How often have you heard it said, "Well, the warm weather is coming on, I had better put my radio on the shelf. It will be of no use until Fall."

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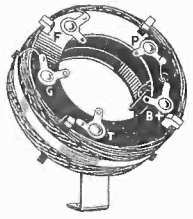
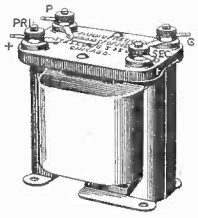
This new way to overcome static is by volume. And volume can best be obtained by using transformers that will amplify weak signals to their greatest strength.



Kellogg Radio Frequency Transformer



Kellogg Audio Frequency Transformer

Here are the Kellogg audio and radio frequency transformers. Kellogg transformers give volume with clarity of tone.

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Kellogg transformers may be obtained at all radio dealers.

**Kellogg Switchboard & Supply Co.**

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EACH MONTH the top of this page shows the newest and best standard radio parts and apparatus—at prices far lower than the same goods can possibly be obtained for elsewhere. Watch for this page! Make it and our big new catalog your buying guide. You will save a great deal of money and at the same time be assured of complete satisfaction with every purchase.

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B—T—. Green silk wound on low loss bakelite form.
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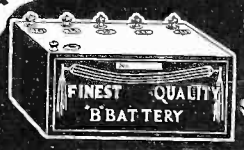


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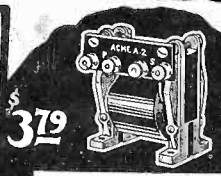

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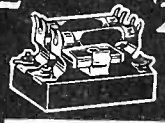

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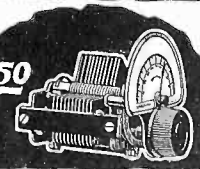

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Years ahead of the present standard types of tuned radio frequency receivers because its specifications and essential parts are of a far advanced superior design. The Marvelo V will give you clear, clean, undistorted, long distance, loud speaker reception with

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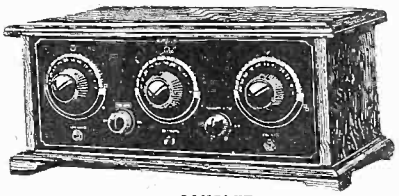

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| Set | $35.00 |
| 5 Type 201A Tubes<br>2—45 V-B Batteries<br>1—Antennae Equipment<br>1—Loud Speaker | 32.50 |
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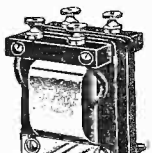

The equal of any transformer, regardless of price. Produces the finest tone quality possible with satisfactory volume.

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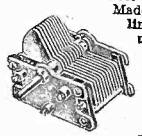

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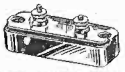
W141—UV199 Base.....30c



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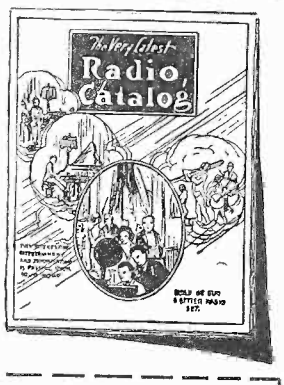


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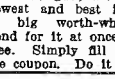

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For the Crosley Musicone, designed and built on entirely new principles, covered by *basic patents* issued and pending, reproduces music and the speaking voice true to life—

**Without distortion, extraneous overtones, resonance vibrations or other horn noises;**
**Over the *entire* musical scale, from lowest to highest notes, on *any* instrument;**
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**And at a price that is revolutionary.**

Sound from it fills the entire room, the notes clear and round and mellow. No need to cluster round. Every note comes in at its true musical value—in solo, duet, chorus, orchestra and drums.

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**The Crosley Radio Corporation, Cincinnati**
*Powel Crosley, Jr., President*
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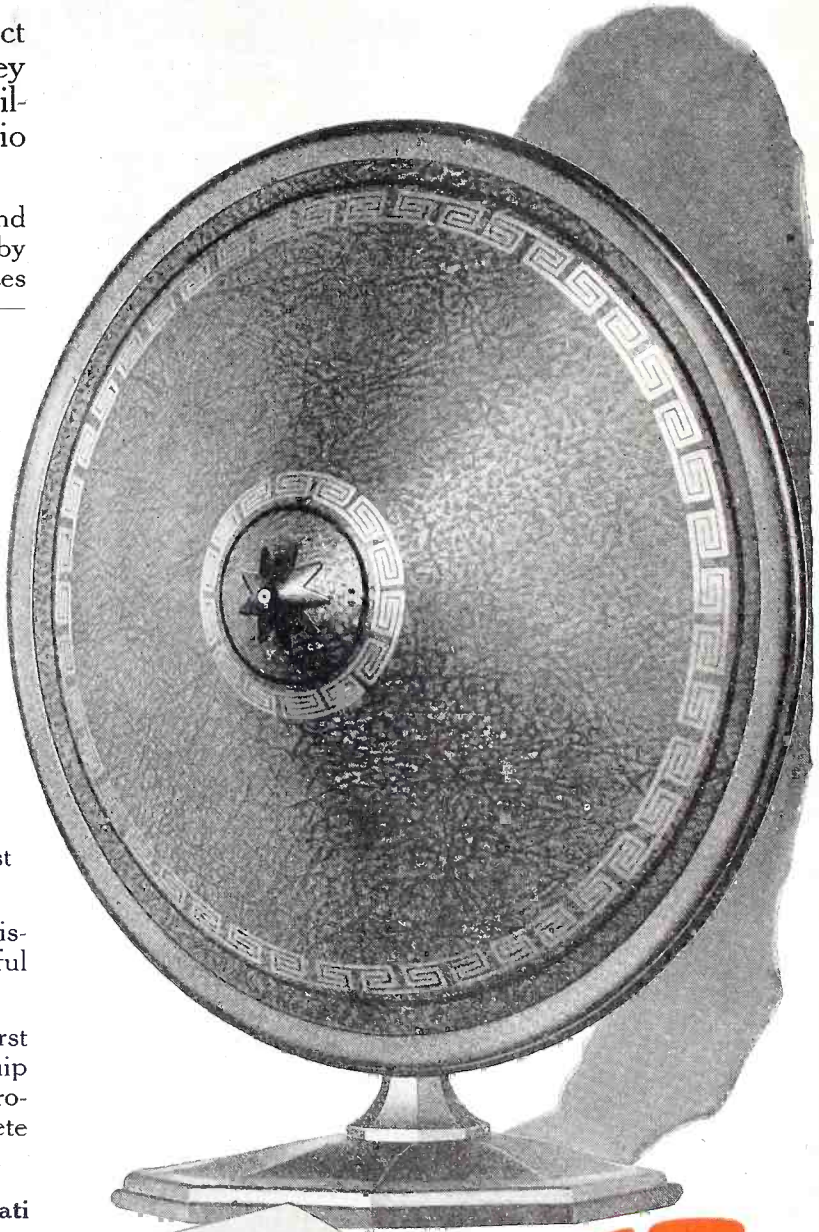


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*The Crosley Musicone is artistically beautiful—an ornament in any home.*

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*Dealers are authorized to sell the Crosley Musicone on five days' trial in your home. Satisfaction guaranteed or money refunded upon return.*

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VOLUME SEVEN OF

# RADIO WORLD

[Entered as second-class mater, March, 1922, at the post office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Paper Published by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Phones: Lackawanna 6976 and 2063

Vol. VII. No. 11. Whole No. 167. June 6, 1925 15c per copy, $6.00 a year

# The Smokestack Portable

## *A Fine Set for Use on Vacation*

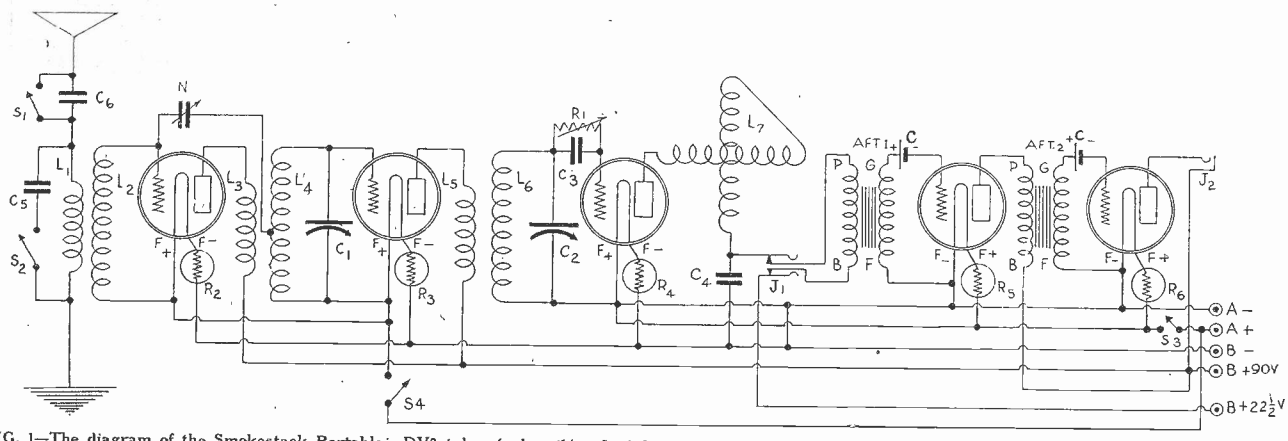



FIG. 1—The diagram of the Smokestack Portable. DV3 tubes (using 4½ volt A battery) are used in standard sockets. The grid return of the two RF stages worked fine to positive as shown, instead of the usual negative, but both ways should be tried.

*By Neal Fitzalan*

RECENTLY I received the following letter from a friend:

My Dear Neal:

I shall soon go on my vacation. You know last year I had a portable radio set but the reception was not very good. I didn't know much about radio then, but I have studied since and now can build almost any set. Of course you understand that I do not know the theoretical part of radio, but enough to put a set together. Now here is where you come in the boat. I would like you to give me a hook-up and complete description of a portable radio receiver, one that can get all the New York stations, and also some greater distance, with good quality. I don't want to spend much. Also put the least amount of controls on the panel that you can, and try and do away with rheostats.

Your friend,

PHILIP KRAMER.

* * *

The set (Fig. 1) is not expensive or difficult to build.

**Parts to Purchase**

The first things to buy are the five tubes, DV3 being used here, five standard sockets being next in line. Two Hegehog audio-frequency transformers, 5 Amperites (to match the tubes that you purchase), three .001 mfd. Dubilier fixed condensers, .005 mfd. variable condensers, one X-L Vario-Denser (type N), one variometer, 7x24" panel (hard rubber), 1 lb. of number 22 DCC wire, two pieces of hard rubber or other tubing 8" in length and 1½" in diameter, another piece of hard rubber tubing, 3" in diameter and 4" in length, a .00025 mfd. Dubilier fixed condenser for the grid, a 2-megohm grid leak, one double-circuit jack (anti-capacity) one single-circuit jack (anti-capacity) one terminal strip, one portable cabinet 15" x 24" four Cutler-Hammer single-circuit switches, two small Eveready C batteries (4½ volts apiece), three dry cells 1½ volts apiece), four small B batteries (22½ volts apiece), screws, nuts, etc. No. 18 bell wire for wiring up set. Don't use bus bar.

Wind all coils with number 22 double cotton covered wire. L1 and L2 are wound on a 3" tubing, L1 having 10 turns. Leave ¼" and wind 45 turns for the secondary L2 and terminate. Leave the beginning and the end of the primary of the coil sticking out and the beginning and the end of the secondary winding likewise. This winding should take about 4". Cover the entire length of the tubing. L3L4L5L6 are wound on the smokestack forms, the forms being 8" in length and 1½" in diameter.

Leave the beginning of coil (L) sticking out and wind 20 turns No. 22 DCC wire on one form 8" in length and 1½" in diameter. Leave the end of wire out as a lead. Leave ¼" at space on form. Begin winding L4, which has a tap at the 50th turn, and is continued 30 turns more, leaving an end out as a lead. Total wire on secondary, 80 turns No. DCC.

L5 is wound in same fashion as L4 on same kind of tubing. Terminate. Leave ¼" and wind in straight fashion 80 turns (no tap). Be sure to leave an excess at the beginning and end of L5 and L6 (four leads) for interval set connection purposes. Do not put any shellac or varnish on coils. If you want coil to hold, put a drop of collodion on the ends of coils. Preferably bunch pinholes for wire anchorage.

The smokestack coils are placed on the end of the baseboard, 3½" from ends and ¾" in from ends. Strike an arc, and saw out the semicircle (see Fig. 2). This is done on both ends.

The two audio-frequency transformers are placed at right angles to each other and right next to their respective sockets. The same applies to the radio-frequency transformers, that is, they are placed close to their respective sockets also. This is all done so as to have very short leads and to prevent losses, as this is a portable set and you will not be right on top of a station, therefore must conserve all the energy that is necessary to receive loud signals. Exactly in the center of the baseboard place the antenna RFT, the only long leads here being the antenna and the ground. Place the Amperites one end at the socket, near the filament

# Loop Used As Open Antenna

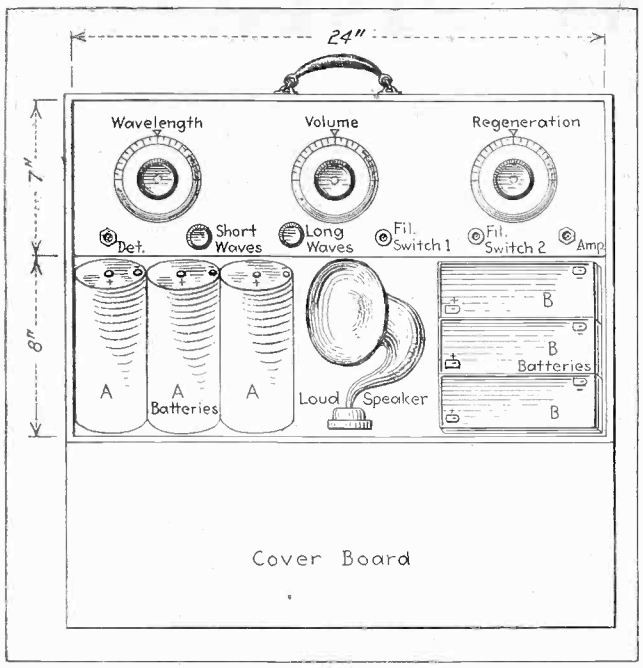



FIG. 2—How the front of the panel looks when completed. Note the small loud speaker between the A and B batteries. The whole case weighs 12 pounds. Four-inch dials are used.

posts. The other instruments are placed according to the discretion of the builder.

Six inches from the end of the panel and 2½" from the top and the bottom of the panel drill a ¼" hole for the variable condenser dial. Six inches away from this hole and 2½" from the top and the bottom of panel drill another hole for the other condenser 6" away from this hole and 2½" from the top and the bottom of the panel, drill the last hole for the variometer. Three inches from the left of the panel and 1" from the bottom drill a hole for the jack. Four inches away from this hole and on the same line from the bottom of the panel drill another hole for the switch; 4" away from this hole drill another for the other switch; 4" away from this hole, and while still working on the same line drill another hole for the switch; 4" away from this hole drill another hole for the last switch, and 4" away from this hole drill the final hole for the last jack, this being 3" away from the right-hand side of the panel. The total length of the cabinet as you see in the picture is 15". The cover board is of the same dimensions, that is 15" width and 24" length. The A battery takes up about 9" of the space in the bottom of the cabinet. The loud speaker (the Amplion was used here, which is 3" in diameter) will take up the same amount of space. The B batteries will take up the other 12" of the space in the cabinet. The leads from the batteries may be led up from the back of the panel from the terminal strip.

### The Wiring of the Set

First connect the coils up, as they are the most important instruments in the set. The beginning of L1 goes to the ground and not to the antenna, the end of the coil going to the antenna. The secondary winding of the same coil goes to the grid and the end of the winding of this coil goes to the filament switch S4, the other end of the filament switch going to the A plus. This connection which goes to the grid also goes to the X-L Vario-Denser (neutralizing condenser), the end of this condenser going to the 30th tap of L4. The beginning of the L3 goes to the plate post of the socket, the end going to the B plus 90 volts and to the end of L5. The beginning of L4 goes to the grid post of the socket, also connecting to the stationary plates of the variable condenser, the rotary plates going to the end of

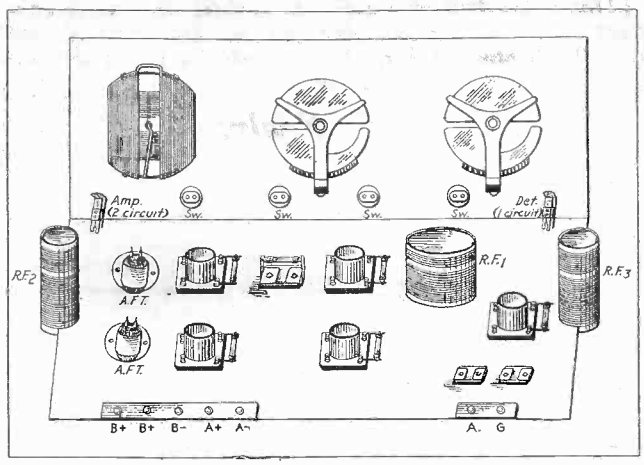



FIG. 3—A complete layout of back of the panel and the baseboard. Note the semi-circle cut in on each end to accommodate the Smokestack Coils. The diameter of the semi-circle is 1½" and from circumference to panel edge ¾".

L4, not to the tap, but to the last turn on the coil. This turn also goes to S4. The beginning of L5 goes to the plate and the end to the B plus 90 volts. The beginning of L6 to C3 and to RI, also to the stationary plates of the variable condenser. The variable plates of the condenser go to the end of L6 and to the filament plus. One end of the variometer goes to the plate post of the socket, the end of the variometer going to the top of the double circuit jack and also to the .001 mfd. condenser, the other end of this condenser going to the B minus which is connected to the A minus. All the Amperites are placed in the positive lead, except the ones in the AFT stages, which are placed in the negative leads of the A batteries. This way worked best on the set I built, although not according to formula. S1 is connected across the fixed condenser, with a capacity of .001 mfd., which s connected in series with the antenna. One end of S2 goes to the beginning of the coil L1, the other end of the switch going to C5, which also has a capacity of .001 mfd. The other end of this condenser goes to the end of the coil. This is so arranged that the condenser can be cut in or out. S3 is placed in the amplifier filament leads so that the filament current may be turned off and on.

We will now connect up the audio amplifier. Connect the post marked P to the second terminal of the double-circuit jack and the post B to the third terminal of the same jack, the end of the jack going to the B plus 22½ volts. From the G post of the AFT, bring the plus of the C battery to this post and the negative post to the grid post of the socket, connecting the G post of the other AFT in the same fashion. The F post of the AFT goes to the filament minus. Connect the other transformer up in exactly the same fashion. Connect the plate post of the second AFT to the top terminal of the single-circuit jack, the end of the jack going to the B plus 90 volts. That completes the wiring of the set.

### How to Tune the Set

By rough adjustments tune in any station (local, with plenty of volume), and take out tube number 1, this being the first from the left in Fig. 1. Turn the little knob on the neutralizing condenser in or out until the signal disappears entirely. This completes the neutralization. Leave the switches S1 and S2 in and turn the two variable condensers at approximately the same point, that is 30-30, and turn the variometer to the right until the tube is just about to spill over. The condenser C4 helps the regeneration a great deal, and it may be that this condenser is either shorted or blown if you do not get a lot of oscillatory action out of the tube. The detector filament needs no careful

(*Concluded on page 28*)

# A and B Battery Eliminators

*[This is the first of a series of articles on how to construct apparatus for obtaining filament and plate current from the lighting mains. Part II will be published next week.]*

*By P. E. Edelman*

Electrical Engineer

## PART I

HOW can I use the ordinary house lighting line as a current supply for operating my vacuum tube radio set? What apparatus and wiring are necessary? These questions are often asked, so I will answer them.

### Requirements

For operating just one tube or possibly two, especially when these are of dry cell type, the use of dry cells is favored, but when a multi-tube set is to be operated a substitute is sometimes sought.

A substitute must afford reasonably constant supply and be quiet in practical operation. Considering an average 5-tube set using type 201A tubes suitable outputs will be as follows:

*For Amplifier Tubes*

Plate output supply, D. C. 100 volts, 25 milliamperes.

*For Detector Tubes*

Plate output supply, D. C. 20 volts or 40 volts, 4 milliamperes.

Total plate watts, four amplifier tubes, 2.5 watts; one detector tube, 40 volts; plate, .16 watts.

For each tube, filament supply, 6 volts ¼ ampere, or 1½ watts per tube. Total for five tubes, 7½ watts.

For 199-type tubes, filament requirements are much less, on basis of .07 ampere per tube. Five 199 tubes, 5 x .07 = .35 ampere.

Further requirements are absolute safety of operation, separation for loop set supply, of tube current source from ground lighting mains, absence of noises and large amount of heat, small space taken, and low cost. To be popular the initial cost should not be high. The upkeep cost must be low, preferably with absence of renewable parts, bulbs, chemicals, etc. A further requirement for popular use is absolute simplicity and fixed adjustment, so that no special wiring nor changes in standard types of sets are needed. Universal operation of A. C. or D. C. line is desirable, but special types, one for each kind of lighting circuit, are permissible when clearly labelled accordingly.

### Kinds of Substitutes Considered

The following kinds of substitutes will be considered. First there is the use of direct current line. For filament supply this requires a series resistance. For plate supply this requires a filter trap, to remove commutator ripples. Other ways are to use the generator, or similarly to operate a vacuum tube oscillator to obtain high frequency current suitable for use on both filament and plate circuits via transformers.

Then there is the A. C. (alternating current) line. Here an obvious combination is the transformer, rectifier and filter. The rotary converter is worth consideration.

For either D. C. or A. C. line, thermic convertors using thermopiles are worth consideration along with rotary convertors and high frequency tube oscillators.

Then there are the battery combinations using continuously charged storage batteries of small size. I will show how this is practically done. Also there are the more cumbersome large type batteries and separate charger outfits.

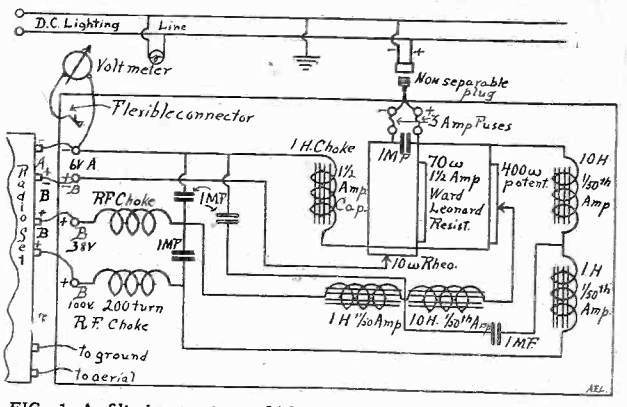



FIG. 1—A filtering system which employs the Campbell method. This method is used for cutting out the hum, which usually comes from the commutator of the DC generator.

The use of high frequency current for filament supply and also for self-rectifying plate current supply will be considered as well as the use of thermocouple batteries energized by nichrome wire heaters. Practical filter circuits for cutting down hum and audio pulsating currents to negligible value will be shown.

Then there are special set circuits permitting direct A. C. feed from transformers. The necessary windings and middle tap connections will be shown. Also the use of ordinary 201A tubes as rectifier will be shown as well as use of special tubes, S tubes, and ordinary double filament incandescent auto lamp substitute for making an inexpensive home-made unit.

Brief mention will be made of chemical convertors or colloid rectifiers and electrolytic condensers, but all chemical devices are handicapped by undesirable messy liquid chemicals which are far from neatly handled in sets in parlors, etc.

Operation of tubes from filament current only, without separate plate current supply, will also receive mention with circuits suitable therefor.

Thus, while special attention is to be given to supply suitable for the average set, the same principles can be extended to fit requirements of any practical radio set using up to ten tubes of any type. Also, a unit suitable for a 5-tube set can be employed without change for a set of only four or three or even two tubes.

Because A. C. is the lighting current found in most homes and apartments, arrangements for its use will receive the main notice.

### What Kind of Current?

First find out what kind of lighting circuit you have. One way is to telephone the lighting company. The fan motor you use may tell on its name plate, if it is not a universal type. Tests that can be made to determine this are omitted owing to the danger that novices may cause short circuits and blow fuses.

The usual house current will be 110 volts A. C. 60 cycle, or 110 volts D. C. Direct current will only be found in buildings having separate power supply or in certain downtown districts or business loops of cities.

One thing to remember is that usually one side of the line is grounded. Universal units insulated from ground are specially desirable, but where an arrangement is used in which there is a direct connection from the radio set to the lighting circuit, special care must be taken to have the ground wire on the correct side, else the current may run through the set and to the

# How to Use the 110-volt Line

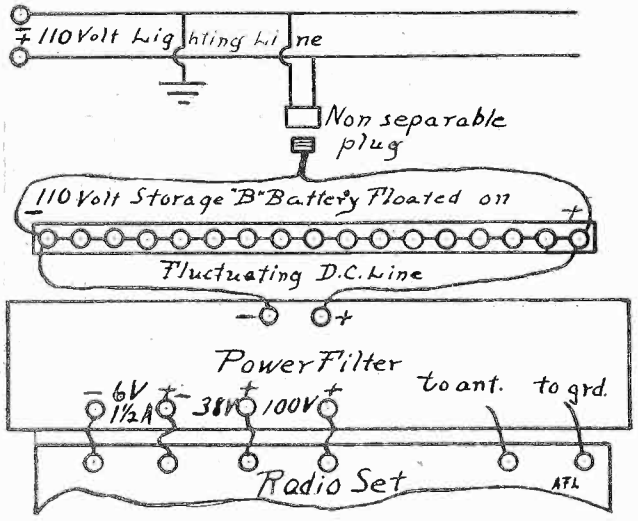



FIG. 3—How a floating B battery is hooked up in the line, in case the Campbell method does not cut out hum.

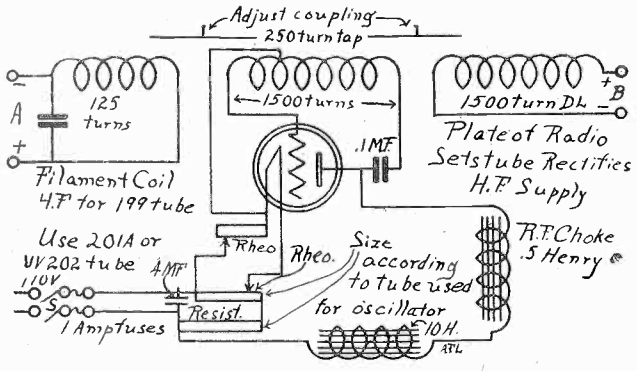



FIG. 3—How a 5-watt electron tube is hooked up in an oscillating system to supply A and B battery current.

ground via ground post of set, burning out the radio circuit. Every arrangement in which this can happen by wrong connection will be restated as a precaution and that is why further favor may be given to units in which this danger is wholly avoided.

In a unit employing a vacuum tube as a high frequency oscillator, the output can be used as plate current feed, also for supplying filaments of tubes having low current consumption, such as 199 type. Each kind of substitute is further to be considered from initial cost and upkeep standpoint.

From the general statements made thus far it may be evident that there will always be some capacity effect between the substitute and the ground. For filaments this does no harm, but requires attention in loop-operated sets. For plate circuit supply, the capacity effect of the substitute with respect to the ground must be reduced to a minimum in radio-frequency circuits to avoid bypass losses.

### Comparative Results

Based on operation during two years it can be stated that battery substitute arrangements of proper design are economical.

City lighting mains are today very dependable in most localities with regard to continuity of supply and maintenance of characteristics of voltage and frequency. In some localities, where heavy power motors are operated on the same circuits as the lighting is taken from, this is not true, and wide fluctuations will not make substitutes operate smoothly as desired. A simple test is to watch the incandescent lamp in a socket burning. If it gives a steady light, the circuit can be used. If it flickers or fluctuates often, it is useless to attempt to employ the source, except possibly with a sluggish-acting heater unit operating a thermocouple.

### Use of Direct Current Lighting Line and Universal Units

The use of a direct current lighting socket as tube current supply source requires a device to control or change the lighting current to suitable form. Dircet current will be found only in limited localities, usually downtown districts of cities and private plant-operated buildings. Ordinarily 110 volts direct current will be found, but a few buildings will have 220 volts or other voltage for lighting, so determine this by looking at label of a lamp socket used, or inquire of the power company.

Direct current usually comes from a generator but in some places a storage battery is kept floating on the line by the power plant. The latter case affords a good steady supply but the use of generator only is likely to give considerable commutator hum. To design a filter to cut out this hum is simple for a given case but the pitch of hum or commutator pulsating frequency will differ for various localities from different dynamos, so that a filter for general use will be preferably of the Campbell type, capable of cutting out a considerable band of audio frequencies. See Fig. 1.

An essential is the use of a fuse in each circuit, not larger than six amperes in main line connection and not over one ampere size in tap for plate supply. While lamps can be impressed into service as series resistors, the manufactured units such as G. E. or Ward Leonard come in suitable sizes and are preferable. The condensers are preferably of mica type such as Micadon, Freshman, etc., though some of the telephone condensers, as Mansfield or Western Electric types, may be economically used for the large sizes. The coils must have sufficient current carrying ability so as not to heat up, and this requires ordinarily, No. 18 wire or larger for filament circuit and No. 30 or larger for plate circuit. The resistance values of resistors used must be made to fit the type of tubes and number of tubes used, in size and current carrying capacity.

In first arranging a current feed circuit, as in Fig. 1, a voltmeter is a handy device to have around in making adjustments and determining plus and minus connections. Makeshifts such as noticing the bubbles from the negative wire inserted in a glass of water to show polarity, or noting brightness of a ten-watt 110-volt lamp for rough voltage guess, are not recommended.

The arrangement of Fig. 1 usually will be grounded via one side of line, so it is necessary to determine this and label wires correctly. A separable plug connector should be taped together so as not to get the polarity of connection reversed. Care should be used to keep the ground post of radio set and the ground of line connection on the same polarity side of the wiring as it is not desirable to have lighting current flow through the radio set wiring and down the radio set ground wire connection. There have been devices manufactured along lines of Fig. 1, but this method is properly considered experimental and requires care in use owing to usual ground on line wire. By making adjustments initially the proper voltages may be had, and thereafter the operation will be very satisfactory in most instances. The precautions are essential, to avoid burnouts. If the arrangement of Fig. 1 is tried and there are still undesirable audio hums or wide fluctuations in current due to varying generator supplying the lighting line, it is nevertheless possible to get good results by adding a small B battery storage cell unit, continuously charged or floated on the circuit, Fig. 2. But this is not strictly a non-battery plan. In this case the stor-

# Different Types of Rectifiers

age B battery can be used for both A and B battery supply, with suitable tubes.

### Universal Methods

The universal methods will be discussed along with the alternating current supply arrangements as they can be used equally well on either kind of prime current supply. The thermopile or assembled heater and thermocouple series units are of this class. Thermopiles cannot be relied on for heavy currents but may be used as B battery substitute with satisfaction. The voltage from one thermocouple is usually very small, so a great many have to be assembled in series. By using an electric heater at one terminal and the air at room temperature at the other junction, it is possible with such combinations as nickel or german silver against zinc or an alloy of zinc and antimony to obtain as much as .04 volt per couple conveniently, and of course, there are no chemicals to renew as in batteries. 40 volts would require 1,000 junctions, usually arranged in plate form, heated at center and cooled outside.

Similarly, the direct current supply can also be used to energize a separate vacuum tube oscillator from which high-frequency current output suitable for operating the radio set tubes may be taken.

### Vacuum Tube Oscillator on Direct Current Line

Fig. 3 indicates use of a 5-watt vacuum tube as oscillator. The coils may be chosen to give any frequency output which will not interfere with usual operation of set. This can be very high to keep below broadcasting wavelengths or made very low to be above both the broadcast and intermediate wavelength bands. For plate supply only, it is possible to use even a 201A type tube, but the UV202 or equivalent tube is best. Suppose that an ordinary radio set is to be used. Then honeycomb or D. L. coils 1500 can be used for the oscillator tube. The high-frequency output should come in the supersonic range but may be just at the high limit of audibility. The plate of the regular set tubes can rectify this high-frequency current, so this means is suitable for plate voltage supply. For filament operation, 199 tubes must be used and a separate step down coupling coil used. Units of this kind are difficult of initial adjustment for the home experimenter but can be made up in proper adjusted sizes in any equipped laboratory or factory, and may even be elaborated on with addition of filter or bypass trap condenser and smoothing choke coil.

### Use and Size of Choke Coil

You will notice a radio-frequency choke coil mentioned in all cases where there can be a direct leak of plate to filament via the plate current supply source. It can be made simply by winding 200 turns of 22 DCC wire on a spool or form one inch in diameter, Fig. 4. This will choke back the radio-frequencies in the broadcast waveband.

### Commercial Units

Units of this kind which have been marketed or are made or announced for early placing on market are known under several names. There is one comprised for direct current use only, on lines of Fig. 1. Another for universal use employs thermopile, called a Thermoformer. A different unit employs condensers and coils, as in Superducon. Then there is the "nobatte" rotary convertor device. Also in this class may be considered the assembled storage battery and charger devices such as Gould Unipower. Another way in which lighting circuits may be used directly requires special form of vacuum tube. Several kinds of these tubes have been made but not as yet marketed. Usually the lighting current is used to operate a heater which gives heat energy to an electron-emitting surface according to the types. A, uninsulated (Nicholson); B, separable (Torrissi); C, renewable, separated (Edelman). There is no technical reason why radio sets using such tubes and operating simply and directly from lighting mains without requiring somewhat complicated convertor devices, should not be marketed. For alternating current power amplifier plate and filament supply, there is the Western Electric A. C. 2-tube unit.

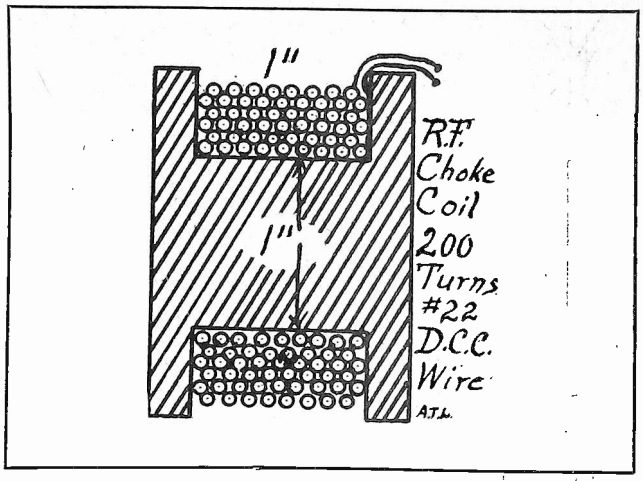



FIG. 4—How the radio-frequency choke coil is wound.

As should now be evident, there is little need for using battery substitutes in case of one or two tube sets employing 199 type tubes, and it is only in the large multitube sets that batteries become less desirable. That is where substitutes are practicable, using 201A and 200 type tubes. The use of small size storage cells of B battery type as A battery supply for 199 type tubes is quite practical, especiall when a continuous charging arrangement is used, and this plan gives considerable competition to some of the battery substitute arrangements.

[*Part II, of this article, to be published next week, June 13 issue, will deal with AC current mains used for supplying filament and plate potentials. The article will be concluded with Part III, June 20.*]

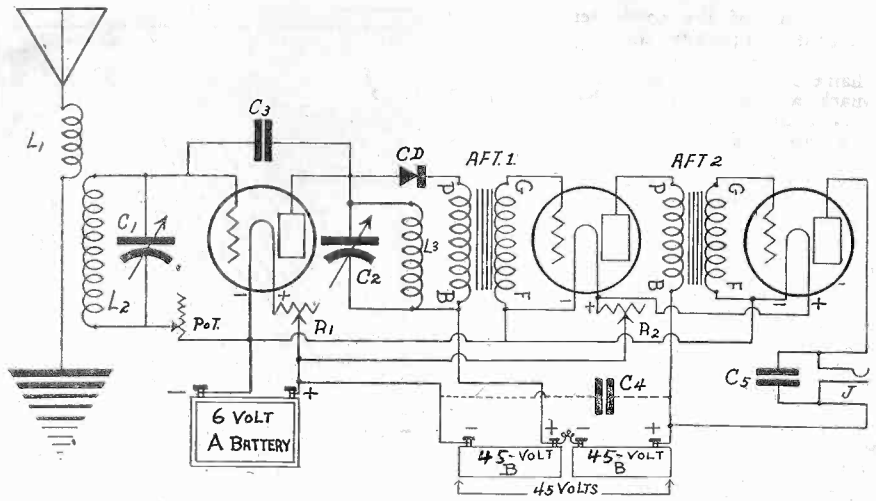
## Mount the Condenser Back from Panel

IF a variable condenser without a metal end plate, or one with a grounded rotor, is used, capacity effects can be cut down by spacing the condenser away from the panel. That is, mount the condenser about one-half inch from the back of the panel with spacing washers. Then make sure that the shaft is long enough to take the dial set screw.

## Wedge Will Keep Tube in Place

VERY often a tube will not fit properly in its socket. If too loose it must be held down to make contact with the springs of the socket. To temporarily offset this condition a toothpick or a match whittled down to form a wedge and placed between socket and tube will hold the tube tightly in place.

# A Saunter Down Radio Lane




**A FAN may build a circuit like this one, which ought to be (and is) selective, and yet will not get selectivity, because of improper aerial. Read what Herman Bernard says of the solution of this problem.**

## THE PRIMER

### *By Herman Bernard*

**Associate, Institute of Radio Engineers**

IN THE Big City there are streets of great magnitude, such as Railroad Street and Garment Street. As no city has thirty-two great thoroughfares —New York has only three, Broadway, Fifth Avenue and Park Avenue — radio, as the thirty-second greatest industry in the United States, rates a lane. That is something less than rating a salute, as the ranks of highways are reckoned, but there are other and greater days ahead.


* * *

I LOOKED over the thoroughfares in the Big City and decided that the most interesting one to me would be Radio Lane. It held forth greater allurement, despite some bucolic aspects, for within its confines resided greater mysteries. Here and there was a Super-Heterodyne mansion, but for the most part the domiciles were not so dignified as to deny every pretense of welcome to an inquiring stranger. It bespoke the radio condition throughout the land, where unpretensiousness and modesty are the earmarks of the majority of receivers. Unlike Automobile Row, where every house was the product of the skilled trades, shacks and cabins in Radio Lane were built by those who lived within as shelter from the monotony to which radio abstinence condemns all hookup agnostics. But there were mansions enough, by way of hopeful interspersal, to remind one that the shack-dweller would not long remain content with his humble abode. There was enough moving in progress from the humbler to the handsomer to stir enthusiastic hopes even in a set manufacturer's breast amid the uncertainty of business in declining Spring.

It struck me, however, that even the humbler places could be made much more like the statelier abodes, and with little work, at that. Therefore I looked over a patch of aerials and found something there that could be improved. A storage battery here, an inductance there—something was to be said about each in the interests of betterment.

* * *

LET US look at one aerial. From one insulator to the other, this stretch of 7-strand copper wire measures almost 100 feet. Near one insulator some No. 14 insulated wire is scraped and soldered to the aerial, trailing into a window on the ground floor of the house. A wooden arm projects at the cornice and at the tip of this bracket is a round porcelain insulator, "a circle with a hole in it, this serving to keep the No. 14 wire, called the lead-in, from touching the roof. The precaution is an excellent one from a service viewpoint. Also, the rules of the Board of Fire Underwriters require that the lead-in be not nearer than 1 foot from the house, and thus insulated.

A glimpse at the ground wire shows that it connects from a cold-water pipe in the kitchen, up beside a door jamb, around to another rom, thence behind a moulding and finally to the set, a total distance of 32 feet. The wire between the corrugated insulators on the roof is 100 feet, the lead-in is 25 feet, and the ground wire measures 32 feet. Total, 157 feet. Now, what does that represent? The length of Hascom Flower's aerial! Nobody ever recommended an aerial of 157 feet for broadcast reception, not even a radio expert. The mistake Mr. Flower made was to consider that the size of one's aerial is the length of wire used for that part of the antenna system most commonly referred to as the aerial. Indeed, if we desired to split hairs, we might even include the pick-up qualities of the very coils in the set, and give them a rating in modified terms of feet, adding that to the aerial length. But at least, whenever anybody recommends a 100-foot aerial, be sure to include the aerial *per se*, and also, and by all means, the length of the lead-in and the lead from ground to set. All that wire helps pick up energy, the ground lead with that sweet gentleness characteristic of the indoor antenna, the outside wire with the grasping spirit and energetic endeavor that leads most of us to employ the exposed type.

Mr. Flower, therefore, had better mend his aerial ways. He had been complaining, neighbors said—for there are gossips along Radio Lane as well as along the Rialto and among the officers of secret societies—that his set was not selective. His receiver probably was as selective as anyone with reason might hope it to be, and quite as selective as the needs of the day or night required. But he had saddled this inefficient aerial system on it. He had chained the horse to the barn and shouted, "Giddap!"

What should he do, therefore? Tear down part of his aerial? Preferably he should bring the lead from the cold water pipe outside the kitchen window and introduce it through the same window where his aerial lead-in is placed, thus confining to 12 feet a lead that measures 32. If that piece of electrical carpentry takes more time than he can spare from reading the Sunday newspaper comic sheets, then he might safely halve the 100-foot stretch, or even reduce it to 40 feet. He will be overjoyed at the resulting selectivity.

The aerial and ground leads are like respective plates of a physically large condenser, and by their length is largely determined the capacity of that condenser as well as the strain placed upon the grid of the tube. The charging and discharging of this condenser, if the capacity is too high, robs the grid of its effectiveness, and forces one to operate the tubes so far below the point of oscillation as to destroy the inherent advantage of tube employment.

In addition to either of the previously-mentioned ways, he should insert a small fixed condenser in series with the aerial or the ground connection to the set. The condenser may be .00025 mfd., as that is most likely to be the smalled fixed condenser Mr. Flower will have around the house. But if any purchasing is to be done, he should get a .0001 mfd. fixed condenser. The instrument is inserted by cutting the wire between the aerial antenna post and the coil lead that connects thereto, one side of the condenser being soldered to the antenna post, the other to the severed coil terminal. The insertion of this condenser accomplishes electrically what would result from reduction of the actual physical length of the wire on the roof. By the law of condensers, when you insert one in parallel it raises the capacity (hence also the natural wavelength of the system) and if you connect it in series it reduces the capacity. The lessened capacity restores the antenna system efficiency and allows the grids to approach the oscillation point, most easily distinguished as that crucial stage where the tube begins to squeal or contributes total inaudibility.

The physical reduction of the antenna length is to be preferred, for not only does that automatically reduce the capacity, but it also safeguards against the delivery of an overload of signal to the set. The antenna system is an agency for picking up energy, hence while the series condenser may avoid the harmfully excessive discharge, the unnecessary wire on the roof may be regarded as so many extra fielders, picking up balls batted from other diamonds and causing only confusion in one's own game.

* * *

MR. MONTAGUE ASTORFIELD, as you might have guessed, lived in one of the mansions. He personally didn't have any trouble, because he never concerned himself with any of the duties attendant on raising a radio to productive manhood. But his butler, Jukes—butlers are almost invariably called Jukes, though born Smith—was rebuked by his employer on one occasion for radio remission.

Mr. Astorfield, after hard hours at the

*(Concluded on page 22)*

# How to Make a Wavemeter

*By Lewis Winner*

**Radio Engineer**

OF all the many radio instruments, the wavemeter plays the most important part in an experimental laboratory. One of the instances when a meter of this type comes into use is before you have completely wired the set with stiff wire so that you will know to just what wavelength your receiver will reach without going to the trouble of adding to or subtracting turns. Then after you have completely wired up your receiver in good fashion, the wavelength to which your receiver will respond can be marked in accordance with the numbers on your dial. There are a great many more ways that one may use the wavemeter, such as for resonance testing, crystal testing and finally finding the wavelength of the open and the closed oscillating circuits. There are many types of wavemeters, including the wavemeter with a galvanometer in series with the coil instead of the buzzer, and the plain wavemeter with a coil in series with the calibrated variable condenser. I am going to discuss the wavemeter with buzzer for excitation purposes, this one being the most practical for receiving set work, and the unilateral wavemeter for the transmitting set.

**What to Buy**

All the material which is purchased for this instrument should be of the very best. The first thing to purchase is a buzzer, which should be of the Century high-frequency type (Federal Company, Buffalo, N. Y.). A variable .005 mfd. straight line frequency condenser is used, or any other, .0005 variable condenser. A dial should be bought for the condenser. On some dials the stations can be marked down with pencil or India Ink (as on the Lacault), so that you will have no trouble in finding the station on your receiver after you have once calculated it with the wavemeter. See Fig. 1. Two dry cells (1½ volts apiece), a piece of bakelite or hard rubber tubing, ¼ lb. of number 18 DCC, a panel 7 x 10", and finally a cabinet 7x10" inches, or one as the picture shows which will have to be built and be 9" long, 8½" wide, and 8¼" high, which includes the cover, 1" in height. The panel for this cabinet is 5 x 8½".

**Layout of Panel.**

The panel is very simple to drill. On the left hand of the cabinet place the two batteries, therefore there is nothing seen on the outside of this part of the panel. Six inches from the left edge of the panel and 3" down from the top of the panel drill a 3/16" hole for the condenser shaft. Lay the template of the condenser over this hole and drill the three other holes for holding the condenser. After this is done and the condenser fits snugly, place the dial on the shaft of the condenser. You will note that on the Lacault dial there are two holes which keep the dial in place. Put the dial on so that the set screws do not hit the set screws of the condenser proper. That will be at an angle of about 67½ degrees away. Drill two holes through the dial holes, using the dial as a template, the holes being ⅛" diameter. One-quarter inch from the top of the panel and 1¾" from the right-hand side of the panel drill a ¼" hole for the binding post, leaving ¼" and drill another hole with the same dimensions for the other binding post. That completes the drilling of the top of the panel. Two holes still having to be drilled for the buzzer which is on the inside of the panel. Mount the condenser. Then turn the panel "inside out" so that you will see the plates of the condenser. One inch diagonally opposite the second binding post from the right drill a hole ⅛" in diameter, fit the buzzer in its place, and mark another hole for the purpose of holding the buzzer firmly, being sure that the buzzer does not hit the condenser plates, which it will if placed too close. Looking at the condenser with the back facing you and the piece of hard rubber (with 3 set screws) at the bottom, the first screw that you drilled for the buzzer should be 1" away from the center of the last screw on the end plate and the other post will be 2¼" away from the same place. There are seven holes to drill in the top of the panel. After you have placed all the instruments the next thing to do is to wind the excitation coil.

**How to Wind the Coil.**

Take a piece of tubing 3" in diameter and wind 50 turns of 18 DCC wire in one direction. After winding these turns, which will take up about 2¼" on the form, leave ⅛" and drill a ¼" hole for the binding post, leave 1½" and drill another hole of same dimensions. Put the posts in their respective places and attach the ends of the winding to the posts. DO NOT PUT ANY HOLDING MATERIAL ON THE COIL. That is all there is to the winding of the coil. We are now ready to wire the instrument up.

Study the picture and the schematic diagrams carefully. Holding the buzzer with the adjustment knob towards you, shunt the terminal attached to the frame and the terminal to the right of it with a 1 mfd. Dubilier fixed condenser. Connect the right-hand terminal to the positive end of the battery, and the other end of the battery, which is the negative, to the stationary plates of the variable condenser, the same end going to one binding post. The rotary plates go to the free terminal of the buzzer and to the other binding post. Across the binding posts shunt the coil. See Fig. 1. After finishing the above, we are ready to put the instrument into operation.

**The Theory of the Operation of Set**

Place the coil in inductive relation to the ground system (Fig. 1), so that radio-frequency oscillations will flow from the coil through the ground to the secondary of the set, which is tuned in resonance with the primary. Set the buzzer going at a very high pitch, which can be done by simply moving the little knob of the buzzer to you or away from you. The oscillations given out by the buzzer are transmitted by electromagnetic coupling to the open oscillation circuit through the ground wire. The greatest height of these oscillations will be heard when the tuning devices of that specific circuit are manipulated so that the same constant of oscillation will be had, e. g., the same wavelength in the set as that of the meter. The telephone diaphragm will be actuated greatest when the detector or secondary circuit is in exact resonance with the antenna system. The reason that we use the 1 mfd. condenser across the terminals of the buzzer (magnets of buzzer) is to absorb the counter-electromotive force of the windings and thus prevent sparking at the vibrator, which would cause an uneven tone in the telephones when adjusting for the specific wavelength, and which would make adjustment very difficult. Put your receiver into operation and adjust your tuning elements until you hear the same note in your headphones. The following data are given with relation to the setting of the condenser dial and to the wavelengths thereby obtained, on a 25-foot outdoor antenna, no ground, using

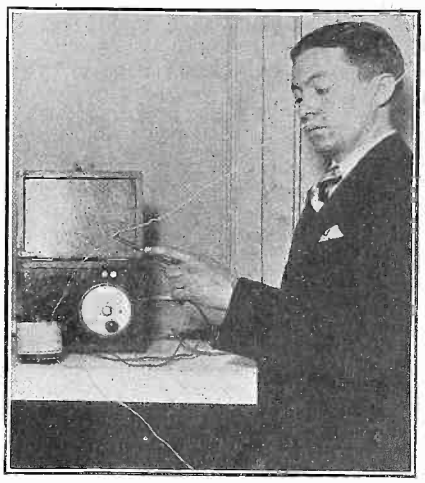


**FIG. 1—Joseph Kramer, of 939 Longwood Avenue, Bronx, N. Y. C., showing how to place the wavemeter coil in inductive relation to the ground. The ground wire is seen running through the coil. The wavemeter is in the background. Note the dial on the wavemeter condenser.**

# *Blind War Veteran Honored on Opening Own Radio Shop*

**"BLIND JOE" ALONZO, world war veteran, who made a success as a radio expert and received a loving cup and bouquets from admirers when he opened a shop on the East Side, New York City. (Kadel & Herbert).**

# Testing Receiver's Cycle Range

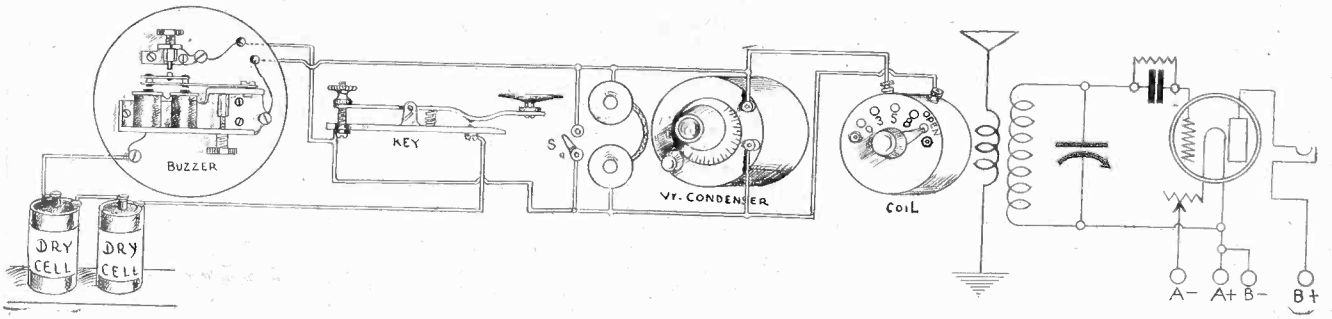



FIG. 4—A picture diagram of the wavemeter for receivers and transmitters. The switch is for closing the circuit. The key is for using the wavemeter as a miniature code transmitter, when using the absorption method of transmission by placing the coil in inductive relation to the antenna. This has a range of about five miles and is called the ICW method of transmission.

THE AUTHOR with the portable wavemeter described his article. Note that the only thing that was carried outside the meter was the special wavemeter coil.

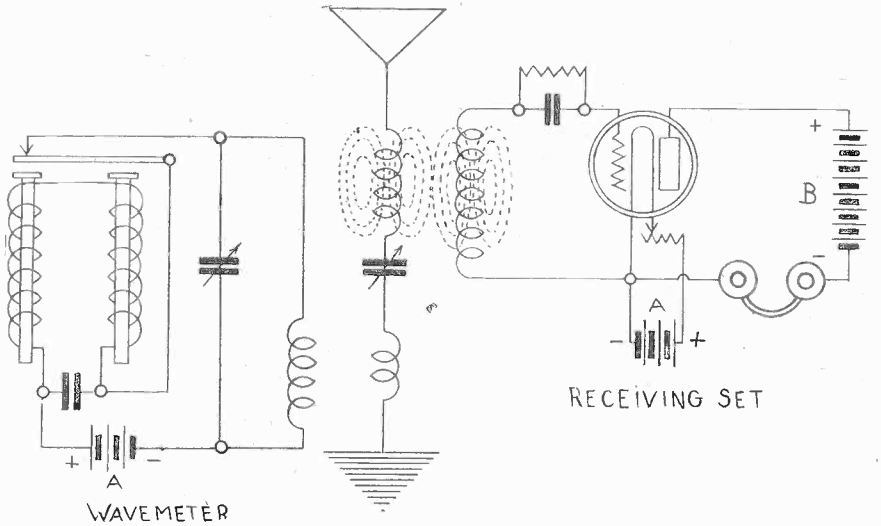



FIG. 5—An electrical diagram of a wavemeter for receivers only. The excitation coil is placed in inductive relation to ground of an ordinary receiving set. Note the fixed condenser (1 mfd.) shunted across buzzer magnets.

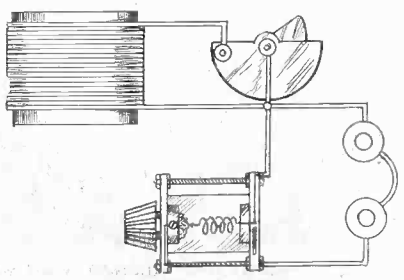
the Lacault condenser and the described coil:

| DIAL NUMBER OF CONDENSER OF WAVEMETER | WAVELENGTH IN METERS |
|---|---|
| 0 | 250 |
| 10 | 275 |
| 20 | 300 |
| 30 | 325 |
| 40 | 350 |
| 50 | 375 |
| 60 | 400 |
| 70 | 425 |
| 80 | 450 |
| 90 | 475 |
| 100 | 500 |

Adjust condenser dial of wavemeter to 10 and turn dials of receiver until you hear the high-pitched note of buzzer in telephones. Say at 20 on the wavemeter and 30 on the receiver you hear the note. This is one wavelength. If you think that your set tunes below 250 meters, e. g., if you do not hear buzz at point where you receive your lowest wavelength, take three turns off the wavemeter coil. This will get it down to 220 meters, and so on for the lower waves (to 100 meters). If you tune your set to a point where, say, KYW (536 meters) should come in and you do not hear a buzz, put 8 turns on the meter coil. For the intermediate waves the procedure first mentioned is followed.

### How to Calibrate a Transmitter

The meter just described was for the calibration of receiving instruments only. For transmitting sets, however, we have a very simple arrangement of instruments employing only a crystal, pair of phones and a condenser, the same as used in the wavemeter just described, connected up in unilateral fashion (Fig. 3). Use a 20-turn coil. A crystal used here is a fixed type. DO NOT PLACE COIL TOO NEAR THE TRANSMITTER, AS YOU WILL BURN OUT YOUR CRYSTAL IF THERE IS TOO MUCH ENERGY BEING TRANSMITTED FROM THE SET. Place the coil about a foot away from the ground system, and set the transmitter going. When you hear the note (CW, spark, or ICW) in the telephones of the wavemeter, you may calculate your transmitter to specific wavelengths. The following data are given for the purpose of calibrating your transmitter:



UNILATERAL wavemeter hookup, a crystal detector being used, for transmission only.

| DIAL READING OF THE METER CONDENSER | WAVELENGTH IN METERS |
|---|---|
| 0 | 100 |
| 10 | 110 |
| 20 | 120 |
| 30 | 130 |
| 40 | 140 |
| 50 | 150 |
| 60 | 100 |
| 70 | 170 |
| 80 | 180 |
| 90 | 190 |
| 100 | 200 |

Add turns for higher waves; decrease turns for lower waves.

The calibration of your transmitter is very important as the United States Government gives every amateur a specific wavelength to operate on and if the Radio Inspector (R. I.) ever comes up to your house when you least expect it and tests your transmitter with his wavemeter, finding out that you are no toperating at the wavelength assigned, your license is taken away and you have lots of trouble getting another.

Fig. 4 gives the wiring diagram of the wavemeter.

(Concluded next week)

# Official List of Stations

## *Complete, Accurate, Up-to-Date*

### Corrected and revised up to May 26

| Station | Owner and Location | Meters |
|---|---|---|
| KDKA | Westinghouse E. & M. Co., E. Pittsburgh, Pa. | 309 |
| KDLR | Radio Elec. Co., Devils Lake, N. D. | 231 |
| KDPM | Westinghouse E. & M. Co., Cleveland, Ohio | 250 |
| KDYL | Newhouse Hotel, Salt Lake City, Utah | 250 |
| KDZB | F. E. Seifert, Bakersfield, Cal. | 210 |
| KFAB | Nebraska Buick Auto Co., Lincoln, Neb. | 240 |
| KFAD | McArthur Bros. Merc. Co., Phoenix, Ariz. | 360 |
| KFAE | State College, Pullman, Wash. | 349 |
| KFAF | Western Radio Corp., Denver, Colo. | 278 |
| KFAJ | University of Colorado, Boulder, Colo. | 261 |
| KFAN | University of Idaho, Moscow, Idaho. | 231 |
| KFAU | Boise High School, Boise, Idaho. | 275 |
| KFAW | Radio Den, Santa Ana, Cal. | 214 |
| KFBB | F. A. Buttrey Co., Havre, Mont. | 275 |
| KFBC | W. K. Azbill, San Diego, Cal. | 278 |
| KFBE | Horn & Wilson, San Luis Obispo, Cal. | 216 |
| KFBG | 1st Presbyterian Church, Tacoma, Wash. | 250 |
| KFBK | Kimball Upson So., Sacramento, Cal. | 248 |
| KFBL | Leese Bros., Everett, Wash. | 224 |
| KFBU | Bishop N. S. Thomas, Laramie, Wyo. | 270 |
| KFCB | Nielson Radio Co., Phoenix, Ariz. | 238 |
| KFCC | 1st Congregational Church, Helena, Mont. | 248 |
| KFCF | F. A. Moore, Walla Walla, Wash. | 256 |
| KFCY | Western Union College, Lemars, Iowa. | 252 |
| KFCZ | Central High School, Omaha, Neb. | 258 |
| KFDD | St. Michael's Cathedral, Boise, Idaho. | 275 |
| KFDH | University of Arizona, Tuscon, Ariz. | 268 |
| KFDJ | Oregon Agricultural College, Corvallis, Ore. | 254 |
| KFDM | Magnolia Petroleum Co., Beaumont, Texas. | 316 |
| KFDX | 1st Baptist Church, Shreveport, La. | 250 |
| KFDY | State College of Agriculture, Brookings, S. D. | 273 |
| KFDZ | H. O. Iverson, Minneapolis, Minn. | 231 |
| KFEC | Meier & Frank Co., Portland, Ore. | 248 |
| KFEL | Winner Radio Corp., Denver, Colo. | 254 |
| KFEQ | J. L. Scroggin, Oak, Neb. | 268 |
| KFER | Auto Elec. Service Co., Ft. Dodge, Ia. | 231 |
| KFEY | Bunker Hill & Sullivan, Kellog, Idaho. | 233 |
| KFFP | 1st Baptist Church, Moberly, Mo. | 266 |
| KFFV | Graceland Colege, Lamoni, Iowa. | 250 |
| KFGC | Louisiana State University, Baton Rouge, La. | 268 |
| KFGD | College for Women, Chickasha, Okla. | 252 |
| KFGH | Leland Stanford Junior University, Stanford University, Cal. | 270 |
| KFGQ | Crary Co., Boone, Iowa. | 226 |
| KFHA | Western State College, Gunnison, Colo. | 252 |
| KFHL | Penn College, Oskaloosa, Iowa. | 240 |
| KFI | E. C. Anthony, Inc., Los Angeles, Cal. | 469 |
| KFIF | Benson Institute, Portland, Ore. | 248 |
| KFIO | North Central High School, Spokane, Wash. | 265 |
| KFIQ | 1st Methodist Church, Yakima, Wash. | 256 |
| KFIU | Alaska Elec. Co., Juneau, Alaska. | 226 |
| KFIZ | Daily Commonwealth, Fond du Lac, Wis. | 273 |
| KFJB | Marshall Elec. Co., Marshalltown, Ia. | 248 |
| KFJC | R. B. Fegan, Junction City, Kan. | 219 |
| KFJF | National Radio Co., Oklahoma City, Okla. | 261 |
| KFJI | Liberty Theatre, Astoria, Ore. | 246 |
| KFJM | University of N. D., Grand Forks, N. D. | 278 |
| KFJR | Ashley C. Dixon & Son, Portland, Ore. | 263 |
| KFJX | State Teachers College, Cedar Falls, Ia. | 258 |
| KFJY | Tunwall Radio Co., Ft. Dodge, Iowa. | 246 |
| KFJZ | W. E. Branch, Ft. Worth, Tex. | 254 |
| KFKA | State Teachers College, Greeley, Colo. | 273 |
| KFKB | Brinkley Jones Hospital, Ass'n, Milford, Kans. | 273 |
| KFKQ | Conway Radio Laboratory, Conway, Ark. | 250 |
| KFKU | University of Kansas, Lawrence, Kans. | 275 |
| KFKX | Westinghouse E. & M. Co., Hastings, Neb. | 288 |
| KFLB | Signal Elec. Mfg. Co., Menominee, Mich. | 248 |
| KFLP | Everette M. Foster, Cedar Rapids, Ia. | 256 |
| KFLR | University of N. M., Albuquerque, N. M. | 254 |
| KFLU | Rio Grande Radio Sup. Co., San Benito, Texas | 236 |
| KFLV | Swedish Evangelist Church, Rockford, Ill. | 229 |
| KFLX | George R. Clough, Galveston, Texas. | 240 |
| KFLZ | Atlantic Auto Co., Atlantic, Iowa. | 273 |
| KFMB | Christian Churches of Little Rock, Little Rock, Ark. | 254 |
| KFMQ | University of Ark., Fayetteville, Ark. | 300 |
| KFMR | Morningside College, Sioux City, Iowa. | 261 |
| KFMT | Dr. G. W. Young, Minneapolis, Minn. | 263 |
| KFMW | M. G. Sataren, Houghton, Mich. | 266 |
| KFMX | Carleton College, Northfield, Minn. | 337 |
| KFNF | Henry Field Seed Co., Shenandoah, Iowa. | 266 |
| KFNG | Wooten Radio Shop, Coldwater, Miss. | 254 |
| KFNJ | Teachers College, Warrensburg, Mo. | 234 |
| KFNL | Union High School, Paso Robles, Cal. | 240 |
| KFNV | L. A. Drake, Santa Rosa, Cal. | 227 |
| KFNY | Montana Phono Co., Helena, Mont. | 248 |
| KFOA | Rhodes Company, Seattle, Wash. | 455 |
| KFOC | 1st Christian Church, Whittier, Cal. | 236 |
| KFOJ | Moberly High School, Moberly, Mo. | 246 |
| KFOL | L. M. Schafbuch, Marengo, Iowa. | 234 |
| KFON | Echophone Radio Shop, Long Beach, Cal. | 234 |
| KFOO | Latter Day Saints University, Salt Lake City, Utah | 261 |
| KFOR | David City Tire & Elec. Co., David City, Neb. | 226 |
| KFOT | College Hill Radio Club, Wichita, Kan. | 231 |
| KFOX | Technical High School, Omaha, Neb. | 248 |
| KFOY | Beacon Radio Service, St. Pau, Minn. | 252 |
| KFPG | Oliver S. Garretson, Los Angeles, Cal. | 238 |
| KFPL | C. C. Baxter, Dublin, Texas | 252 |
| KFPM | New Furniture Co., Greenville, Texas. | 242 |
| KFPR | Forestry Department, Los Angeles, Cal. | 431 |
| KFPV | Heintz & Kohlmoos, San Francisco, Cal. | 236 |
| KFPW | St. John's Church, Carterville, Mo. | 268 |
| KFPY | Symonds Investment Co., Spokane, Wash. | 266 |
| KFQA | The Principia, St. Louis, Mo. | 261 |
| KFQB | Searchlight Publishing Co., Ft. Worth, Texas | 254 |
| KFQC | Kidd Bros., Taft, Cal. | 231 |
| KFQG | Southern Calif. Radio Ass'n, Los Angeles, Cal. | 329 |
| KFQH | Radio Service Co., Burlingame, Cal. | 231 |
| KFQP | G. S. Carson, Jr., Iowa City, Ia. | 224 |
| KFQR | W. L. Ellis, Oklahoma City, Okla. | 210 |
| KFQT | National Guard, Denison, Tex. | 252 |
| KFQU | W. Riker, Holy City, Cal. | 234 |
| KFQW | F. C. Knierim, North Bend, Wash. | 216 |
| KFQA | Farmers State Bank, Belden, Neb. | 273 |
| KFQZ | Taft Radio Co., Hollywood, Cal. | 226 |
| KFRB | Hall Bros., Beevile, Texas | 248 |
| KFRC | Paris Dry Goods Co., San Francisco. | 268 |
| KFRH | The Radio Shop, Grafton, N. D. | 268 |
| KFRL | Men's Club, Grand Forks, N. D. | 240 |
| KFRM | J. F. Boland, Ft. Sill, Okla. | 263 |
| KFRP | Trinity Church, Redlands, Cal. | 211 |
| KFRQ | Radio Service Co., Portland, Ore. | 213 |
| KFRU | Etherical Studio, Bristow, Okla. | 395 |
| KFRW | United Churches, Olympia, Wash. | 220 |
| KFRX | J. G. Klemgard, Pullman, Wash. | 217 |
| KFRY | College of Agriculture, State College, N. M. | 256 |
| KFRR | College of Agriculture, State College, N. M. | 266 |
| KFRZ | The Electric Shop, Hartington, Neb. | 222 |
| KFSG | Echo Park Evangelistic Ass'n, Los Angeles, Cal. | 278 |
| KFSY | The Van Blaricom Co., Helena, Mont. | 248 |
| KFUJ | Hoppert P. and H. Co., Breckenridge, Minn. | 242 |
| KFUL | T. Goggan & Bro., Galveston, Tex. | 258 |
| KFUM | W. D. Corley, Colorado Springs, Colo. | 242 |
| KFUO | Concordia Theo. Seminary, St. Louis, Mo. | 545 |
| KFUP | Fitzsimons General Hospital, Denver, Colo. | 234 |
| KFUR | H. W. Peery and C. Redfield, Ogden, Utah. | 224 |
| KFUS | Louis L. Sherman, Oakland, Cal. | 233 |
| KFUT | University of Utah, Salt Lake City, Utah. | 261 |
| KFUU | Colburn Radio Laboratories, San Leandro, Cal. | 224 |
| KFUV | G. P. Ward, Springfield, Mo. | 252 |
| KFUY | Irvine H. Bouchard, Butte, Mont. | 254 |
| KFUZ | Y. M. C. A., Virginia, Minn. | 248 |
| KFVC | G. J. Bensberg, Camden, Ark. | 242 |
| KFVD | Chas. & W. J. McWhinnie, San Pedro, Cal. | 205 |
| KFVE | Film Corp., St. Louis, Mo. | 240 |
| KFVF | Clarence B. Juneau, Hollywood, Cal. | 208 |
| KFVG | 1st Meth-Epis. Church, Independence, Kan. | 236 |
| KFVH | Herbert Whan, Manhattan, Kans. | 219 |
| KFVI | 56th Cav. Brigade, Houston, Tex. | 248 |
| KFVJ | First Baptist Church, 2nd and San Antonio St., San Jose, Cal. | 226 |
| KFVK | Sacramento Chamber of Commerce, cor. 10th and J. Sts., Sacramento, Cal. | 248 |
| KFVL | Richard F. Lussier, 1st Lt. Hd. 5th Inf. Brigade, U.S.A., Vancouver Barracks, Vancouver, Wash. | 231 |
| KFVO | F. M. Henry, Kirksville, Mo. | 226 |
| KFVR | Moonlight Ranch, Denver, Col. | 246 |
| KFWA | Browning Bros. Co., Ogden, Utah. | 214 |
| KFWB | Warner Bros. Pictures, Inc., Hollywood, Cal. | 252 |
| KFWC | L. E. Wall & C. S. Myers, Upland, Cal. | 211 |
| KFWD | Ark Light Co., Arkadelphia, Ark. | 266 |
| KFWF | St. Louis Truth Center, Lindell St., St. Louis, Mo. | 214 |
| KFYN | Carl E. Bagley, Welcome, Minn. | 227 |
| KGB | The Ledger, Tacoma, Wash. | 250 |
| KGO | General Electric Company, Oakland, Cal. | 361 |
| KGU | M. A. Mulrony, Honolulu, Hawaii | 270 |
| KGW | The Oregonian, Portland, Ore. | 492 |
| KGY | St. Martin's College, Lacey, Wash. | 246 |
| KHJ | The Times, Los Angeles, Cal. | 405 |
| KHQ | Louis Wasmer, Seattle, Wash. | 273 |
| KJBS | J. Brunton & Sons Co., San Francisco, Cal. | 236 |
| KJR | Northwest Radio Co., Seattle, Wash. | 384 |
| KJS | Bible Institute, Los Angeles, Cal. | 294 |
| KLDS | Reorganized Church of Jesus Christ of Latter Day Saints, Independence, Mo. | 268 |
| KLS | Warner Bros Radio Co., Oakland, Cal. | 242 |
| KLX | Tribune, Oakland, Cal. | 508 |
| KLZ | Reynolds Radio Co., Denver, Col. | 266 |
| KMJ | San Joaquin Corp., Fresno, Cal. | 234 |
| KMO | Love Elec. Co., Tacoma, Wash. | 250 |
| KNX | Express, Hollywood, Cal. | 337 |
| KOA | General Electric Co., Denver, Col. | 322 |
| KOB | College of Agri, State College, N. M. | 349 |
| KOP | Detroit Police Department, Detroit, Mich. | 278 |
| KPO | Hale Brothers, San Francisco, Cal. | 429 |
| KPPC | Pasadena Presbyterian Church, Pasadena, Cal. | 229 |
| KPRC | Houston Print Co., Houston, Tex. | 297 |
| KQV | Doubleday Hill Elec. Co., Pittsburgh, Pa. | 275 |
| KRE | Gazette, Berkeley, Cal. | 258 |
| KSAC | Kansas State Agricultural College, Manhattan, Kans. | 341 |
| KSD | Post Dispatch, St. Louis, Mo. | 545 |
| KSL | Radio Service Corp., Salt Lake City, Utah. | 300 |
| KTHS | New Arlington Hotel, Hot Springs, Ark. | 375 |
| KTW | 1st Presbyterian Church, Seattle, Wash. | 454 |
| KUO | Examiner, San Francisco, Cal. | 346 |
| KUOM | State University of Montana, Missoula, Mont. | 245 |
| KWG | Portable Wireless Tel. Co., Stockton, Cal. | 248 |
| KYW | Westinghouse E. & M. Co., Chicago, Ill. | 535 |
| KZKZ | Electric Supply Co., Manila, P. I. | 270 |
| KZM | Western Radio Inst., Oakland, Cal. | 241 |
| KZRQ | Far Eastern Radio, Inc., Manila, P. I. | 222 |
| WAAB | V. Jensen, New Orleans, La. | 273 |
| WAAC | Tulane University, New Orleans, La. | 275 |
| WAAD | Ohio Mech. Institute, Cincinnati, Ohio | 259 |
| WAAF | Drovers Journal, Chicago, Ill. | 278 |
| WAAM | I. R. Nelson Co., Newark, N. J. | 263 |
| WAAW | Omaha Grain Exchange, Omaha, Neb. | 384 |
| WABA | Lake Forest University, Lake Forest, Ill. | 227 |
| WABB | Harrisburg Sporting Goods Co., Harrisburg, Pa. | 266 |
| WABI | Bangor Ry. & Elec. Co., Bangor, Me. | 240 |
| WABL | Agricultural College, Storrs, Conn. | 275 |
| WABM | F. E. Doherty Radio Co., Saginaw, Mich. | 261 |
| WABN | Ott Radio, Inc., La Crosse, Wis. | 244 |
| WABO | Lake Avenue Baptist Church, Rochester, N. Y. | 278 |
| WABQ | Haverford College Radio Club, Haverford, Pa. | 261 |
| WABR | Scott High School, Toledo, O. | 263 |
| WABU | Victor Talking Machine Co., Camden, N. J. | 226 |
| WABW | College of Wooster, Wooster, O. | 207 |
| WABX | H. B. Joy, Mt. Clemens, Mich. | 254 |
| WABY | John Magaldi, Philadelphia, Pa. | 242 |
| WABZ | Coliseum Place Baptist Church, New Orleans, La. | 275 |
| WADC | Allen Theatre, Akron, Ohio | 258 |
| WAFD | A. B. Parfet Co., Port Huron, Mich. | 258 |
| WAHG | A. H. Grebe Co., Richmond Hill, N. Y. | 316 |
| WAIT | A. H. Waite & Co., Taunton, Mass. | 229 |
| WAMD | Hubbard & Co., Minneapolis, Minn. | 244 |
| WARG | American Radio Res. Corp., Medford Hillside, Mass. | 261 |
| WBAA | Purdue University, West Lafayette, Ind. | 273 |
| WBAK | State Police, Harrisburg, Pa. | 276 |
| WBAO | James Millikin University, Decatur, Ill. | 263 |
| WBAP | Star Telegram, Fort Worth, Tex. | 476 |
| WBAV | Erner Hopkins Co., Columbus, O. | 294 |
| WBAX | J. H. Stenger, Jr., Wilkes-Barre, Pa. | 256 |
| WBBA | Plymouth Congregational Church, Newark, O. | 226 |
| WBBG | I. Vermilya, Mattapoisett, Mass. | 248 |
| WBBL | Grace Covenant Presbyterian Church, Richmond, Va. | 229 |
| WBBM | H. L. Atlass, Chicago, Ill. | 226 |
| WBBP | Petoskey High School, Petoskey, Mich. | 238 |
| WBBR | Peoples Pulpit Ass'n, Rossville, N. Y. | 273 |
| WBBS | 1st Baptist Church, New Orleans, La. | 252 |
| WBBU | Jenks Motor Sales Co., Monmouth, Ill. | 224 |
| WBBV | Johnstown Radio Co., Johnstown, Pa. | 248 |
| WBBW | Ruffner City High School, Norfolk, Va. | 222 |
| WBBY | Washington Light Infantry, Charleston, S. C. | 268 |
| WBBZ | N. B. Watson, Indianapolis, Ind. | 238 |
| WBCN | Southtown Economist, Chicago, Ill. | 266 |
| WBDC | Baxter Laundry Co., Grand Rapids, Mich | 256 |
| WBES | Bliss Electrical School, Takoma Park, Md. | 222 |
| WBOQ | A. H. Grebe & Co., Richmond Hill, N. Y. | 236 |
| WBR | State Police, Butler, Pa. | 203 |
| WBRE | Baltimore Radio Ex., Wilkes-Barre, Pa. | 231 |
| WBS | D. W. May, Inc., Newark, N. J. | 252 |
| WBT | Southern Radio Co., Charlotte, N. C. | 275 |
| WBZ | Westinghouse E. & M. Co., Springfield, Mass. | 333 |
| WCAD | St. Lawrence University, Canton, N. Y. | 263 |
| WCAE | Kaufman & Baer, Pittsburgh, Pa. | 461 |

| Station | Owner and Location | Meters |
|---|---|---|
| WCAG | C. R. Randall, New Orleans, La. | 268 |
| WCAH | Entrekin Electric Co., Columbus, O. | 266 |
| WCAJ | Nebraska Wesleyan University, University Place, Neb. | 275 |
| WCAL | St. Olaf College, Northfield, Minn. | 337 |
| WCAO | Sanders & Stayman, Baltimore, Md. | 275 |
| WCAP | C. & P. Tel. Co., Washington, D. C. | 469 |
| WCAR | Southern Radio Corp., San Antonio, Texas. | 263 |
| WCAT | School of Mines, Rapids City, S. D. | 240 |
| WCAU | Durham & Co., Philadelphia, Pa. | 278 |
| WCAX | University of Vermont, Burlington, Vt. | 250 |
| WCAY | Civic Broadcasting Ass'n, Milwaukee, Wis. | 266 |
| WCAZ | Carthage College, Carthage, Ill. | 246 |
| WCBA | Queen City Radio, Allentown, Pa. | 254 |
| WCBC | University of Michigan, Ann Arbor, Mich. | 229 |
| WCBD | W. G. Voliva, Zion, Ill. | 345 |
| WCBE | Uhalt Radio Co., New Orleans, La. | 263 |
| WCBG | H. S. Williams, Mayleld, Ky. | 268 |
| WCBH | University of Mississippi, Oxford, Miss. | 242 |
| WCBI | Nicoll, Duncan & Rush, Bemis, Tenn. | 240 |
| WCBJ | J. C. Mans, Jennings, La. | 244 |
| WCBL | Northern Radio Mfg. Co., Houlton, Me. | 266 |
| WCBM | Hotel Chateau, Baltimore, Md. | 229 |
| WCBQ | 1st Baptist Church, Nashville, Tenn. | 242 |
| WCBR | C. H. Messter (Portable), Providence, R. I. | 205 |
| WCBU | Arnold Wireless Co., Arnold, Pa. | 220 |
| WCBY | Forks Electrical Shop, Buck Hill Falls, Pa. | 231 |
| WCBZ | Neutrowound Radio Mfg. Co., Chicago Heights, Ill. | 217 |
| WCCO | Washburn Crosby Co., Minneapolis, Minn. | 416 |
| WCEE | C. E. Erbstein, Elgin, Ill. | 275 |
| WCK | Stix Baer & Fuller Co., St. Louis, Mo. | 273 |
| WCM | Texas Market Department, Austin, Texas. | 268 |
| WCSO | Wittenberg College, Springleld, Ohio | 248 |
| WCTS | C. T. Sherer Co., Worcester, Mass. | 268 |
| WCUW | Clark University, Worcester, Mass. | 238 |
| WCX | Detroit Free Press, Detroit, Mich. | 517 |
| WDAE | Tampa Daily News, Tampa, Fla. | 273 |
| WDAF | Kansas City Star, Kansas City, Mo. | 366 |
| WDAG | J. L. Martin, Amarillo, Tex. | 263 |
| WDAH | Trinity Methodist Church, El Paso, Texas | 268 |
| WDAY | Radio Equipment Corp., Fargo, N. D. | 244 |
| WDBC | Kirk, Johnson & Co., Lancaster, Pa. | 258 |
| WDBE | Gilham-Schoen Elec. Co., Atlanta, Ga. | 278 |
| WDBF | R. G. Phillips, Youngstown, O. | 222 |
| WDBJ | Richardson Wayland Elec. Co., Roanoke, Va. | 229 |
| WDBK | M. F. Broz, Furn., Cleveland, O. | 227 |
| WDBL | Department ofMarkets, Stevens Point, Wis. | 278 |
| WDBO | Rollins College, Winter Park, Fla. | 240 |
| WDBP | State Normal School, Superior, Wis. | 261 |
| WDBQ | Morton Radio Supply Co., Salem, N. J. | 234 |
| WDBR | Tremont Temple Baptist Church, Boston, Mass. | 261 |
| WDBS | S. M. K. Radio Corp., Dayton. O. | 275 |
| WDBW | Radio Den, Columbia, Tenn. | 268 |
| WDBX | Dyckman Radio Shop, New York, N. Y. | 233 |
| WDBY | North Shore Congregational Church, Chicago, Ill. | 258 |
| WDBZ | Boy Scouts of America, Kingston, N. Y. | 233 |
| WDM | Church of the Covenant, Washington, D. C. | 270 |
| WDOD | Chattanooga Radio Co., Chattanooga, Tenn. | 256 |
| WDRC | Doolittle Radio Corp., New Haven, Conn. | 268 |
| WDWF | Dutee Wilcox Flint, Inc., Cranston, R. I. | 440.9 |
| WDZ | J. L. Bush, Tuscola, Ill. | 278 |
| WEAA | F. D. Fallain, Flint, Mich. | 234 |
| WEAF | A. T. & T. Co., New York, N. Y. | 492 |
| WEAH | Wichita Board of Trade, Wichita, Kans. | 268 |
| WEAI | Cornell University, Ithaca, N. Y. | 254 |
| WEAJ | University of South Dakota, Vermillion, S. D. | 278 |
| WEAM | Borough of North Plainfield, N. Plainfield, N. J. | 261 |
| WEAN | Shepard Co., Providence, R. I. | 270 |
| WEAO | Ohio State University, Columbus, O. | 294 |
| WEAR | Goodyear T. and R. Co., Cleveland, O. | 389 |
| WEAU | Davidson Bros. Co., Sioux City, Ia. | 275 |
| WEAY | Iris Theatre, Houston, Texas. | 270 |
| WEBA | The Electric Shop, Highland Park, N. J. | 233 |
| WEBC | W. C. Bridges, Superior, Wisc. | 242 |
| WEBD | Elec. Equipment & Service Co., Anderson, Ind. | 246 |
| WEBE | Roy W. Waller, Cambridge, Ohio. | 234 |
| WEBH | Edgewater Beach Hotel, Chicago, Ill. | 370 |
| WEBJ | Third Avenue R. R. Co., New York, N. Y. | 273 |
| WEBK | Rrand Rapids Radio Co., Grand Rapids, Mich. | 242 |
| WEBL | Radio Corp. of Ama. (Portable). | 226 |
| WEBM | Radio Corp. of Ama., Portable Mobile Station. | 226 |
| WEBP | E. B. Peldicord, New Orleans, La. | 280 |
| WEBQ | Tate Radio Co., Harrisburg, Ill. | 226 |
| WEBR | H. H. Howell, Buffalo, N. Y. | 240 |
| WEBT | Dayton High School, Dayton, Ohio. | 256 |
| WEBW | Beloit College, Beloit, Wisc. | 268 |
| WEBZ | Savannah Radio Corp., Savannah, Ga. | 234 |
| WEEI | Edison Electric Illuminating Co., Boston, Mass. | 476 |
| WEMC | Emm. Missionary College, Berrien Springs, Mich. | 286 |
| WENR | All-Amer. Radio Corp., Chicago, Ill. | 266 |
| WEW | St. Louis University, St. Louis, Mo. | 248 |
| WFAA | Dallas News & Journal, Dallas, Texas | 476 |
| WFAM | The Times, St. Cloud, Minn. | 273 |
| WFAV | University of Nebr., Lincoln, Nebr. | 275 |
| WFBB | Eureka College, Eureka, Ill. | 240 |
| WFBC | 1st Baptist Church, Knoxville, Tenn. | 250 |
| WFBD | Gethsemane Baptist Church, Philadelphia, Pa. | 234 |
| WFBE | J. V. De Walle, Seymour, Ind. | 226 |
| WFBG | W. F. Gable Co., Altoona, Pa. | 278 |
| WFBH | Concourse Radio Corp., New York, N. Y. | 273 |
| WFBI | Galvin Radio Supply Co., Camden, N. J. | 236 |
| WFBJ | St. Johns University, Collegeville, Minn. | 236 |
| WFBK | Dartmouth College, Hanover, N. H. | 256 |
| WFBL | Onondaga Hotel, Syracuse, N. Y. | 252 |
| WFBM | Merchants Lighting Co., Indianapolis, Ind. | 268 |
| WFBN | Radio Sales & Service Co., Bridgewater, Mass. | 226 |
| WFBQ | Wynne Radio Co., Raleigh, N. C. | 252 |
| WFBR | Maryland National Guard, Baltimore, Md. | 254 |
| WFBY | Signal Corps, Ft. Ben Harrison, Ind. | 258 |
| WFBZ | Knox College, Galesburg, Ill. | 254 |
| WFI | Strawbridge & Clothier, Philadelphia, Pa. | 395 |
| WFKB | Francis K. Bridgman, Chicago, Ill. | 217 |
| WGAL | Lancaster Elec. Supply Co., Lancaster, Pa. | 248 |
| WGAQ | W. G. Patterson, Shreveport, La. | 263 |
| WGAZ | The Tribune, South Bend, Ind. | 275 |
| WGBA | Jones Elec. & Radio Co., Baltimore, Md. | 254 |
| WGBB | H. H. Carman, Freeport, N. Y. | 244 |
| WGBC | 1st Baptist Church, Memphis, Tenn. | 266 |
| WGBF | The Finke Furniture Co., Evansville, Ind. | 217 |
| WGBG | Breitenbach's Radio Shop, Thrifton, Va. | 226 |
| WGBH | Fall River Herald Pub. Co. (New England States Portable) | 210 |
| WGBI | Frank S. Megargee, Scranton, Pa. | 240 |
| WGBK | L. W. Campbell, Johnstown, Pa. | 248 |
| WGBL | Elyria Radio Assn., Elyria, Ohio. | 227 |
| WGBM | T. N. Saaty, Providence, R. I. | 234 |
| WGBN | Hub Radio Shop, La Salle, Ill. | 256 |
| WGBO | Dr. Roses Artan, San Juan, P. R. | 275 |
| WGBQ | Stout Institute, Menomonie, Wis. | 234 |
| WGBR | Marshfield Broadcasting Association, Marshfield, Wis. | 229 |
| WGBS | Gimbel Brothers, New York, N. Y. | 316 |
| WGBT | Furman University, Greenville, S. C. | 236 |
| WGBW | Valley Theatre, Spring Valley, Ill. | 256 |
| WGBX | University of Maine, Orono, Maine. | 252 |
| WGBY | Progress Sales Co., New Lebanon, Ohio | 219 |
| WGN | The Tribune, Chicago, Ill. | 370 |
| WGR | Federal Telephone Mfg. Co., Buffalo, N. Y. | 319 |
| WGST | Ga. School of Tech., Atlanta, Ga. | 278 |
| WGY | General Elec. Co., Schenectady, N. Y. | 380 |
| WHA | University of Wisconsin, Madison, Wis. | 535 |
| WHAD | Marquette University, Milwaukee, Wis. | 275 |
| WHAG | University of Cincinnati, Cincinnati, Ohio | 233 |
| WHAM | University of Rochester, Rochester, N. Y. | 278 |
| WHAP | Wm. H. Taylor Finance Corp., Brooklyn, N. Y. | 240 |
| WHAR | F. P. Cooks Sons, Atlantic City, N. J. | 275 |
| WHAS | The Courier Journal-Times, Louisville, Ky. | 400 |
| WHAV | Wilmington Elc. Spec. Co., Wilmington, Del. | 266 |
| WHAZ | Rensselaer Polytechnic Institute, Troy, N. Y. | 380 |
| WHB | Sweeney School Co., Kansas City, Mo. | 366 |
| WHBA | Shaffer Music House, Oil City, Pa. | 250 |
| WHBB | Hebal's Store, Stevens Point, Wis. | 240 |
| WHBC | Rev. E. P. Graham, Canton, Ohio. | 254 |
| WHBD | Charles W. Howard, Bellefontaine, Ohio | 222 |
| WHBF | Beardsley Specialty Co., Rock Island, Ill. | 222 |
| WHBG | John S. Skane, Harrisburg, Pa. | 231 |
| WHBH | Culver Military Academy, Culver, Ind. | 222 |
| WHBI | Chesaning Electric Co., Chesaning, Mich. | 227 |
| WHBJ | Laver Auto Co., Ft. Wayne, Ind. | 234 |
| WHBK | Franklin St. Garage, Ellsworth, Me. | 231 |
| WHBL | J. H. Slusser, Logansport, Ind. | 220 |
| WHBM | C. L. Carroll (Portable), Chicago, Ill. | 233 |
| WHBN | 1st Ave. Methodist Church, St. Petersburg, Fla. | 258 |
| WHBO | Y. M. C. A., Providence, R. I. | 231 |
| WHBP | Johnstown Auto Co., Johnstown, Pa. | 256 |
| WHBQ | St. John's M. E. Church, Memphis, Tenn. | 233 |
| WHBR | Scientific E. & M. Co., Cincinnati, O. | 216 |
| WHBS | E. W. Loche, Mechanicsburg, Ohio. | 208 |
| WHBT | Thos. W. Tizzard, Jr., Downers Grove, Ill. | 207 |
| WHBU | B. L. Bing's Sons, Anderson, Ind. | 219 |
| WHBV | Ray's Radio Shop, Columbus, Ga. | 244 |
| WHBW | D. R. Kienzle, Philadelphia, Pa. | 216 |
| WHBX | J. W. Bowser, Punxutawney, Pa. | 213 |
| WHBY | St. Norbert's Coll., West DePere, Wis. | 250 |
| WHDI | Wm. Hood Dunwoody Ind. Inst., Minneapolis, Minn. | 278 |
| WHEC | Hickson Elec. Co., Rochester, N. Y. | 258 |
| WHK | Radiovox Company, Cleveland, Ohio. | 273 |
| WHN | George Schubel, New York, N. Y. | 361 |
| WHO | Bankers Life Co., Des Moines, Ia. | 526 |
| WHT | Radiophone Corp., Deerfield, Ill. | 238 |
| WIAD | H. R. Miller, Philadelphia, Pa. | 250 |
| WIAK | Journal Stockton Co., Omaha, Nebr. | 278 |
| WIAS | Home Elc. Co., Burlington, Iowa. | 254 |
| WIBA | Capital Times, Madison, Wis. | 236 |
| WIBC | L. M. Tate Post, V. F. W., St. Petersburg, Fla. | 222 |
| WIBH | Elite Radio, New Bedford, Mass. | 210 |
| WIBI | Fredk. B. Zittell, Flushing, N.Y. | 219 |
| WIBJ | C. L. Carrell, Chicago (portable). | 216 |
| WIBK | Univ. of Toledo, Toledo, O. | 205 |
| WIBO | Nelson Bros., Chicago, Ill. | 226 |
| WIBN | Elite Radio Stores, New Bedford, Mass | 210 |
| WIL | Benson Radio Co., St. Louis, Mo. | 273 |
| WIP | Gimbel Brothers, Philadelphia, Pa. | 508 |
| WJAD | Jackson's Radio Elec. Co., Waco, Tex. | 353 |
| WJAG | Norfolk Daily News, Norfolk, Nebr. | 270 |
| WJAK | Rev. C. L. White, Greentown, Ind. | 254 |
| WJAM | D. M. Perham, Cedar Rapids, Ia. | 258 |
| WJAR | The Outlet Co., Providence, R. I. | 306 |
| WJAS | Pittsburgh Radio Supply House, Pittsburgh, Pa. | 275 |
| WJAZ | Zenith Radio Corp., Chicago, Ill. | 268 |
| WJBC | Hummer Furniture Co., 2nd and Joilet Sts., La Salle, Ill. | 234 |
| WJBD | Ashland Broadcasting Committee, Ashland, Wis. | 233 |
| WJD | Dennison University, Granville, O. | 317 |
| WJJD | Loyal Order of Moose, Mooseheart, Ill. | 303 |
| WJY | Radio Corp. of Ama., New York, N. Y. | 405 |
| WJZ | Radio Corp. of Ama., New York, N. Y. | 454 |
| WKAA | H. F. Paar, Cedar Rapids, Iowa. | 278 |
| WKAP | D. W. Flint, Cranston, R. I. | 234 |
| WKAQ | Radio Corp. of Porto Rico, San Juan, P. R. | 341 |
| WKAR | Mich. Agricultural College, Lansing, Mich. | 285 |
| WKAV | Laconia Radio Club, Laconia, N. H. | 210 |
| WKBE | K. & B. Electric Co., Webster, Mass. | 231 |
| WKRC | Kodel Radio Corp., Cincinnati, O. | 326 |
| WKY | WKY Radio Shop, Oklahoma City, Okla. | 275 |
| WLAL | 1st Presbyterian Church, Tulsa, Okla. | 250 |
| WLAP | W. V. Jordan, Louisville, Ky. | 275 |
| WLAX | Greencastle Commun. Broad. Sta., Greencastle, Ind. | 231 |
| WLB | University of Minneapolis, Minneapolis, Minn. | 278 |
| WLBL | Wisconsin Department of Markets, Stevens Point, Wis. | 278 |
| WLIT | Lit Brothers, Philadelphia, Pa. | 395 |
| WLS | Sears Roebuck Co., Chicago, Ill. | 345 |
| WLW | Crosley Radio Corp., Cincinnati, O. | 422 |
| WMAC | C. B. Meredith, Cazenovia, N. Y. | 275 |
| WMAF | Round Hills Radio Corp., Dartmouth, Mass. | 360 |
| WMAK | Norton Laboratory, Lockport, N. Y. | 266 |
| WMAN | 1st Baptist Church, Columbus, Ohio | 278 |
| WMAQ | Chicago Daily News, Chicago, Ill. | 448 |
| WMAY | Kings Highway Presbyterian Church, St. Louis, Mo. | 248 |
| WMAZ | Mercer University, Macon, Ga. | 261 |
| WMBB | Trianon Ball Room, Chicago, Ill. | 250 |
| WMBF | Fleetwood Hotel, Miami Beach, Fla. | 384 |
| WMC | The Commercial Appeal, Memphis, Tenn. | 500 |
| WMCA | Hotel McAlpin, N. Y. C. | 341 |
| WMU | Doubleday, Hill Elec. Co., Washington, D. C. | 261 |
| WNAB | Shepard stores, Boston, Mass. | 250 |
| WNAC | Shepard Stores, Boston, Mass. | 280 |
| WNAD | University of Okla., Norman, Okla. | 254 |
| WNAL | Omaha Central High School, Omaha, Nebr. | 258 |
| WNAP | Wittenberg College, Springfield, O. | 248 |
| WNAR | 1st Christian Church, Butler, Mo. | 231 |
| WNAT | Lenning Bros. Co., Philadelphia, Pa. | 250 |
| WNAX | Dakota Radio App. Co., Yankton, S. D. | 244 |
| WNJ | Radio Shop, Newark, N. J. | 233 |
| WNYC | Municipal Station, New York, N. Y. | 526 |
| WOAC | Page Organ Co., Lima, Ohio. | 261 |
| WOAI | South East Equipment So., San Antonio, Texas. | 395 |
| WOAN | Vaughan Con. of Music, Lawrenceburg, Tenn. | 283 |
| WOAW | Woodmen of the World, Omaha, Neb. | 526 |
| WOAX | F. J. Wolff, Trenton, N. J. | 240 |
| WOC | Palmer School of Chiro, Davinport, Ia. | 484 |
| WODA | Odea Radio, Paterson, N. J. | 203 |
| WOCL | Hotel Jamestown, Jamestown, N. Y. | 275 |
| WOI | Iowa State College, Ames, Iowa. | 270 |
| WOO | John Wanamaker, Philadelphia, Pa. | 508 |
| WOQ | Unity School of Christianity, Kansas City, Mo. | 278 |
| WOR | L. Bamberger & Co., Newark, N. J. | 405 |
| WORD | Peoples Pulpit Assn., Batavia, Ill. | 275 |
| WOS | Mo. State Marketing Bureau, Jefferson City, Mo. | 441 |
| WPAK | N. D. Agricultural College, Agricultural College, N. D. | 275 |
| WPAZ | Dr. John R. Koch, Charleston, W. Va. | 268 |
| WPG | Municipality, Atantic City, N. J. | 300 |
| WPSC | Penn State College, State College, Pa. | 261 |
| WQAA | H. A. Beale, Jr., Parkersburg, Pa. | 229 |
| WQAC | Gish Radio Service, Amarillo, Texas | 234 |
| WQAE | Moore Radio News Station, Springfield, Vermont | 246 |
| WQAM | Electric Equipment Co., Miami, Fla. | 268 |
| WQAN | The Scranton Times, Scranton, Pa. | 250 |
| WQAO | Calvary Baptist Church, New York, N. Y. | 360 |
| WQAS | Prince Walter Co., Lowell, Mass. | 252 |
| WQJ | Calumet Rainbo Broadcasting Co., Chicago, Ill. | 448 |
| WRAA | Rice Institute, Houston, Texas. | 256 |
| WRAF | Radio Club, Inc., Laporte, Ind. | 224 |
| WRAK | Economy Light Co., Escanaba, Mich. | 256 |
| WRAL | Northern States Power Co., St. Croix Falls, Wisc. | 248 |
| WRAM | Lombard College, Galesburg, Ill. | 244 |
| WRAN | Black Hawk Elc. Co., Waterloo, Ia. | 236 |
| WRAV | Antioch College, Yellow Springs, O. | 263 |
| WRAW | Avenue Radio Shop, Reading, Pa. | 238 |

**[Concluded on page 22. Cut out strip on page 22 and paste here, for convenient 1-sheet station directory.]**

# THE RADIO UNIVERSITY

A QUESTION and Answer Department conducted by RADIO WORLD for its Readers by its Staff of Experts. Address Letters to The Radio University, RADIO WORLD, 1493 Broadway, New York City.

**KINDLY ADVISE** me if the Acme R2, R3 and R4 radio-frequency transformers, can be used in the "Powerful 3-Tube Reflex," described in the May 23 issue of RADIO WORLD.

No. This circuit called for variably tuned coils.

* * *

**KINDLY** tell me if an Amperite for a WD11 will work three UV199s.—Frank Raphaelian, 54 Wadsworth Terrace, N. Y. C.

No. Use the 199 tube type (for 4½- or 6-volt sound, depending on your battery), one Amperite for each tube.

* * *

**DURING THE** period of Herman Bernard's broadcasting from WGBS, Friday, at 7 P. M., (316 meters), I switched off to WNYC and could distinctly hear the talk of Mr. Bernard. What is the cause of this?—Wm. H. Ewen, Vincetown, N. J.

That was a harmonic of WGBS, around 526 meters.

* * *

**I HAVE** made the loop as designed by Frank Freer in the May 16 issue of RADIO WORLD, and connected it to the antenna post of my set, finding that I do not get good results.—E. W. Link, 4914 Woodland Ave., Philadelphia, Pa.

Disconnect the coupling coil which is attached to the antenna and shunt the loop with a .0005 mfd. variable condenser, connecting the both ends of the loop to the present antenna post of the set. Ground to the ground post.

* * *

**WHENEVER** I try to add radio-frequency to any set I always fail. Could you tell me how to obtain success when adding RF to any set?—A. Richardson, Conklingville, N. Y.

Follow Herman Bernard's directions for the Diamond of the Air (April 4, 11 and 25.)

* * *

**I NOTE** that in the 1925 I-A portable, published in the March 28 issue of RADIO WORLD, the dimensions on the rotor and the stator of the coil seem erroneous.—W. Lehman, Gibbon, Minn.

Look at the template. Also see April 18 issue of RADIO WORLD.

* * *

**PLEASE** give a hook-up of a 2-step AF amplifier.—J. C. Carlton, Beacon, N. Y.

Fig. 154 shows the diagram.

* * *

**CAN THE** loop as described by Frank Freer in the May 2 issue of RADIO WORLD be used with great success on the Diamond of the Air?—Geo. Sassman, 811 E. Russell St., Philadelphia, Pa.

Yes.

* * *

**I HAVE** built the "Crystal Set That Gets DX," published in the Dec. 6 issue of RADIO WORLD, and get fine results on the high waves. Why can't I get the stations which are on low waves?—F. H. Quade, 706 Eashwood, Santa Ana, Cal.

In the May 16th issue the data that you request was published.

* * *

**WHERE CAN** I get a good book on the fundamentals of radio?—Wm. J. Todd, Ogden, Utah.

Send a note requesting all the pamphlets on the data that you want to the Superintendent of Documents, Government Printing Office, Washington, D. C., who will send you a list of the free pamphlets that they have, also the list of books for which charge is made.

* * *

**I AM** about to install a new antenna and would like to know if there is one that will reduce static and extraneous noises and also be simple to install.—B. C. Bohnan, Long Beach, Cal.

The Kane Antenna Co., Dept. W, Houquiam, Washington, makes just the thing you need. This can be purchased complete, with drawings and data as how to install for $14.

* * *

**WHEN** I put my finger on the plate and grid posts of the audio-frequency transformer I get a pronounced whistle. Could you please tell me how to cure this?—Louis Poster, 1070 Washington Ave., Bronx.

Place a .001 mfd. fixed condenser across the secondary of your first and second AFT.

* * *

**THE CONDENSER** which is shunted across the loop of my Super-Heterodyne is very broad in tuning.—Dr. F. Waitzfelder, 4224 Clayton Ave., Los Angeles, Cal.

Decrease the number of turns on your loop, also put a .001 mfd. fixed condenser across the loop.

* * *

**I HAVE** a milliameter in the plate circuit and it does not show any current flowing. Is this the correct way in which the set should work?—D. M. Piyor, Muzquz, Coat.

No. If there is no current flowing through the plate circuit you may be sure that the tube is not in working order, as the flow of current in the plate circuit is the important factor in determining the amplification factor of the tube. If you have the same amount of B battery on all your tubes, and all the tubes are of the same type, there is no reason that the meter should not show a flow of current of nearly equal strength in all tubes. It cannot be equal because there are always some physical differences in the plate construction (plate a bit larger or smaller) which change the flow of current, but not enough sometimes to be noticed unless you detect the least wiggle of the needle on the meter.

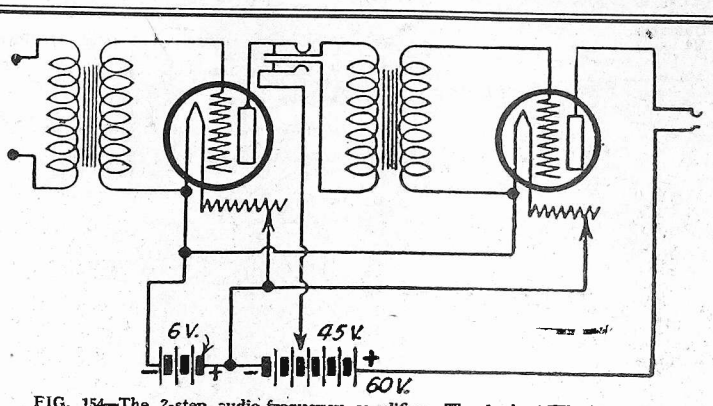



**FIG. 154—The 2-step audio-frequency amplifier. The both AFT should be of the low ratio type and matched, or the first high, the second low. UV201As are used with 6-ohm rheostats. A double-circuit jack is used for first step and a single-circuit jack last step (second audio). Note that the F of AFT is connected to the A— and not to A+. If the amplifier distorts, shunt a .001 mfd. condenser across primary winding of either or both AFT.**

**I HAVE** built the Benson Super-Heterodyne which was published in the March 7 edition, and have obtained good results as far as volume is concerned, but it is not selective. Could you help me out of this trouble?—A. A. Shore, 3216 Monument Ave., Philadelphia, Pa.

Reverse the secondary of the radio-frequency transformer. Decrease number of turns on loop or antenna. Ground the negative side of the A battery.

* * *

**WILL YOU** please give me the data on how to make a coupling coil for use with antenna in the Diamond of the Air, the circuit published in the April 4, 11 and 18 issues of RADIO WORLD?—P. Flynn, 2600-B. St. Urbain St., Montreal, Quebec, Canada.

Wind coil on a form 3" diameter tubing, with No. 23 DCC., 10 turns for primary, leave ¼", 50 turns for secondary, and shunt a .0005 mfd. variable condenser across secondary.

* * *

**COULD YOU** please state where I can purchase a complete list of parts for the Pressley Super-Heterodyne, which was published in the April 18 issue of RADIO WORLD. How much will these parts cost?—Elza Powell, 330 N. Oakland Ave., Indianapolis, Ind.

Write to the Wallace Radio Company, Inc., 135 Liberty St., New York City, and to the Superadio Co.

* * *

**REFERRING** to the radio receiver described by Brewster Lee in the May 16 issue of RADIO WORLD, would you please answer following questions:—1. Will it cover all wavelengths? 2. Can 23 plate condensers be used? 3. Can a 3½" tubing be used (2¾" for rotor)? 4. Can double cotton covered wire be used for winding coils? 5. Can this set be built on a 21" panel? 6. Give capacity of neutralizing condensers. 7. What should the ratio of the audio-frequency transformers be? 8. Can Pacant neutralizing condensers be used?—E. Crass, care Post Office, Paducah, Ky.

1, 2, 3, 4 and 5, the answers are yes. 6. Variable. 7. Both low, about 3-5 to 1. 8. Yes.

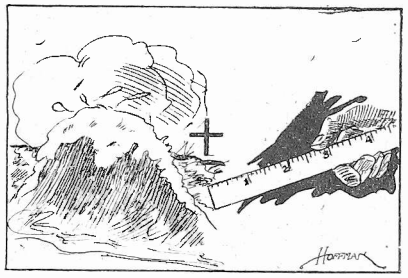
* * *

**I BUILT** the Diamond of the Air, and get no results. What is the trouble?—William Rossvelt, R.R. 3, Box 88, Santa Rosa, Cal.

Your question is too unspecific. There are at least 1,000 things that can be the matter with any set. See results letters of those who get wonderful results on this set. Test your tubes, batteries, wiring (for broken connections) and your audio transformers for shorts.

## The Weekly Rebus

WHAT does this Rebus represent? Send answer to Rebus Editor, RADIO WORLD, 1493 Broadway, New York City. The names of those sending in the solution will be published.



T. Heyward Brown, 1133 Euclid St., N. W. Washnigton, D. C.
Max Greenhut, 99 Avenue C, N. Y. C.
Gail Eaton, 231 Harvard St., Houston, Tex.
Isidore Weiss, 608 East 9th St., N. Y. C.
A. Saroky, P. O. Box 211, Station A, San Antonio, Tex.
James Moran, 910 W. Pine, Enid, Oklahoma.
V. T. Olson, 615 Florence St., Turlock, Cal.
Harry Henderson, Macomb, Ill.
T. B. Pinyown, 3846 Mayfield Rd., Cleveland Heights, O.

## Join RADIO WORLD'S University Club

**and we will enter your name on our subscription and University lists by special number. Put this number on the outside of your envelope addressed to RADIO WORLD (not the enclosed return envelope) and also put it in your queries and the questions will be answered the same day as received.**

**And Get Free Question and Answer Service for the Coming 52 Weeks.**

**RADIO WORLD, 1493 Broadway, New York City:**

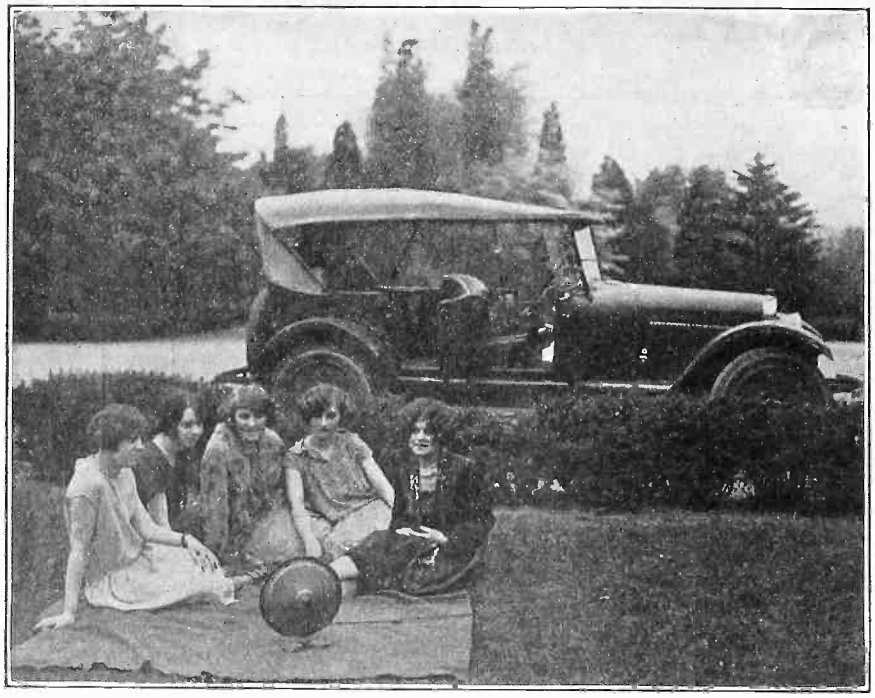
**Enclosed find $6.00 for RADIO WORLD for one year (52 Nos.) and also consider this an application to join RADIO WORLD'S University Club, which gives me free information in your Radio University Department for the coming year, and a number indicating my membership.**

**Name** .....

**Street** .....

**City and State** .....

# Call of the Great Outdoors



VACATION TIME raises the question of how best to employ a portable receiver. Top photo shows the storage battery of an auto used to light the tubes. A loop is in the lid, the batteries in the cabinet in the lower photo. (Foto Topics).

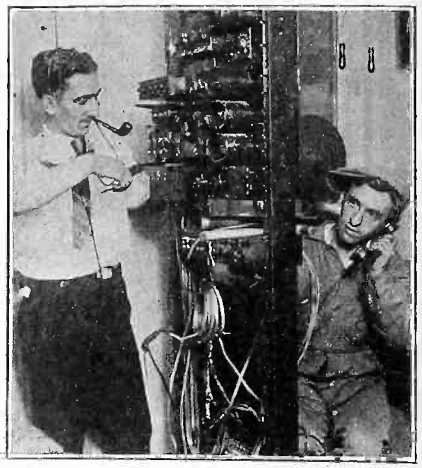
## Sunlight Radio a Lure

ALTHOUGH sunlight reception is not as good as listening in at night, radio sets have advanced so far that they are very practical under the hottest sun. The light rays ionize the air, making it somewhat of a conductor, so that the energy of radio waves is partly dissipated. Therefore a successful portable should be a sensitive receiver for satisfactory results.

A loop will do very well, although at least four tubes must be used for successful speaker operation without reflex. This includes regeneration in the RF or detector stage. Otherwise six tubes are needed, else a reflex arrangement.

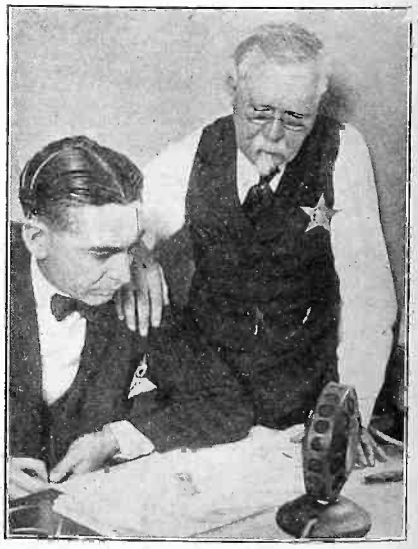
A loop is handier than an outdoor open-end antenna for portable use.

# New Station



GETTING ready for WRNY, "Radio News" station, N. Y. C., sparring for shortest broadcast wavelength. (Foto Topics)

THIS 40-ounce bottle is a crystal set panel and cabinet. (Gilliams)



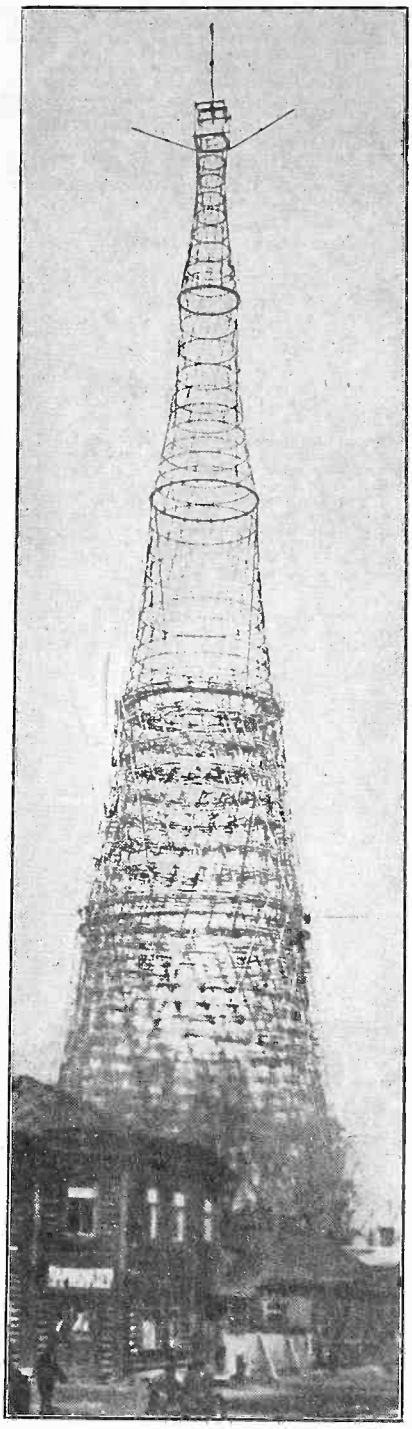
EMMET EVANS and Capt. M. P. Evans of the Bureau of Identification, Police Department, Chicago, Ill., use the radio to catch criminals. (Underwood & Underwood)

# Memorial to Victor Herbert

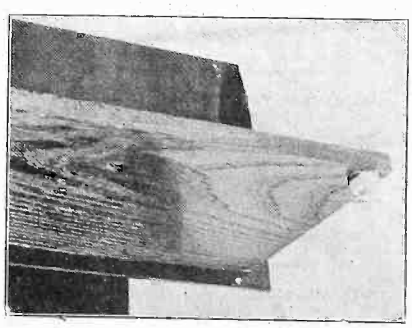
ONE OF THE BEST radio programs in the four years of broadcasting was rendered by artists at the Ritz-Carlton Hotel, New York City, in a memorial one year after the death of Victor Herbert, America's greatest composer. Fritzi Scheff (center) sang, "Kiss Me Again" almost as well as a generation ago, when she and the song made a mutual hit. Graham McNamee, third from left, rear, announced at WEAF. To his left is Paul Whiteman, whose orchestra played the Spanish suite specially composed by Mr. Herbert. Fred Stone (right, front) sang a song from "The Red Mill." Beside him is Dorothy Stone. Silvio Hein was master of ceremonies and Nahan Franko directed his own orchestra in Herbert music. (Foto Topics)

A DEMONSTRATION at Police Headquarters, New York City, connected by land line to station WNYC. The radio signalling device is shown in transmission work. When the key of the signalling device is closed a signal is flashed to all of the police stations and traffic booths throughout the city, which are equipped with receiving sets that are then tuned to WNYC's wave. This rapid means of communication is intended to help the police in watching and capturing automobile bandits. (International Newsreel)

# Russian Tower



NOT a pagoda, but the tower of a broadcasting station in Moscow. (Wide World)



A FOOT under the baseboard prevents it from sagging. (Hayden)

# THE KEY TO THE AIR

## KEY

Abbreviations; E. S. T., Eastern Standard Time; C. S. T., Central Standard Time; M. S. T., Mountain Standard Time; P. S. T., Pacific Standard Time; D. S., Daylight Saving Time.

How to tune in a desired distant station at just the right time—Choose your station from the list published herewith. See what time division the station is under (E. S. T., C. S. T., etc.); then consult the table below. Add to or subtract, as directed from the time as given on the PROGRAM. The result will be the same BY YOUR CLOCK that you should tune in, unless daylight saving time intervenes, as explained below.—The table:

| *If you are in* | *And want a station in* | *Subtract* | *Add* |
|---|---|---|---|
| E. S. T. | C. S. T. | .. | 1 hr. |
| E. S. T. | M. S. T. | .. | 2 hrs. |
| E. S. T. | P. S. T. | .. | 3 hrs. |
| C. S. T. | E. S. T. | 1 hr. | .. |
| C. S. T. | M. S. T. | .. | 1 hr. |
| C. S. T. | P. S. T. | .. | 2 hrs. |
| M. S. T. | E. S. T. | 2 hrs. | .. |
| M. S. T. | C. S. T. | 1 hr. | .. |
| M. S. T. | P. S. T. | .. | 1 hr. |
| P. S. T. | E. S. T. | 3 hrs. | .. |
| P. S. T. | C. S. T. | 2 hrs. | .. |
| P. S. T. | D. S. T. | 1 hr. | .. |

If you are under Daylight Saving Time, and the station you want is under that time, too, if both are under Standard Time, the above table will hold.

If you are under Daylight Saving Time, and the stations operates under Standard Time, add one hour to the table result.

If the station uses Daylight Saving Time, and you are under Standard Time, subtract one hour from the table result.

### FRIDAY

WAAM, Newark, N. J., 263 (E. S. T., D. S.) —11 A. M. to 12.

WAHG, Richmond Hill, N. Y., 316 (E. S. T., D. S.)—12 to 1:05 P. M.; 8 to 12 P. M.

WAMD, Minneapolis, Minn., 243.8 (C. S. T.)— 12 to 1 P. M.; 10 to 12.

WBBM, Chicago, Ill., 226 (C. S. T.)—8 to 10 P. M.

WBBR, New York City, 272.6 (E. S. T., D. S.) —8 P. M. to 10.

WBZ, Springfield, Mass., 333.1 (E. S. T., D. S.) —6 P. M. to 11.

WCCO, St. Paul and Minneapolis, Minn., 416.4 (C. S. T.)—9:30 A. M. to 12 M.; 1:30 to 4; 5:30 to 10.

WCAE, Pittsburgh, Pa., 461.3 (E. S. T., D. S.) —12:30 to 1:30 P. M.; 4:30 to 5:30; 6:30 to 11.

WDAF, Kansas City, Kansas, 365.6 (C. S. T.)— 3:30 to 7 P. M.; 8 to 10; 11:45 to 1 A. M.

WEAF, New York City, 492 (E. S. T., D. S.) —6:45 A. M. to 7:45; 11 to 12; 4 P. M. to 5; 6 to 12.

WEAR, Cleveland, O., 390 (E. S. T.)—11:30 A. M. to 12:10 P. M.; 3:30 to 4:10; 8 to 11.

WEAO, Ohio State University, 293.9 (E. S. T.) —8 P. M. to 10.

WEEI, Boston, Mass., 476 (E. S. T., D. S.)— 6:45 A. M. to 7:45; 2 P. M. to 3:15; 5:30 to 10.

WEMC, Berrien Springs, Mich., 286 (C. S. T.)— 9 P. M. to 11.

WFAA, Dallas, Texas, 475.9 (C. S. T.)—10:30 A. M. to 11:30; 12:30 P. M. to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30.

WGBS, New York City, 316 (E. S. T., D. S.) —10 A. M. to 11; 1:30 P. M. to 4; 6 to 11.

WGES, Chicago, Ill., 250 (C. S. T., D. S.)— 5 P. M. to 7; 10:30 to 1 A. M.

WGN, Chicago, Ill., 370 (C. S. T.)—9:31 A. M. to 3:30 P. M.; 5:30 to 11:30.

WGR, Buffalo, N. Y., 319 (E. S. T., D. S.)— 12 M. to 12:45 P. M.; 7:30 to 11.

WGST, Atlanta, Ga., 270 (C. S. T.)—7 P. M. to 8.

WGY, Schenectady, N. Y., 379.5 (E. S. T.)— 1 P. M. to 2; 5:30 to 10:30.

WHAD, Milwaukee, Wis., 275 (C. S. T.)—11 A. M. to 11:30; 6 P. M. to 8.

WHAS, Louisville, Ky., 399.8 (C. S. T.)—4 P. M. to 5; 7:30 to 9.

WHN, New York City, 360 (E. S. T., D. S.) —12:30 P. M. to 1; 2:15 to 5; 7 to 11; 12 to 12:30 A. M.

WHO, Des Moines, Iowa, 526 (C. S. T.)—7:30 P. M. to 9; 11 to 12; 12:30 to 1:30; 4:30 to 5:30; 6:30 to 9:30.

WIP, Philadelphia, Pa., 508.2 (E. S. T., D. S.) —7 A. M. to 8; 1 P. M. to 2; 3 to 4:50; 6 to 8.

WJY, New York City, 405 (E. S. T., D. S.)— 7:30 P. M. to 11:30.

WJZ, New York City, 455 (E. S. T., D. S.— 10 A. M. to 11; 1 P. M. to 2; 4 to 6; 7 to 10:30.

WLIT, Philadelphia, Pa., 395 (E. S. T.)—12:02 P. M. to 12:30; 2 to 3; 4:30 to 6; 7:30 to 1 A. M.

WLW, Cincinnati, O., 422.3 (E. S. T.)—10:45 A. M. to 12:15; 1:30 P. M. to 2:30.

WMCA, New York City, 341 (E. S. T., D. S.)— 3 P. M. to 5; 6:30 to 7:30; 8:15 to 8:20; 9 to 10:15; 11 to 11:30.

WNYC, New York City, 526 (E. S. T., D. S.— —3:45 P. M. to 4:45; 6:20 to 11.

WOAW, Omaha, Neb., 526 (C. S. T.)—12:30 P. M. to 1; 5:45 to 7:10; 9 to 11.

WOC, Davenport, Iowa, 484 (C. S. T.)—12:57 P. M. to 2; 3 to 3:30; 5:45 to 12.

WOR, Newark, N. J., 405 (E. S. T., D. S.)— 6:45 A. M. to 7:45; 2:30 P. M. to 4; 6:15 to 7.

WPAK, Fargo, N. D., 283 (C. S. T.)—7:30 P. M. to 9.

WPG, Atlantic City, N. J., 299.8 (E. S. T., D. S.) —7 P. M. to 8:30; 10 to 12.

WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M. to 12M.; 3 P. M. to 4; 7 to 8; 10 to 2 A. M.

WRC, Washington, D. C., 469 (E. S. T.)—4:30 P. M. to 5; 6:45 to 12.

KDKA, Pittsburgh, Pa., 309 (E. S. T.)—6 A. M. to 7; 9:45 to 12:20 P. M.; 1:30 to 3:20; 5:30 to 11.

KFAE, State College of Wash., 348.6 (P. S. T.) —7:30 P. M. to 9.

KFDY, Brookings, S. D., 273 (M. S. T.)—8 P. M. to 9.

KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M. to 10.

KFKX, Hastings, Neb., 288.3 (C. S. T.)—12:30 P. M. to 1:30; 9:30 to 12.

KFNF, Shenandoah, Iowa, 266 (C. S. T.)—12:15 P. M. to 1:15; 3 to 4; 6:30 to 10.

KFOA, Seattle, Wash., 455 (P. S. T.)—12:30 P. M. to 1:30; 4 to 5:15; 6 to 11.

KGO, Oakland, Cal., 361.2 (P. S. T.)—11:10 A. M. to 1 P. M.; 1:30 to 3; 4 to 7.

KGW, Portland, Oregon, 491.5 (P. S. T.)—11:30 A. M. to 1:30 P. M.; 5 to 11.

KHJ, Los Angeles, Cal., 405.2 (P. S. T.)—7 A. M. to 7:15; 12 M. to 3:30 P. M.; 5:30 to 11:30.

KNX, Hollywood, Cal., 337 (P. S. T.)—11:30 A. M. to 12:30 P. M.; 1 to 2; 4 to 5; 6:30 to 12.

KOB, State College of New Mexico, 348.6 (M. S. T.)—11:55 A. M. to 12:30 P. M.; 7:30 to 8:30; 9:55 to 10:10.

KPO, San Francisco, Cal., 429 (P. S. T.)—7:30 A. M. to 8; 10:30 to 12 M.; 1 P. M. to 2; 4:30 to 11.

KSD, St. Louis, Mo., 545.1 (C. S. T.)—4 P. M. to 5.

KTHS, Hot Springs, Ark., 374.8 (C. S. T.)— 12:30 P. M. to 1; 8:20 to 10.

KYW, Chicago, Ill., 536 (C. S. T., D. S.)— 6:30 A. M. to 7:30; 10:55 to 1 P. M.; 2:25 to 3:30; 6:02 to 7:20; 9 to 1:30 A. M.

CNRA, Moncton, Canada, 313 (E. S. T.)—8:30 P. M. to 10:30.

CNRE, Edmonton, Canada, 516.9 (M. S. T.)— 8:30 P. M. to 10:30.

CNRS, Saskatoon, Canada, 400 (M. S. T.)—2:30 P. M. to 3.

CNRT, Toronto, Canada, 357 (E. S. T.)—6:30 P. M. to 11.

### SATURDAY

WAAM, Newark, N. J., 263 (E. S. T.)—7 P. M. to 11.

WAHG, Richmond Hill, N. Y., 316 (E. S. T., D. S.)—12 M. to 2 A. M.

WAMD, Minneapolis, Minn., 243.8 (C. S. T.)— 12 M. to 1 P. M.; 10 to 12.

WBBM, Chicago, Ill., 226 (C. S. T.)—8 P. M. to 1 A. M.

WBBR, New York City, 272.6 (E. S. T., D. S.) —8 P. M. to 9.

WBZ, Springfield, Mass., 333.1 (E. S. T., D. S.) —11 A. M. to 12:30 P. M.; 7 to 9.

WCAE, Pittsburgh, Pa., 461.3 (E. S. T., D. S.) —10:45 A. M. to 12 M.; 3 P. M. to 4; 6:30 to 7:30.

WCBD, Zion, Ill., 344.6 (C. S. T.)—8 P. M. to 10.

WCCO, St. Paul and Minneapolis, Minn., 416.4 (C. S. T.)—9:30 A. M. to 12:30 P. M.; 2:30 to 5; 6 to 10.

WEAF, New York City, 492 (E. S. T., D. S.)— 6:45 A. M. to 7:45; 4 P. M. to 5; 6 to 12.

WEEI, Boston, Mass., 476 (E. S. T., D. S.)— 6:45 A. M. to 7 A. M.

WEAR, Cleveland, O., 390 (E. S. T.)—11:30 A. M. to 12:10 P. M.; 3:30 to 4:10; 7 to 8.

WEMC, Berrien Springs, Mich., 286 (C. S. T.) —11 A. M. to 12:30 P. M.; 8:15 to 11.

WFAA, Dallas, Texas, 475.9 (C. S. T.)—12:30 P. M. to 1; 6 to 7; 8:30 to 9:30; 11 to 12:30 A. M.

WGBS, New York City, 316 (E. S. T., D. S.)— 10 A. M. to 11; 1:30 P. M. to 3; 6 to 12.

WGN, Chicago, Ill., 370 (C. S. T.)—9:31 A. M. to 2:30 P. M.; 3 to 5:57; 6 to 11:30.

WGR, Buffalo, N. Y., 319 (E. S. T., D. S.)— 12 M. to 12:45 P. M.; 2:30 to 4:30; 7:30 to 8.

WGY, Schenectady, N. Y., 379.5 (E. S. T.)—7:30 P. M. to 10.

WHAD, Milwaukee, Wis., 275 (C. S. T.)—11 A. M. to 11:30; 6 P. M. to 8.

WHAS, Louisville, Ky., 399.8 (C. S. T.)—4 P. M. to 5; 7:30 to 9.

WHN, New York City, 360 (E. S. T., D. S.)— 2:15 P. M. to 5; 7:30 to 10.

WHO, Des Moines, Iowa, 526 (C. S. T.)—11 A. M. to 12:30 P. M.; 4 to 5:30; 7:30 to 8:30.

WIP, Philadelphia, Pa., 508.2 (E. S. T., D. S.)— 7 A. M. to 8; 10:20 to 11; 1 P. M. to 2; 3 to 4; 6 to 11:30.

WJY, New York City, 405 (E. S. T., D. S.)— 2:30 P. M. to 5; 8 to 10:30.

WJZ, New York City, 455 (E. S. T., D. S.)— 9 A. M. to 12:30 P. M.; 2:30 to 4; 7 to 10.

WKRC, Cincinnati, O., 326 (E. S. T.)—10 to 12 M.

WLW, Cincinnati, O., 422.3 (E. S. T.)—9:30 A. M. to 12:30 P. M.; 7:30 to 10.

WMAK, Lockport, N. Y., 265.5 (E. S. T.)— 10:25 A. M. to 12:30 P. M.

WMC, Memphis, Tenn., 499.7 (E. S. T.)—7:30 P. M. to 10.

WMCA, New York City, 341 (E. S. T., D. S.) —3 P. M. to 3:15; 3:30 to 5; 8 to 8:15; 8:30 to 8:45; 11 P. M. to 1 A. M.

WNYC, New York City, 526 (E. S. T., D. S.)— 1 P. M. to 3; 7 to 11.

WOAW, Omaha, Neb., 526 (C. S. T.)—9 A. M. to 11; 2:15 P. M. to 4; 9 to 11.

WOC, Davenport, Iowa, 484 (C. S. T.)—12:57 P. M. to 2; 5:45 to 7:10; 9 to 12.

WOO, Philadelphia, Pa., 508.2 (E. S. T., D. S.) —11 A. M. to 1 P. M.; 4:40 to 5; 10:55 to 11:02.

WOR, Newark, N. J., 405 (E. S. T., D. S.)— 6:45 A. M. to 7:45; 2:30 P. M. to 4; 6:15 to 7:30; 8 to 11.

WPG, Atlantic City, N. J., 299.8 (C. S. T.)— 7 P. M. to 12.

WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M. to 12 M.; 3 P. M. to 4; 7 to 8; 10 to 3 A. M.

WRC, Washington, D. C., 469 (E. S. T.)—4:30 to 5:30 P. M.; 6:45 to 12.

WWJ, Detroit, Mich., 352.7 (E. S. T.)—11 A. M. to 12:30 P. M.; 2 to 3; 7:20 to 10:30.

KDKA, Pittsburgh, Pa., 309 (E. S. T.)—10 A. M. to 12:30 P. M.; 1:30 to 6:30; 8:45 to 10.

KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M. to 11.

KFKX, Hastings, Neb., 288.3 (C. S. T.)—12:30 P. M. to 1:30; 9:30 to 12:30.

KFNF, Shenandoah, Iowa, 266 (C. S. T.)—12:15 P. M. to 1:15; 3 to 4; 6:30 to 10:30.

KFOA, Seattle, Wash., 455 (P. S. T.)—Silent.

KGO, Oakland, Cal., 361.2 (P. S. T.)—11 A. M. to 12:30 P. M.; 3:30 to 5:45; 7:30 to 9.

KGW, Portland, Oregon, 491.5 P. S. T.)—11:30 A. M. to 1:30 P. M.; 6 to 7; 10 to 11.

KHJ, Los Angeles, Cal., 405.2 (E. S. T., D. S.)— 7 A. M. to 7:30; 10 to 1:30 P. M.; 2:30 to 3:30; 5:30 to 2 A. M.

KNX, Hollywood, Cal., 337 (P. S. T.)—1 P. M. to 2; 6:30 to 2 A. M.

KOA, Denver, Colo., 322.4 (M. S. T.)—11:30 A. M. to 1 P. M.; 7 to 10.

KPO, San Francisco, Cal., 429 (P. S. T.)—8 A. M. to 12 M.; 2 P. M. to 3; 6 to 10.

KSD, St. Louis, Mo., 545.1 (C. S. T.)—7 P. M. to 8:30.

KTHS, Hot Springs, Ark., 374.8 (C. S. T.)— 12:30 P. M. to 1; 8:30 to 10:30.

KYW, Chicago, Ill., 536 (C. S. T., D. S.)—11 A. M. to 12:30 P. M.; 4 to 5; 7 to 8.

CKAC, Montreal, Canada, 411 (E. S. T.)—4:30 P. M. to 5:30.

CNRO, Ottawa, Ontario, Canada, 435 (E. S. T.) —7:30 P. M. to 10.

PWX, Havana, Cuba, 400 (E. S. T.)—8:30 P. M. to 11:30.

### SUNDAY

WBBM, Chicago, Ill., 226 (C. S. T.)—4 P. M. to 6; 8 to 10.

WBBR, New York City, 272.6 (E. S. T., D. S.)— 10 A. M. to 12 M., 9 P. M. to 11.

WCCO, St. Paul and Minneapolis, Minn., 416.4 (C. S. T.)—11 A. M. to 12:30 P. M.; 4:10 to 5:10; 7:20 to 10.

WDAF, Kansas City, Kansas, 365.6 (C. S. T.)— 4 P. M. to 5:30.

WEAF, New York City, 492 (E. S. T., D. S.)— 3 P. M. to 5; 7:20 to 10:15.

WEAR, Cleveland, O., 390 (E. S. T.)—3:30 P. M. to 5; 7 to 8; 9 to 10.

WGBS, New York City, 316 (E. S. T., D. S.)— 3:30 P. M. to 4:30; 9:30 to 10:30.

WGN, Chicago, Ill., 370 (C. S. T.)—11 A. M. to 12:45 P. M.; 2:30 to 5; 9 to 10.

WGR, Buffalo, N. Y., 319 (E. S. T., D. S.)— 3 P. M. to 4; 7:15 to 8.

WGY, Schenectady, N. Y., 379.5 (E. S. T.)— 9:30 A. M. to 12:30 P. M.; 2:35 to 3:45; 6:30 to 10:30.

WHAD, Milwaukee, Wis., 275 (C. S. T.)—2 P. M. to 3.

WHN, New York City, 360 (E. S. T., D. S.)— 1 P. M. to 1:30; 3 to 6; 10 to 12.

WIP, Philadelphia, Pa., 508.2 (E. S. T., D. S.) —10:45 A. M. to 12:30 P. M.; 3:30 to 4:30.

WKRC, Cincinnati, O., 326 (E. S. T.)—6:45 P. M. to 11.

WNYC, New York City, 526 (E. S. T., D. S.)— 9 P. M. to 11.

WPG, Atlantic City, N. J., 299.8 (C. S. T., D. S.) —3:15 P. M. to 5; 9 to 11.

WQJ, Chicago, Ill., 448 (C. S. T.)—10:30 A. M. to 12:30 P. M.; 3 P. M. to 4; 8 to 10.

KDKA, Pittsburgh, Pa., 309 (E. S. T.)—9:45 A. M. to 10:30; 11:55 to 12 M.; 2:30 P. M. to 5:30; 7 to 11.

KFNF, Shenandoah, Iowa, 266 (C. S. T.)—10:45 A. M. to 12:30 P. M.; 2:30 to 4:30; 6:30 to 10.

KOA, Denver, Col., 322.4 (M. S. T.)—10:55 A. M. to 12 M.; 4 P. M. to 5:30 P. M.; 7:45 P. M. to 10 P. M.

KGW, Portland, Oregon, 491.5 (P. S. T.)—10:30 A. M. to 12:30 P. M.; 6 to 9.

KHJ, Los Angeles, Cal., 405.2 (E. S. T., D. S.) —10 A. M. to 12:30 P. M.; 6 to 9.

KTHS, Hot Springs, Ark., 374.8 (C. S. T.)— 11 A. M. to 12:30 P. M.; 2:30 to 3:40; 8:40 to 11.

### MONDAY

WAAM, Newark, N. J., 263 (E. S. T., D. S.) —11 A. M. to 12 M.; 7 P. M. to 11.

WAHG, Richmond Hill, N. Y., 316 (E. S. T., D. S.)—12 M. to 1:05 P. M.; 8 to 2 A. M.

WAMB, Minneapolis, Minn., 243.8 (C. S. T)— 10 P. M. to 12.

WBBM, Chicago, Ill., 226 (C. S. T.)—6 P. M. to 7.

WBBR, New York City, 272.6 (E. S. T., D. S.) —8 P. M. to 9.

WBZ, Springfield, Mass., 333.1 (E. S. T., D. S.) —6 P. M. to 11:30.

WCAE, Pittsburgh, Pa., 461.3 (E. S. T., D. S.)— 12:30 P. M. to 1:30; 4:30 to 5:30; 6:30 to 12.

WCBD, Zion, Ill., 344.6 (C. S. T.)—8 P. M. to 10.

WCCO, St. Paul and Minneapolis, Minn., 416.4 (C. S. T.)—9:30 A. M. to 12 M.; 1:30 P. M. to 6:15; 8 to 10.

WDAF, Kansas City, Kansas, 365.6 (C. S. T.)— 3:30 P. M. to 7; 8 to 10; 11:45 to 1 A. M.

WEAF, New York City, 492 (E. S. T., D. S.)— 6:45 A. M. to 7:45; 4 P. M. to 5; 6 to 11:30.

WEAR, Cleveland, O., 390 (E. S. T.)—11:30 A. M. to 12:10 P. M.; 3:30 to 4:10; 7 to 8.

WEEI, Boston, Mass., 476 (E. S. T., D. S.)— 6:45 A. M. to 8; 3 P. M. to 4; 5:30 to 10.

WEMC, Berrien Springs, Mich., 286 (C. S. T.)— 8:15 P. M. to 11.

WFAA, Dallas, Texas, 475.9 (C. S. T.)—10:30 A. M. to 11:30; 12:30 P. M. to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30.

WGBS, New York City, 316 (E. S. T., D. S.) —10 A. M. to 11; 1:30 P. M. to 3:10; 6 to 7:30.

WGES, Chicago, Ill., 250 (C. S. T., D. S.)— 5 P. M. to 8.

WGN, Chicago, Ill., 370 (C. S. T.)—9:31 A. M. to 3:30 P. M.; 5:30 to 5:57.

WGR, Buffalo, N. Y., 319 (E. S. T., D. S.)— 12 M. to 12:30 P. M.; 2:30 to 4:30; 7:30 to 11.

WGST, Atlanta, Ga., 270 (C. S. T.)—9 P. M. to 10.

WGY, Schenectady, N. Y., 379.5 (E. S. T.)—1 P. M. to 2; 5:30 to 8:30.

WHAD, Milwaukee, Wis., 275 (C. S. T.)—11 A. M. to 11:30; 6 P. M. to 10:30.

WHAS, Louisville, Ky., 399.8 (C. S. T.)—4 P. M. to 5; 7:30 to 9.

WHN, New York City, 360 (E. S. T., D. S.)—2:15 P. M. to 5; 6:30 to 12.
WHO, Des Moines, Iowa, 526 (C. S. T.)—12:15 P. M. to 1:30; 7:30 to 9; 11:15 to 12.
WIP, Philadelphia, Pa., 508.2 (E. S. T., D. S.)—7 A. M. to 8; 1 P. M. to 3; 5 to 8.
WJZ, New York City, 455 (E. S. T., D. S.)—10 A. M. to 11; 1 P. M. to 2; 4 to 5:30; 6 to 6:30; 7 to 11.
WKRC, Cincinnati, O., 326 (E. S. T.)—8 P. M. to 10.
WLIT, Philadelphia, Pa., 395 (E. S. T.)—12:02 P. M. to 1; 3 to 3; 4:30 to 6; 7:30 to 11:30.
WPAK, Fargo, N. D., 283 (C. S. T.)—7:30 P. M. to 9.
WLW, Cincinnati, O., 422.3 (E. S. T.)—10:45 A. M. to 12:15 P. M.; 1:30 to 2:30; 3 to 5; 6 to 10.
WMAK, Lockport, N. Y., 285.5 (E. S. T.)—8 P. M. to 12.
WNYC, New York City, 526 (E. S. T., D. S.)—3:15 P. M. to 4:15; 6:20 to 11.
WOAW, Omaha, Neb., 526 (C. S. T.)—12:30 P. M. to 1:30; 5:45 to 10:30.
WOC, Davenport, Iowa, 484 (C. S. T.)—12:57 P. M. to 2; 3 to 3:30; 5:45 to 6.
WOO, Philadelphia, Pa., 508.2 (E. S. T., D. S.)—11 A. M. to 1 P. M.; 4:40 to 6; 7:30 to 11.
WOR, Newark, N. J., 405 (E. S. T., D. S.)—6:45 A. M. to 7:45; 2:30 to 4; 6:15 to 11:30.
WPG, Atlantic City, N. J., 299.8 (E. S. T., D. S.)—7 P. M. to 11.
WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M. to 12 M.; 3 P. M. to 4.
WRC, Washington, D. C., 469 (E. S. T.)—1 P. M. to 2; 4 to 6.
KDKA, Pittsburgh, Pa., 309 (E. S. T.)—6 A. M. to 7; 9:45 to 12:15 P. M.; 2:30 to 3:20; 5:30 to 10.
KFAE, State College of Wash., 348.6 (P. S. T.)—7:30 P. M. to 9.
KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M. to 11.
KFKX, Hastings, Neb., 288.3 (C. S. T.)—12:30 P. M. to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 266 (C. S. T.)—12:15 P. M. to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (P. S. T.)—12:45 P. M. to 1:30; 4 to 5:15; 6 to 10.
KGO, Oakland, Cal., 361.2 (P. S. T.)—9 A. M. to 10:30; 11:30 A. M. to 1 P. M.; 1:30 to 6; 6:45 to 7; 8 to 1 A. M.
KGW, Portland, Oregon, 491.5 (P. S. T.)—11:30 A. M. to 1:30; 5 to 8.
KHJ, Los Angeles, Cal., 405.2 (P. S. T.)—7 A. M. to 7:15; 12 M. to 1:30 P. M.; 5:30 to 10.
KNX, Hollywood, Cal., 337 (P. S. T.)—12 M. to 1 P. M.; 4 to 5; 6:30 to 12.
KOB, State College of New Mexico, 348.6 (M. S. T.)—11:55 A. M. to 12:30 P. M.; 7:30 to 8:30; 9:55 to 10:10.
KPO, San Francisco, Cal., 429 (P. S. T.)—10:30 A. M. to 12 M.; 1 P. M. to 3; 3:30 to 3:30; 4:30 to 10.
KSD, St. Louis, Mo., 545.1 (C. S. T.)—7:30 P. M. to 10.
KTHS, Hot Springs, Ark., 374.8 (C. S. T.)—12:30 P. M. to 1; 8:30 to 10.30.
KYW, Chicago, Ill., 536 (C. S. T., D. S.)—6:30 A. M. to 7:30; 10:55 to 1 P. M.; 2:15 to 3:30; 6:02 to 7.

TUESDAY

WAAM, Newark, N. J., 263 (E. S. T., D. S.)—11 A. M. to 12 M.; 7 P. M. to 11.
WAHG, Richmond Hill, N. Y., 316 (E. S. T., D. S.)—12 P. M. to 1:05 A. M.
WAMD, Minneapolis, Minn., 243.8 (C. S. T.)—12 M. to 1 P. M.; 10 to 12.
WBBM, Chicago, Ill., 226 (C. S. T.)—8 P. M. to 12.
WBZ, Springfield, Mass., 333.1 (E. S. T., D. S.)—6 P. M. to 11.
WCAE, Pittsburgh, Pa., 461.3 (E. S. T., D. S.)—12:30 P. M. to 1:30; 4:30 to 5:30; 6:30 to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (C. S. T.)—9:30 A. M. to 12 M.; 1:30 to 4; 5:30 to 11.
WDAF, Kansas City, Kansas, 365.6 (C. S. T.)—3:30 P. M. to 7; 11:45 to 1 A. M.
WEAF, New York City, 492 (E. S. T., D. S.)—6:45 A. M. to 7:45; 11 to 12 M.; 4 P. M. to 5; 6 to 12.
WEAR, Cleveland, O., 390 (E. S. T.)—11:30 A. M. to 12:10 P. M.; 7 to 10; 10 to 11.
WEEI, Boston, Mass., 476 (E. S. T., D. S.)—6:45 A. M. to 8; 1 P. M. to 2; 6:30 to 10.
WFAA, Dallas, Texas, 475.9 (C. S. T.)—10:30 A. M. to 11:30; 12:30 P. M. to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30; 11 to 12.
WGES, Chicago, Ill., 250 (C. S. T., D. S.)—5 P. M. to 8; 10:30 to 1 A. M.
WGN, Chicago, Ill., 370 (C. S. T.)—9:31 A. M. to 3:30 P. M.; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (E. S. T., D. S.)—12 M. to 1; 3 to 3; 4:30 to 6; 7:30 to 11:30.
WGY, Schenectady, N. Y., 379.5 (C. S. T.)—10:30 A. M. to 11:30; 12:30 P. M. to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30; 11 to 12.
WGBS, New York City, 316 (E. S. T., D. S.)—10 A. M. to 11; 1:30 P. M. to 3; 6 to 11:30.
WGES, Chicago, Ill., 250 (C. S. T., D. S.)—5 P. M. to 8; 10:30 to 1 A. M.
WGN, Chicago, Ill., 370 (C. S. T.)—9:31 A. M. to 3:30 P. M.; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (E. S. T., D. S.)—11 A. M. to 12:45 P. M.; 2:30 to 4:30; 6:30 to 11.
WGY, Schenectady, N. Y., 379.5 (C. S. T.)—5:30 P. M. to 11:30.
WHAD, Milwaukee, Wis., 275 (C. S. T.)—11 A. M. to 11:30; 6 P. M. to 8.
WHAS, Louisville, Ky., 399.8 (C. S. T.)—4 P. M. to 5; 7:30 to 9.
WHN, New York City, 360 (E. S. T., D. S.)—12:30 P. M. to 1; 2:15 to 3:15; 4 to 5:30; 7:30 to 10:45; 11:30 to 12:30 A. M.
WHO, Des Moines, Iowa, 526 (C. S. T.)—12:15 P. M. to 1:30; 7:30 to 9; 11 to 12.
WIP, Philadelphia, Pa., 508.2 (E. S. T., D. S.)—6 P. M. to 2; 3 to 4:50; 6 to 11.
WJY, New York City, 405 (E. S. T., D. S.)—7:30 P. M. to 1:30.
WJZ, New York City, 455 (E. S. T., D. S.)—10 A. M. to 11; 1 P. M. to 2; 4 to 6; 7 to 11.
WKRC, Cincinnati, O., 326 (E. S. T.)—8 P. M. to 12.
WLIT, Philadelphia, Pa., 395 (E. S. T.)—11 A. M. to 12:30 P. M.; 2 to 3; 4:30 to 7.
WLW, Cincinnati, O., 422.3 (E. S. T.)—10:45 A. M. to 1 P. M.; 1:30 to 2:30; 3 to 5; 6 to 11.
WNYC, New York City, 526 (E. S. T., D. S.)—3:45 P. M. to 5; 6:50 to 11.
WOAW, Omaha, Neb., 526 (C. S. T.)—12:30 P. M. to 1:30; 5:45 to 11.
WOC, Davenport, Iowa, 484 (C. S. T.)—12:57 P. M. to 2; 3 to 3:30; 5:45 to 10.
WOO, Philadelphia, Pa., 508.2 (E. S. T., D. S.)—11 A. M. to 1 P. M.; 4:40 to 5; 10:55 to 11:02.
WOR, Newark, N. J., 405 (E. S. T., D. S.)—6:45 A. M. to 7:45; 2:30 P. M. to 4; 6:15 to 7:30.
WPG, Atlantic City, N. J., 299.8 (E. S. T., D. S.)—7 P. M. to 11.
WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M. to 12 M.; 3 P. M. to 4; 7 to 8; 10 to 2 A. M.
WRC, Washington, D. C., 469 (E. S. T.)—1:30 P. M. to 5:30; 6:45 to 11.
KDKA, Pittsburgh, Pa., 309 (E. S. T.)—9:45 P. M. to 12 M.; 1:30 P. M. to 3:20; 5:30 to 10:45.
KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M. to 11.
KFKX, Hastings, Neb., 288.3 (C. S. T.)—12:30 P. M. to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFOA, Seattle, Wash., 455 (P. S. T.)—12:30 P. M. to 1:30; 4 to 5:15; 6 to 11.
KGO, Oakland, Cal., 361.2 (P. S. T.)—11:30 A. M. to 1 P. M.; 1:30 to 3; 4 to 6:45; 8 to 1 A. M.
KGW, Portland, Oregon, 491.5 (P. S. T.)—11:30 A. M. to 1:30 P. M.; 5 to 11.
KHJ, Los Angeles, Cal., 405.2 (P. S. T.)—7 A. M. to 7:15; 12 M. to 3:30 P. M.; 5:30 to 11.
KNX, Hollywood, Cal., 337 (P. S. T.)—9 A. M. to 10; 1 P. M. to 3; 4 to 5; 6:30 to 12.
KPO, San Francisco, Cal., 429 (P. S. T.)—7 A. M. to 7:45; 10 to 12 M.; 1 P. M. to 2; 3:30 to 11.
KSD, St. Louis, Mo., 545.1 (C. S. T.)—6 P. M. to 7.
KTHS, Hot Springs, Ark., 374.8 (C. S. T.)—12:30 P. M. to 1; 8:30 to 10:30.
KYW, Chicago, Ill., 536 (C. S. T., D. S.)—6:30 A. M. to 7:30; 10:30 to 1 P. M.; 2:15 to 4; 6:02 to 11:30.
CNRA, Moncton, New Brunswick, Canada, 313 (E. S. T.)—9:30 P. M. to 11.
CNRR, Regina, Saskatchewan, Canada, 8 P. M. to 11.

WEDNESDAY

WAAM, Newark, N. J., 263 (E. S. T., D. S.)—11 A. M. to 12 M.; 7 P. M. to 11.
WAHG, Richmond Hill, N. Y., 316 (E. S. T., D. S.)—12 M. to 1:05 P. M.; 8 to 12.
WAMD, Minneapolis, Minn., 243.8 (C. S. T.)—12 M. to 1 P. M.; 10 to 12.
WBBM, Chicago, Ill., 226 (C. S. T.)—8 P. M. to 10.
WBZ, Springfield, Mass., 333.1 (E. S. T., D. S.)—6 P. M. to 11.
WCAE, Pittsburgh, Pa., 461.3 (E. S. T., D. S.)—12:30 P. M. to 1:30; 4:30 to 5:30; 6:30 to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (C. S. T.)—9:30 A. M. to 12 M.; 1:30 to 4; 5:30 to 11.
WDAF, Kansas City, Kansas, 365.6 (C. S. T.)—3:30 P. M. to 7; 8 to 9:15; 11:45 to 1 A. M.
WEAF, New York City, 492 (E. S. T., D. S.)—6:45 A. M. to 7:45; 11 to 12 M.; 4 P. M. to 5; 6 to 12.
WEAO, Ohio State University, 293.9 (E. S. T.)—8 P. M. to 10.
WEAR, Cleveland, O., 390 (E. S. T.)—11:30 A. M. to 12:10 P. M.; 3:30 to 4:10; 6:45 to 7:45.
WEEI, Boston, Mass., 476 (E. S. T., D. S.)—6:45 A. M. to 8; 3 P. M. to 4; 5:30 to 10.
WEMC, Berrien Springs, Mich., 286 (C. S. T.)—8:15 P. M. to 11.
WFAA, Dallas, Texas, 475.9 (C. S. T.)—10:30 A. M. to 11:30; 12:30 P. M. to 1.
WGES, Chicago, Ill., 250 (C. S. T., D. S.)—5 P. M. to 7; 10:30 to 1 A. M.
WGBS, New York City, 316 (E. S. T., D. S.)—10 A. M. to 11 P. M.; 1:30 to 4; 6 to 7.
WGN, Chicago, Ill., 370 (C. S. T.)—9:31 A. M. to 3:30 P. M.; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (E. S. T., D. S.)—12 M. to 12:45 P. M.; 2:30 to 4:30; 6:30 to 11.
WGY, Schenectady, N. Y., 379.5 (C. S. T.)—5:30 P. M. to 7:30.
WHAD, Milwaukee, Wis., 275 (C. S. T.)—11 A. M. to 11:30; 4 P. M. to 5; 6 to 10; 11:30 to 12:30 A. M.
WHAS, Louisville, Ky., 399.8 (C. S. T.)—4 P. M. to 5; 7:30 to 9.
WHN, New York City, 360 (E. S. T., D. S.)—2:15 P. M. to 5:30; 7:30 to 11; 11:30 to 12:30 A. M.
WHO, Des Moines, Iowa, 526 (C. S. T.)—12:15 P. M. to 1:30; 6:30 to 12 M.
WIP, Philadelphia, Pa., 508 (E. S. T., D. S.)—7 A. M. to 8; 10:20 to 11; 1 P. M. to 2; 3 to 4; 6 to 8.
WJZ, New York City, 455 (E. S. T., D. S.)—10 A. M. to 11; 1 P. M. to 2; 4 to 6; 7 to 11:30.
WKRC, Cincinnati, Ohio, 326 (E. S. T.)—8 P. M. to 10.
WLIT, Philadelphia, Pa., 395 (E. S. T.)—12:02 P. M. to 12:30; 2 to 3; 4:30 to 6; 7:30 to 9.
WLW, Cincinnati, O., 422.3 (E. S. T.)—10:45 A. M. to 12:15 P. M.; 1:30 to 2:30; 3 to 5; 6 to 11.
WNYC, New York City, 526 (E. S. T., D. S.)—6:30 P. M. to 11.
WOC, Davenport, Iowa, 484 (C. S. T.)—12:57 P. M. to 2; 3 to 3:30; 4 to 7:05; 9 to 11.
WOR, Newark, N. J., 405 (E. S. T., D. S.)—6:45 A. M. to 7:45; 2:30 P. M. to 4; 6:15 to 12 M.
WPAK, Fargo, N. D., 283 (C. S. T.)—7:30 P. M. to 9.
WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M. to 12 M.; 3 P. M. to 4; 7 to 8; 10 to 2 A. M.
WRC, Washington, D. C., 469 (E. S. T.)—1 P. M. to 2; 4 to 6:30.
KDKA, Pittsburgh, Pa., 309 (E. S. T.)—6 A. M. to 7; 9:45 to 12:15 P. M.; 2:30 to 3:20; 5:30 to 11.
KFAE, State College of Wash., 348.6 (P. S. T.)—7:30 P. M. to 9.
KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M. to 11.
KFKX, Hastings, Neb., 288.3 (C. S. T.)—12:30 P. M. to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 266 (C. S. T.)—12:15 P. M. to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (P. S. T.)—12:30 P. M. to 1:30; 4 to 5:15; 6 to 10.
KGO, Oakland, Cal., 361.2 (P. S. T.)—11:30 A. M. to 1 P. M.; 1:30 to 2:30; 3 to 6:45.
KGW, Portland, Oregon, 491.5 (P. S. T.)—11:30 A. M. to 1:30 P. M.; 5 to 10.
KHJ, Los Angeles, Cal., 405.2 (P. S. T.)—7 A. M. to 7:15; 12 M. to 1:30 P. M.; 5:30 to 12.
KNX, Hollywood, Cal., 337 (P. S. T.)—1 P. M. to 2; 7 to 12.
KOB, State College of New Mexico, 348.6 (M. S. T.)—11:55 A. M. to 12:30 P. M.; 7:30 to 8:30; 9:55 to 10:10.
KPO, San Francisco, Cal., 429 (P. S. T.)—7 A. M. to 8; 10:30 to 12 M.; 1 P. M. to 2; 4:30 to 11.
KSD, St. Louis, Mo., 545.1 (C. S. T.)—7 P. M. to 10.
KTHS, Hot Springs, Ark., 374.8 (C. S. T.)—8:30 P. M. to 10.
KYW, Chicago, Ill., 536 (C. S. T., D. S.)—6:30 A. M. to 7:30; 10:55 to 1 P. M.; 2:15 to 4; 6:02 to 11:30.
PWX, Havana, Cuba, 400 (E. S. T.)—8:30 P. M. to 11:30.
CNRO, Ottawa, Ontario, Canada, 435 (E. S. T.)—7 P. M. to 11.

THURSDAY

WAAM, Newark, N. J., 263 (E. S. T., D. S.)—11 A. M. to 12 M.; 7 P. M. to 11.
WAHG, Richmond Hill, N. Y., 316 (E. S. T.)—12 P. M. to 1:05.
WAMB, Minneapolis, Minn., 243.8 (C. S. T.)—12 M. to 1 P. M.; 10 to 12 M.
WBBM, Chicago, Ill., 226 (C. S. T.)—8 P. M. to 10.
WBZ, Springfield, Mass., 333.1 (E. S. T., D. S.)—6 P. M. to 11:45.
WCAE, Pittsburgh, Pa., 461.3 (C. S. T., D. S.)—12:30 P. M. to 1:30; 4:30 to 5:30; 6:30 to 11.
WCBD, Zion, Ill., 344.6 (C. S. T.)—8 P. M. to 10.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (C. S. T.)—9:30 A. M. to 12 M.; 1:30 P. M. to 4; 5:30 to 10.
WEAF, New York City, 492 (E. S. T., D. S.)—6:45 A. M. to 7:45; 11 to 12 M.; 4 P. M. to 5; 6 to 12.
WEAR, Cleveland, O., 390 (E. S. T.)—10:30 A. M. to 12:10 P. M.; 3:30 to 4:15; 7 to 11.
WEEI, Boston, Mass., 476 (E. S. T., D. S.)—6:45 A. M. to 7:45; 1 P. M. to 2; 2:30 to 10.
WFAA, Dallas, Texas, 475.9 (C. S. T.)—10:30 A. M. to 11; 1:30 P. M. to 4; 6 to 7:30.
WGBS, New York City, 316 (E. S. T., D. S.)—10 A. M. to 11; 1:30 P. M. to 4; 6 to 7:30.
WGES, Chicago, Ill., 250 (C. S. T., D. S.)—5 P. M. to 8; 10:30 to 1 A. M.
WGN, Chicago, Ill., 370 (C. S. T.)—9:31 A. M. to 3:30 P. M.; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (E. S. T., D. S.)—12 M. to 12:45 P. M.; 2 to 4; 7:30 to 11.
WHAD, Milwaukee, Wis., 275 (C. S. T.)—11 A. M. to 11:30; 6 P. M. to 7:15; 8:30 to 11.
WHAS, Louisville, Ky., 399.8 (C. S. T.)—4 P. M. to 5; 7:30 to 9.
WHN, New York City, 360 (E. S. T., D. S.)—2:15 P. M. to 5; 7:30 to 11; 11:30 to 12:30 A. M.
WHO, Des Moines, Iowa, 526 (C. S. T.)—7:30 P. M. to 9; 11 to 12 M.
WJY, New York City, 405 (E. S. T., D. S.)—7:30 P. M. to 11:30.
WJZ, New York City, 455 (E. S. T., D. S.)—10 A. M. to 11 P. M.; 1 to 2; 4 to 6; 7 to 12 M.
WLIT, Philadelphia, Pa., 395 (E. S. T.)—12:02 P. M. to 12:30; 2 to 3; 4:30 to 6; 8:30 to 9.
WLW, Cincinnati, O., 422.3 (E. S. T.)—10:40 A. M. to 12:15 P. M.; 1:30 to 5; 6 to 8; 10 to 11.
WMAK, Lockport, N. Y., 285.5 (E. S. T.)—11 P. M. to 1 A. M.
WNYC, New York City, 526 (E. S. T., D. S.)—3:15 P. M. to 4:15; 6:50 to 11.
WOAW, Omaha, Neb., 526 (C. S. T.)—12:30 P. M. to 1:30; 5:45 to 11.
WOC, Davenport, Iowa, 484 (C. S. T.)—12:57 A. M. to 2 P. M.; 3 to 3:30; 4 to 7:10; 8 to 9.
WOR, Newark, N. J., 405 (E. S. T., D. S.)—6:45 A. M. to 7:45; 2:30 P. M. to 4; 6:15 to 7.
WPG, Atlantic City, N. J., 299.8 (E. S. T., D. S.)—7 P. M. to 11.
WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M. to 12 M.; 3 P. M. to 4; 7 to 8; 10 to 2 A. M.
WRC, Washington, D. C., 469 (E. S. T.)—1 P. M. to 2; 4 to 6:30.
KDKA, Pittsburgh, Pa., 309 (E. S. T.)—9:45 A. M. to 12:15 P. M.; 2:30 to 3:20; 5:30 to 10:15.
KFAE, State College of Washington, 348.6 (P. S. T.)—7:30 P. M. to 9.
KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M. to 11.
KFKX, Hastings, Neb., 288.3 (C. S. T.)—12:30 P. M. to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 266 (C. S. T.)—12:15 to 1:15 P. M.; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (P. S. T.)—12:30 P. M. to 1:30; 4 to 5:15; 6 to 7.
KGO, Oakland, Cal., 361.2 (P. S. T.)—11:30 A. M. to 1 P. M.; 1:30 to 3; 4 to 6:45; 7:15 to 10.
KGW, Portland, Oregon, 491.5 (P. S. T.)—11:30 A. M. to 1:30 P. M.; 5 to 11.
KHJ, Los Angeles, Cal., 405.2 (P. S. T.)—7 A. M. to 7:15; 12 M. to 3:20; 5:30 to 11:30.
KNX, Hollywood, Cal., 337 (P. S. T.)—11 A. M. to 12:05 P. M.; 4 to 5; 6 to 12.
KPO, San Francisco, Cal., 429 (P. S. T.)—7 A. M. to 8; 10:30 to 12 M.; 1 P. M. to 2; 3:30 to 11.
KSD, St. Louis, Mo., 545.1 (C. S. T.)—7:30 P. M. to 9.
KYW, Chicago, 536 (C. S. T., D. S.)—6:30 A. M. to 7:30; 10:55 to 1 P. M.; 2:25 to 2:30; 6:02 to 11.
CNRC, Calgary, Canada, 430 (M. S. T.)—7 P. M. to 10.
CNRM, Montreal, Canada, 411 (E. S. T.)—8:30 P. M. to 10:30.
CNRW, Winnipeg, Canada, 384.4 (C. S. T.)—8 P. M. to 10.

### A THOUGHT FOR THE WEEK

IN other years a vacation usually meant a sort of stop-brain process—and no news from the front of the world's activities. Radio in 1925 means that a vacation, no matter how far removed from so-called civilization, is punctuated by news from the diamond, from Washington, from almost every place where folk are busy doing things. Radio certainly has changed the habits of our people to a startling degree.

RADIO WORLD
Pats Reg U S Pat Off

Radio World's Slogan: "A radio set for every home."

TELEPHONES: LACKAWANNA 6776 and 2063
PUBLISHED EVERY WEDNESDAY
(Dated Saturday of same week)
FROM PUBLICATION OFFICE
HENNESSY RADIO PUBLICATIONS CORPORATION
ROLAND BURKE HENNESSY, President
M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
1493 BROADWAY, NEW YORK, N. Y.
(Putnam Bldg., Times Square and 43rd Street)
European Representatives: The International News Co., Breams Bldgs., Chancery Lane, London, Eng. Paris, France. Brentano's 33 Avenue de l'Opera.

EDITOR, Roland Burke Hennessy
MANAGING EDITOR, Herman Bernard

SUBSCRIPTION RATES

Fifteen cents a copy. $6.00 a year. $3.00 for six months. $1.50 for three months. Add $1.00 a year extra for foreign postage. Canada, 50 cents.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order. Changes of address should be received at this office two weeks before date of publication. Always give old address also. State whether subscription is new or a renewal.

ADVERTISING RATES

General Advertising

| | | |
|---|---|---|
| 1 Page, 7¼"x11" | 462 lines | $300.00 |
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| ¼ Page, 4½" D. C. | 115 lines | 75.00 |
| 1 Column, 2¼"x11" | 154 lines | 100.00 |
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| Per agate line | | .75 |

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WEEKLY, dated each Saturday, published Wednesday. Advertising forms close Tuesday, eleven days in advance of date of issue.

CLASSIFIED ADVERTISEMENTS

Ten cents per word. Minimum, 10 words. Cash with order. Business Opportunities, 50 cents a line; minimum, $1.00.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

JUNE 6, 1925

## Crosley Copyright Suit Goes to Highest Court

CINCINNATI.

THE United States Circuit Court of Appeals here granted a stay in the suit over broadcasting as a "public performance" under the copyright law. This halts the test litigation between the owner of the Crosley Radio Corporation's broadcasting station here and Jerome H. Remick & Co., of New York and Detroit, pending a hearing before the United States Supreme Court.

The Crosley Corporation won a decision in the court of first instance, that broadcasting a song was not a "performance," but the Appellate court reversed the finding of the court of first instance. Now the case is before the United States Supreme Court and proceedings are stayed pending appeal.

# BERNIE HOLDS POPULARITY CONTEST LEAD

BEN BERNIE and his orchestra still lead in the voting by RADIO WORLD readers to determine the most popular radio entertainer of 1925. The Happiness Boys stand second. Roxy and Karl Bonawitz (WIP) are tied for third place. These four have a substantial lead over all others, for the time being. Nils T. Granlund, announcer, WHN, New York City, made a substantial gain, and is well ahead of those outside the first four.

Some of the other artists in the popularity fight are: Alvin E. Hauser, of WFBH; the Gold Dust Twins, of WEAF; the Harmony Girls, of WLS; Leo Reisman and Orchestra, of WBZ; Major J. Andrew White, of WJZ; Hotel Commodore Orchestra, under the direction of Bernard Levitow, of WJZ; Walter Peterson, of WLS, and Ford and Glenn, WLS.

### *Contest Rules*

**1. The votes in RADIO WORLD'S 1925 contest to determine the radio entertainer entitled to the popularity gold medal may be cast by filling out the coupon as published weekly in RADIO WORLD. One coupon entitles the sender to one vote. The coupon should be properly filled out and mailed. Anybody subscribing to RADIO WORLD (a new subscriber or one renewing an existing subscription), may cast as many votes as are represented by the total number of weeks of the new or renewed subscription. In addition, as the coupons are published, the subscriber may use them for sending in one vote on each such coupon. When subscribing, cast your total subscription votes by specifying the candidate in the subscription order.**

**2. This contest closes July 31. The last coupon will be published in the July 25 issue.**

**3. In case of a tie, a gold medal will be awarded to each contestant so tied.**

# FOG SIGNAL PUT UNDER TEST AS A LIFE-SAVER

WASHINGTON.

"FOG, the greatest menace of the sea, may be overcome by radio," J. Walter Drake, Assistant Secretary of Commerce, believes. Mr. Drake is sending two of his best radio engineers to Detroit to equip the Huron Lightship, at the entrance of the St. Clair River, with the necessary apparatus to "defeat the white death of the lakes." This will be the first station on the Great Lakes, to be followed by six more installations this season.

Estimating that over 95 per cent. of the $20,000,000 loss in property and about the same percentage of the hundreds of lives lost just on the Pacific from 1918 to 1923 were due to accidents resulting from fog, Mr. Drake said that the Lighthouse Service system of fog signals "for the first time in maritime history affords a practicable means by which a navigator may obtain accurate bearings on invisible objects." It also enables vessels to locate each other in fog when approaching or needing assistance, he said. The mechanism is installed on a radio fog beacon on shore to guide ships.

## Bill For Irish Station Will Go Before Dail

WASHINGTON.

ALTHOUGH Ireland is without a broadcasting station and is still dependent on British broadcast stations, radio is gaining in popularity in the Emerald Isle and approximately 3,000 receiving sets had been licensed up to April 1, according to reports to the Department of Commerce.

The government's plan for the erection of a broadcasting station has been postponed for the time being following consideration of a clause in the Anglo-Irish treaty by which the Free State has agreed not to establish wireless stations except by agreement with the British government. A bill providing for the establishment of a broadcasting station under State control has been completed and will be introduced in the Dail as soon as the necessary agreement has been reached with the British government.



## RADIO WORLD'S POPULARITY CONTEST

*To Determine the Gold Medal Radio Entertainer for 1925*

*Popularity Editor, RADIO WORLD, 1493 Broadway, N. Y. C.*

I hereby cast one ballot for:

(Name of Entertainer).....

(Entertainer's Station).....

(Voter Sign Full Name Here).....

(Street and Number).....

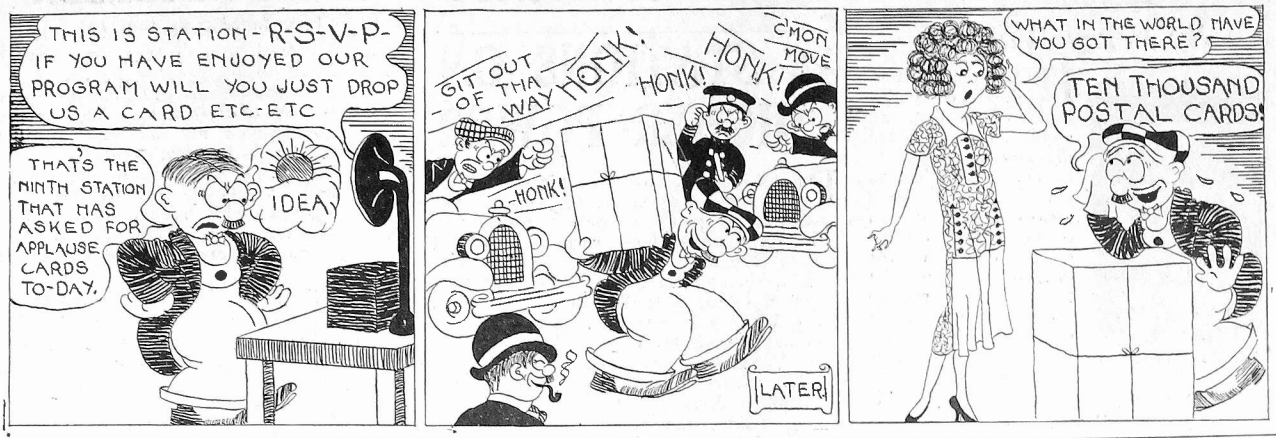
(City)..... (State).....

No. 8-6-6 FILL OUT THIS COUPON AND MAIL NOW!

# MR. DX HOUND

*A Character Created by* RADIO WORLD *Artist*

By HAL SINCLAIR




# THE RADIO TRADE

## Radio World Picked as Fan's Favorite

DON'T you feel terrible when, after you have told a credulous friend that your receiver obtained some very distant station, and you turn the dials in his presence next night to the number where you think you received the station, and it isn't there, even though the station is on the air? Your set no doubt can get the station, but you cannot locate the exact numbers on the dials to get the station. However, this difficulty can be done away with by using a logging chart so that every station that you receive will be marked down permanently. Such a device is put out by the Radio Chart Bureau, Patterson Building, Fresno, Cal., called the Find-Me-Quick Radio Chart. Jack L. Draper, of 501 Main Street, Ligonier, Ind., won a prize of one year's subscription to any magazine for having completed two Find-Me-Quick radio charts containing complete data for 100 different American and foreign stations logged on the Radio Chart. The magazine to be picked out is absolutely up to the winner, and Mr. Draper selected RADIO WORLD, sending his selection to Felix M. Locher, of the Radio Chart Bureau.

## Supertron's Guarantee

A GUARANTEE that really means something, and that is real protection and satisfaction for the consumer, dealer and jobber is being issued by the Supertron Manufacturing Company with every tube made by them. This guarantee certificate accompanies every tube of all types bearing a serial numer, which serial number appears on each tube, the certificate and the tube corresponding, so that the consumer has the privilege of adjustment, exchange and service and knows that a substantial corporation stands squarely behind the tube. This is a sensible guarantee and is good news to the jobber and dealer; the jobber knowing that he takes no risk in handling, and the dealer knowing that he is absolutely protected on all angles of his transaction and that he is justified in recommending this tube not only to the experienced radio fan but also to the "cranky" customer who is always looking for trouble on every purchase, consequently, the slogan behind Supertron is, "The Tube with the sensible guarantee."

**(Tested and Approved by RADIO WORLD)**

## Business Opportunities Radio and Electrical

**Rates: 50c a line; Minimum, $1.00**

**RADIO BATTERY ELIMINATOR,** that can be retailed for less than $20 and make good profit; manufactured on contract if desirable. Box A, Radio World.

**RADIO AND MUSIC STORE;** established over 5 years; busy crosstown thoroughfare; reasonable rent. 451 West 125th St., New York City.

**MACHINE SHOP,** fully equipped for making tools, dies, special machines and parts, metal stamping; suitable accommodations for inventors. Link Manufacturing Co., 151 Lafayette St., New York City.

**WANTED**—Automotive or Radio Product. Established manufacturer with large factory and sales organization and successful experience in manufacturing and marketing automotive and other metal products is open to add article of proven merit to his line; please give full particulars. Box 2, Radio World

## Coming Events

**JUNE 4 to 6**—Conference of Electrical Jobbers' Assn., Homestead Hotel, Hot Springs, Va.

**JUNE 7 to 13**—Music Industries, Chamber of Commerce Convention, Drake Hotel, Chicago, Ill.

**JUNE 8 to 11**—Annual meeting, Associated Manufacturers of Electrical Supplies, Homestead Hotel, Hot Springs, Va. Radio Section meets June 10.

**JUNE 15 to 18**—Radio Display Show, Hotel Chase, St. Louis, Mo.

**AUG. 22 to 28**—3d Annual Pacific Radio Exposition, Civic Auditorium, San Francisco. Write P. R. E., 905 Mission St., San Francisco.

**SEPT. 5 to 12**—Third annual National Radio Exposition, Ambassador Auditorium, Los Angeles, Cal. Address Waldo K. Tupper.

**SEPT. 6 to 12**—National Radio Expositoin Grand Central Palace, N. Y. C. Write American Radio Exp. Co., 522 Fifth Ave., N. Y. C.

**SEPT. 14 to 19**—Second Radio World's Fair, 258th Field Artillery Armory, Kingsbridge Road and Jerome Ave., N. Y. C. Write Radio World's Fair, Times Bldg., N. Y. C.

**SEPT. 14 to 19**—Pittsburgh Radio Show, Motor Square Garden. Write J. A. Simpson, 420 Bessemer Bldg., Pittsburgh, Pa.

**SEPT. 21 to 23**—International Radio Exposition, Steel Pier, Atlantic City, N. J.

**SEPT. 23 to OCT. 4**—International Wireless Exp., Geneva, Switzerland.

**SEPT. 28 to OCT. 3**—National Radio Exposition, American Exp. Palace, Chicago. Write N. R. E., 440 S. Dearborn St., Chicago, Ill.

**OCT. 5 to 10**—Second Annual Northwest Radio Exposition, Auditorium, St. Paul, Minn.

**OCT. 5 to 11**—Second Annual Radio Show, Convention Hall, Washington, D. C. Write Radio Merchants' Association, 233 Woodward Bldg.

**OCT. 12 to 17**—St. Louis Radio Show, Coliseum. Write Thos. P. Convey, manager, 737 Frisco Bldg., St. Louis, Mo.

**OCT. 17 to 24**—Brooklyn Radio Show, 23d Regt. Armory. Write Jos. O'Malley, 1157 Atlantic Ave., Brooklyn, N. Y.

**OCT. 19 to 25**—Second Annual Cincinnati Radio Exposition, Music Hall. Write to G. B. Bodenhof, care Cincinnati Enquirer.

**NOV. 19 to 25**—Milwaukee Radio Exp., Civic Auditorium. Write Sidney Neu, of J. Andrae & Sons, Milwaukee, Wis.

**NOV. 17 to 22**—4th Annual Chicago Radio Exp., Coliseum. Write Herrmann & Kerr, Cort Theatre Bldg., Chicago, Ill.

**DEC. 1 to 6**—Boston Radio Show, Mechanics' Hall. Write to B. R. S., 209 Massachusetts Ave., Boston, Mass.

## Literature Wanted

THE names if readers of RADIO WORLD who desire literature from radio jobbers and dealers are published in RADIO WORLD on request of the reader. The blank below may be used, or a post card or letter will do instead.

Trade Service Editor,
Radio World,
1493 Broadway, New York City.

I desire to receive radio literature.

Name .....

City or town.....

State .....

Are you a dealer?.....

If not who is your dealer?

His Name .....

His Address .....

T. H. Leonard, c/o Remington Typewriter Co., Cedar Rapids, Ia.

C. M. Donahan, Portland, Me.

A. H. Curtin, 512 East Taylor St., Syracuse, N. Y.

W. H. Workman, 4518 14th St., East, Vancouver, B. C.

Thomas McGlove, 955 6th Ave., Astoria, L. I., N. Y.

G. R. Hawks, 8 Pearne Ave., Cortland, N. Y.

I. C. Smith, Saco, Montana.

## SOME RECENT SPECIALS

**THE DIAMOND OF THE AIR AS A 2-CONTROL SET,** by Herman Bernard. This is the circuit that is sweeping the country. Four tubes; loop or aerial. Send 30c for May 23 and 30 issues of RADIO WORLD, 1493 Broadway, New York City.

**BABY PORTABLE SET**

How to make it. See RADIO WORLD, dated May 16, 15c. per copy, or start your subscription with that number. RADIO WORLD, 1493 Broadway, New York City.

**A 3-TUBE REFLEXED NEUTRODYNE,** by Percy Warren. Send 15c for May 16 issue, RADIO WORLD.

**A DX TRANSMITTER,** by C. H. West, May 23 issue, RADIO WORLD, 15c.

# IS THE JOBBER DOOMED?

CHARLES FRESHMAN has decided to place his Fall line direct with authorized agents, cutting out the jobber and distributor entirely. The reason is obvious. A strong undercurrent of shiftiness flows through the jobbing sea. Too many a jobber goes in business on credit and will pay "if he can." This type would recklessly cut prices almost down to production cost. He thinks nothing of his principal, the firm that has put many, many thousands of dollars into research, production and advertising. He will secretly rebate discounts to dealers or even sell retail, until the erstwhile jobber is a trade polyglot. He cheats his main backer—the manufacturer—but not for long. There are, of course, reputable jobbers, most of them banded in associations, but unless the back-stabber is eliminated the jobbing industry will disappear from radio. Freshman is not the first to cut out jobbers.

# Weapons to Use Against Static

*By Percy Warren*

PERCY WARREN

HOW many hundreds of kinks have come out, all supposed to get rid of static entirely! It is yet impossible to rid the air of such strays. All that can be done is to reduce static to some extent and even then you may have to reduce the actual volume of the radio signals. By inserting a crystal in your set you reduce static but you also reduce the total volume.

What is static? Static consists of strays or electrical disturbances in the atmosphere. Some say that it is caused by lightning (when two clouds are supposed to hit each other). One of the most common questions is: Why is it that the stray is received all over the dials? When a spark transmitter emits a radio-frequency wave, which is tuned to a specific wavelength, the spark can be tuned out, but with some difficulty on account of the high decrement, but when static is transmitted there is no specific wavelength on which it is sent out, the decrement being tremendously high. This is a natural cause and cannot be eliminated, although it can be reduced. Since we can reduce static with a crystal detector, let us do so, as the ratio of the static to the signal strength can be reduced, in other words, the signal can be given the better of the argument.

The following is a list of devices that help in reducing the strays in any radio receiver: a potentiometer in series with the antenna, which is really a resistance in the antenna; a 1" gap shunted across the antenna and the ground; a special clarifier (nothing more than some inductances and capacities connected in series and in parallel, so as to reduce the total flow of current in the antenna system), and the old crystal, which may either be placed in series with the antenna or used in place of the detector vacuum tube.

A crystal detector is the best static reducer of the whole btach, because it does not cost much and it improves the quality of the signals, since it cannot amplify, therefore cannot distort. The crystal detector only rectifies signals. It has no plate on which B battery current can be loaded and that is why it absolutely refuses to distort.

There is mechanical static, usually called "man-made static," that is caused by proximity of the receiver to leaky power lines, static machines, X-ray machines, telephone lines, cable lines, trolley lines, power houses and telegraph lines. Static of this nature usually cannot be done away with, unless the cause is removed. Place the antenna at right angles to the lines or shield the antenna with some copper tubing 6" in diameter, which should be placed around the lead-in all the way down from where the lead-in begins until it ends.

## International Parley To Be Held In 1927

WASHINGTON.

WHILE no action has yet been taken on the recommendation of the League of Nations that the International Radio Conference called by the United States to meet in Washington this fall be postponed until 1927, officials in a position to know are inclined to believe the request will be granted.

# 14 STATIONS ON HIGHER POWER

PERMISSION to use higher power has been granted by the Department of Commerce to the following stations:

KFAB, Lincoln, Neb., to increase to 500 watts; KFKX, Hastings, Neb., 2,000; WBZ, Springfield, Mass., 2,000; WDBS, Dayton, Ohio, 500; WEAF, New York, 2,500; WGAQ, Shreveport, La., 250; WGY, Schenectady, 2,000; WHA, Madison, Wis., 750; WKAR, East Lansing, Mich., 750; WLW, Harrison, Ohio, 5,000; WOC, Davenport, Iowa, 2,000; WOAI, San Antonio, Texas, 1,000; WRC, Washington, D. C., 1,000, and WSAI, Mason, Ohio, 5,000.

## List of Stations

(*Concluded from page* 14)

| *Station* | *Owner and Location* | *Meters* |
|---|---|---|
| WRAX | Flexon's Garage, Gloucester City, N. J. | 268 |
| WRBC | Immanuel Lutheran Church, Valpariaso, Ind. | 278 |
| WRC | Radio Corp. of Ama., Washington, D. C. | 469 |
| WREO | Reo Motor Co., Lansing, Mich. | 286 |
| WRHF | Radio Hospital Fund, Washington, D. C. | 256 |
| WRK | Doron Bros. Elec. Co., Hamilton, O. | 270 |
| WRM | University of Illinois, Urbana, Ill. | 273 |
| WRR | Dallas Police and Fire Dept., Dallas, Texas | 261 |
| WRW | Tarrytown Research Laboratory, Tarrytown, N. Y. | 273 |
| WSAB | S. E. Mo. State Teachers' College, Cape Girardeau, Mo. | 275 |
| WSAC | Clemson Agricultural College, Clemson College, S. C. | 337 |
| WSAD | J. A. Foster Co., Providence, R. I. | 256 |
| WSAG | Gospel Tabernacle, St. Petersburg, Fla. | 266 |
| WSAI | U. S. Playing Card Co., Cincinnati, O. | 326 |
| WSAJ | Grove City College, Grove City, Pa. | 229 |
| WSAN | Allentown Call, Allentown, Pa. | 229 |
| WSAP | City Temple, New York, N. Y. | 263 |
| WSAR | Doughty & Welch Elec. Co., Fall River, Mass. | 254 |
| WSAX | Chicago Radio Laboratory, Chicago, Ill. | 268 |
| WSAZ | Chase Electric Shop, Pomeroy, Ohio. | 244 |
| WSB | The Atlanta Journal, Atlanta, Ga. | 428 |
| WSKC | World's Star Knitting Co., Bay City, Mich | 261 |
| WSL | J. & M. Elec. Co., Utica, N. Y. | 242 |
| WSMB | Saenger Amuse. Co., New Orleans, La. | 319 |
| WSOE | School of Engineering, Milwaukee, Wisc. | 246 |
| WSRF | Harden Sales & Service Co., Broadlands, Ill. | 233 |
| WSO | Radio Co., Hamilton, Ohio. | 255 |
| WSUI | State University of Iowa, Iowa City, Iowa | 484 |
| WSY | Alabama Polytechnic Institute, Auburn, Ala. | 250 |
| WTAB | Fall River Daily Herald, Fall River, Mass. | 266 |
| WTAC | Penna. Traffic Co., Johnstown, Pa. | 268 |
| WTAL | Toledo Radio & Elc. Co., Toledo, O. | 252 |
| WTAM | Willard Storage Battery Co., Cleveland, Ohio | 389 |
| WTAP | Cambridge Radio Elec. Co., Cambridge, Ill. | 242 |
| WTAQ | S. Van Gordon & Son, Osseo, Wis. | 254 |
| WTAR | Reliance Radio & Elec. Co., Norfolk, Va. | 261 |
| WTAS | Charles E. Erbstein, Elgin, Ill. | 303 |
| WTAT | Edison Elec. Ill. Co. (Portable), Boston, Mass. | 244 |
| WTAU | Ruegg Battery & Elec. Co., Tecumseh, Neb. | 242 |
| WTAW | Agricultural & Mech. College, College Station, Tex. | 270 |
| WTAX | Williams Hardware Mfg. Co., Streator, Ill. | 231 |
| WTAY | Oak Leaves Broadcasting Assn., Oak Park, Ill. | 250 |
| WTAZ | T. J. McGuire, Lambertville, N. J. | 261 |
| WTG | Kansas State Agricultural College, Manhattan, Kas. | 273 |
| WTIC | Travelers Insurance Co., Hartford, Conn. | 347 |
| WWAD | Wright & Wright, Inc., Philadelphia, Pa. | 250 |
| WWAE | Alama Ballroom, Joliet, Ill. | 242 |
| WWAO | College of Mines, Houghton, Mich. | 244 |
| WWI | Ford Motor Co., Dearborn, Mish. | 366 |
| WWJ | Detroit News, Detroit, Mish. | 517 |
| WWL | Loyola University, New Orleans, La. | 275 |



# RADIO PRIMER

(*Concluded from page* 10)

office, motored home just a little earlier than usual, to be greeted at the porte cochere by the strains of luncheon music from the Waldorf-Astoria. The butler proudly explained he had just finished charging the A battery. This was Mr. Astorfield's pet battery, for anything designated "A-1" or simply "A" struck a favorite pitch in his bonded bosom. For once Mr. Astorfield evidenced at least a semi-technical interest in radio. Asked he:

"Jukes, how does one charge a battery?"

The butler explained that a battery charger was connected to the lighting main, through two leads to the wall plug, and that two other leads from the charger were connected to the terminals of the battery.

"Let me see where this was done," commanded Mr. Astorfield. His tone of voice was not rough, yet it suggested nothing of that solicitude which accompanies announcement of a bonus untinged with cancellation of the Summer vacations.

Down to the cellar they went, the cellar being a place unfrequented by Mr. Astorfield; Jukes was in fact the chief bottle toter.

"I smell something," said the master of the house.

"Nothing," the servant of the house had the temerity to contradict. He thought to himself: "I wonder if he means a rat?"

"Jukes!" said Mr. Astorfield sharply. His voice was most upraiding. A calling-down from Sir Hubert was rebuke indeed. "When I say a thing I am not to be contradicted—in this house. I smell fumes of sulphuric acid. Jukes, when you charged the battery you did not remove the vent caps. Those round screw-knobs over the apertures through which the distilled water is poured are the vent caps, Jukes. When charging a battery you must take them off, otherwise the concentration of fumes may prove disastrous. Mr. Finkelwroth, the president of the Quicksale Storage Battery Company, a $1,000,000 Delaware corporation, paying 7 per cent., had a visiting chat with me at the office today."

* * *

HAVING heard enough of this phase of trouble in Radio Lane, I dropped softly from my uncomfortable perch at the cellar window of the house of unwelcome, and sauntered on to patches of things home-made. In one shack I found a heated discussion in progress on the advisability of grounding the A battery, the effect it has on oscillations, tuning, etc. Although Prof. Marius Latour claims a patent on this, nobody has been able to prevent oscillations by this method, nor affect tuning, nor produce any noticeable alteration, in derogation or improvement of the more conventional system. But there was nothing to be said authoritatively against the practice.

Much confusion attends the connections to the coil in the aerial circuit on such occasions when minus A is grounded. If a radio-frequency transformer—a coil of two windings, one smaller than the other—is regarded as upside-down, with the primary or small coil on bottom, the connections may be made as follows: top terminal of coil, beginning of secondary, to grid; end of secondary, connected to adjoining beginning of primary and to ground and minus A; end of primary, bottom terminal of the RFT, to aerial. Thus, the coil may be made in a single winding having one tap, the common connection of minus A and ground going to this tap.

# Resistance AF in a RF Set That Gets DX on 2 Controls

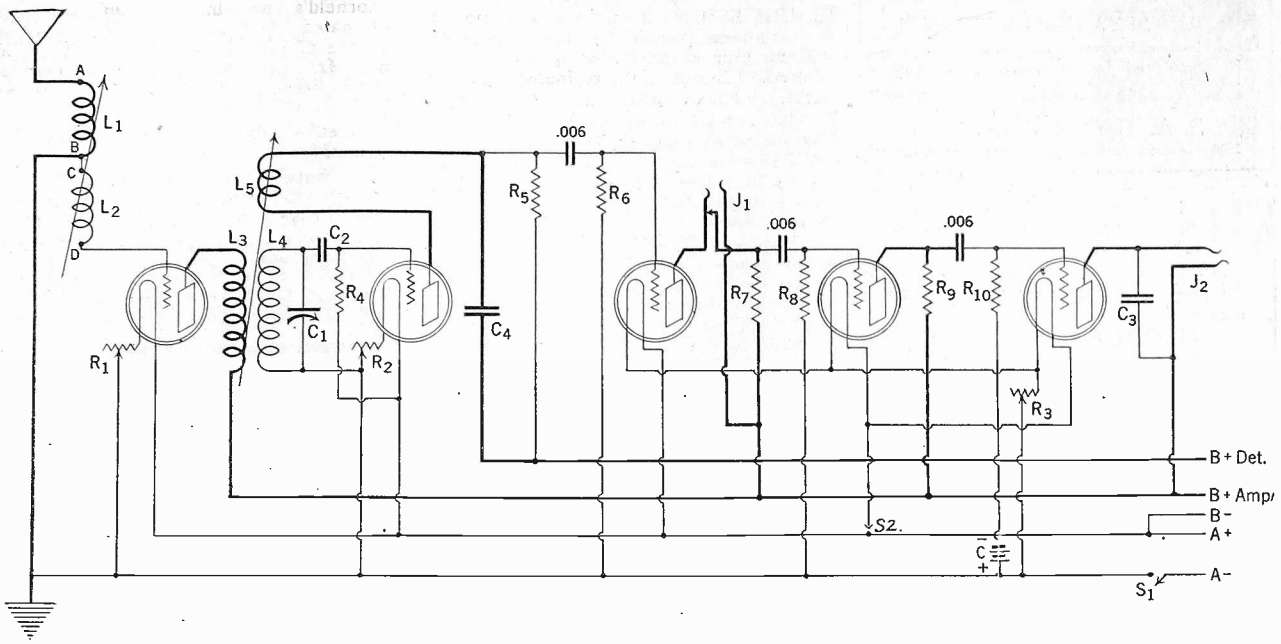



FIG. 1, A 5-tube set, comprising a stage of untuned RF, a regenerative detector and three stages of resistance-coupled AF. If a home-made coil is to be used for L1L2, or a standard variometer, tapped at midpoint, a third control may be included, but it is not necessary. The tone quality from this set, when using good resistors, is superb. R5, R7 and R9 are .1 meg.; R6, 1 meg.; R8, 5 meg.; R10, 25 meg.

*By Capt. P. V. O'Rourke*

USING both the "peak" transformer, of the so-called untuned type, as well as a tuned transformer (with tickler) in a 2-tube receiver, and adding three stages of resistance-coupled audio-frequency amplification, you have a circuit which is simple to tune and produces excellent signal quality. The volume is enough to satisfy anybody, and the use of resistance coupling in the audio stages gives a higher degree of audibility than the AF transformer method. Where the transformer on the AF side is louder than the resistance, it is less distinct, hence resistance is a net overall gain for those who are particular about quality.

CAPT. PETER V. O'ROURKE

The only coil necessary to make is L3 L4L5, a 3-circuit coupler, or a commercial product may be used. If home-made, the coil may consist of ten turns of No. 24 double silk covered wire for the aperiodic primary L3, 43 turns of the same kind of wire, wound in the same direction, for L4, and 26 turns of No. 26 single silk covered wire for the tickler L5. The stator form windings, L3L4, are on a 3½" diameter tubing. The primary is begun near the top circumference, then terminated after the tenth turn. The secondary is begun right where the primary ended. The form for the tickler is 2½" diameter and 2½" high. The stator form may be 3½ or 4" high. No particular attention need be paid to the direction in which the tickler is wound, as the connections thereto should be made one way, then the other, to see which works better.

The transformer in the aerial circuit is the "fixed" one and should be a commercial product. As such is often used for interstage coupling it may have the binding posts at the terminals marked P, B, G and F, in which case P would correspond to A in Fig. 1, B would be B, C would be F and D would be G. The manner of connection is to secure the aerial lead to the P post (which may be marked A in some types) and connect the ground to the B post (which may be Grd. on some transformers). Now connect a wire from the end of the primary (B or Gnd, shown as B in Fig. 1) to the end of the secondary (F, shown as C in Fig. 1). That leaves the remaining secondary connection, G, (or, in Fig. 1, D) to be joined to the grid of the radio-frequency tube, at left, Fig. 1. This method of conductive coupling sometimes gives more volume and does not affect the tuning.

### Optional Home-made Coil

The use of the fixed type of transformer, L1L2, eliminates one control. An arrow is shown in Fig. 1, indicating that this coil may be variable, and that is for those who care to make an inductance at home that will serve the purpose. The commercial product is simpler and preferable, however, those desiring to make a coil which may be regarded as a substitute may use No. 24 double silk covered wire, winding 33 turns on a spider-web form and 33 turns on another spider-web form, mounting both coils on the baseboard in close inductive relationship. One end of one coil is joined to one end of the other. This is a variometer effect. Put a horseshoe magnet, about 3" high, right behind the coils, in upright position. A piece of tin may be used for fastening the magnet to the baseboard. From the foregoing instructions as to wiring the fixed RFT the connections may be followed quite easily, since the common joint of the two coils goes to ground and minus A, the other terminals to aerial and grid respectively. If L1L2 is a home-made

(Continued on page 26)

# Rules for Aerial Safety

## By Feodor Rofpatkin

EVERY fan who is contemplating installing an antenna out of doors should know the rules and regulations as laid down by the National Board of Fire Underwriters. They follow:

The outside antenna shall not pass over or under electric light or power wires of any circuit carrying current of more than 600 volts, or railway or feeder wires, nor shall it be located so that a failure of either antenna or of the above mentioned electric light or power wires can result in a contact between the antenna and such electric light or power lines.

The antenna shall be so constructed and installed that a wind will not allow the wire to sag and swing and thereby touch the electric light and power lines.

All splices and joints in the antenna, unless made with approved clamps or splicing devices, shall be soldered.

All insulation on the antenna shall be of the highest grade, the material being of mica or of porcelain.

The lead-in wire shall be of copper, approved copper-clad steel or other approved metal which will not corrode excessively, and in no case shall they be smaller than No. 14 B. & S. gauge except that approved copper-clad steel not less than No. 17 B. & S. gauge may be used.

The lead-in wires on the outside of buildings shall not come nearer than four (4) inches to electric light or power wires, unless separated therefrom by a continuous and firmly fixed non-conductor that will maintain permanent separation. The non-conductor shall be in addition to any insulation on the wire.

The lead-in wires shall enter the building through a non-combustible, non-absorptive insulating bushing.

Each lead-in shall be provided with an approved device properly connected and located (inside or outside, preferably outside) as near as is practicable to the point where the wire enters the building. The protector shall not be placed in the immediate vicinity of ignitible stuff, or where exposed to inflammable gases, or, dust, or flying of combustible materials.

The protective device shall be an approved lightning arrester which will operate at a potential of 500 volts for the receiver and at least 1000 volts for a 5 watt transmitter.



THE DIAMOND OF THE AIR AS A 2-CONTROL SET, by Herman Bernard. This is the circuit that is sweeping the country. Four tubes; loop or aerial. Send 30c for May 23 and 30 issues of RADIO WORLD, 1493 Broadway, New York City.

THE SHORT-WAVE RECEIVER REINARTZ WILL USE IN ARCTIC. Full wiring directions. Send 15c for May 16 issue, RADIO WORLD, 1493 Broadway, New York City.

A SIMPLE 1-TUBE DX SET FOR THE NOVICE, by Percy Warren. Send 15c for May 23 issue, RADIO WORLD.

## Sets In N. S. Wales Schools Officially Approved

WASHINGTON.

AFTER successful experiments, wireless apparatus will be permitted in public schools for the use of parents and citizens' associations by the New South Wales minister for education. It is expected that such a course will bring isolated country centers in touch with Sydney, and the country schools will thus become important social centers, especially in the evenings.





THE BABY PORTABLE, by Herbert E. Hayden. A 1-tube DX set on a 7½x5½" panel. Send 30c for May 16 and 23 issues to RADIO WORLD, 1493 Broadway, New York City.

A 3-TUBE REFLEXED NEUTRODYNE, by Percy Warren. Send 15c for May 16 issue, RADIO WORLD.

## JOIN THE A. B. C.

A B. C. stands for the American Broadcast Club. Join it today. It involves no dues or payment of any kind, and no obligations. It was founded by RADIO WORLD simply to unite the broadcast listeners and radio fans in general in a common bond to promote their welfare as occasion requires. Send your name and address to A. B. C. Editor, RADIO WORLD, 1493 Broadway, New York City.

# The 2-Control Resistance Set

(*Continued from page 23*)

inductance, the variometer setting is varied after the set is complete until the coupling is best for the whole wavelength band. This will be found to be the coupling which gives loudest signals around 450 meters, or a little lower. Although this coil is variable, once the setting is obtained it remains permanent, unless, of course, the constructor wants to put the set in the 3-controls class.

### Parts Used

R1 and R2 are rheostats to suit the type of tubes used. R3 is a power rheostat, 6 ohms, since it controls three tubes at once (the audio circuit). It is just like any other rheostat, except that the wire is stronger, so that the instrument will not heat up under the comparatively heavy current. Most rheostats of the general run will heat up on three tubes.

C4 is important in this or any other regenerative circuit followed by resistance AF. It, like C3, is .002 mfd., a fixed condenser. R4 is a 2 megohm leak, C2 a .00025 mfd. fixed grid condenser.

The resistors used in the set throughout are standard products. R5, R7 and R9 are all of the same value, 100,000 ohms (.1 meg.) R6, R8 and R9 are grid leaks, respectively 1,000,000 ohms (1 meg.); 500,000 ohms, (.5 meg.) and 125,000 (25 meg.). These values proved best over a long period of experimenting. The isolating condensers are .006 mfd. They keep the plate potentials off the grid and afford capacitative interstage coupling.

S1 and S2 are push-pull or toggle switches. S2 cuts off the last two audio tubes, since the earphones are to be used on the first resistance AF stage, a single closed circuit jack being used (J1) or, if one isn't handy, the more usual double open circuit jack. J2 is a single open circuit jack.

The C battery is inserted in the last stage for better effects and for economy.

## List of Parts

One untuned RF transformer, L1L2.
One 3-circuit tuning coupler, L3L4L5.
Two 20-ohm. rheostats, R1 and R2.
One 6-ohm power rheostat, R3.
One detector grid leak, 2 meg., R4.
Two fixed condensers, .002, C3, C4.
One fixed grid condenser, .00025 mfd., C2.
One .0005 mfd. variable condenser (23 plates), C1.
Three plate resistors and three grid leaks for the audio stages, as described in text, R5, R6, R7, R8, R9 and R10.
Two push-pull or toggle A battery switches, S1, S2.
One single closed circuit jack or double open circuit jack, J1.
One single open circuit jack, J2.
One 4½-volt C battery.
Two or three 45-volt B batteries.
One A battery.
Five standard sockets.
Five tubes, 6-volt storage battery type preferred.
Two 4" dials, one with vernier.
One 7x18" panel.
One 17x9" baseboard.
One cabinet.
Aerial, leadin wire, internal connecting wire, ground clamp, lightning arrestor, jack plug, earphones, speaker.

THE DIAMOND OF THE AIR AS A 2-CONTROL SET, by Herman Bernard. This is the circuit that is sweeping the country. Four tubes; loop or aerial. Send 30c for May 23 and 30 issues of RADIO WORLD, 1493 Broadway, New York City.



## "HOW TO MAKE—"

The following constructional articles have appeared in recent issues of RADIO WORLD:

Sept. 6, 1924—A simplified Neutrodyne with Grid-Biased Detector, by J. E. Anderson. A Low-Loss Wave Trap, by Brewster Lee.
Nov. 15—A Sturdy Low-Loss Coil, by Lieut. P. V. O'Rourke. An Ultra 2-Tube Receiver, by Byrt C. Caldwell.
Dec. 6—A 6-Tube Super-Heterodyne Using a Variometer, by J. E. Anderson. A $1 Coil Winder by Herbert E. Hayden.
Dec. 13—The World's Simplest Tube Set, by Lieut. P. V. O'Rourke.
Dec. 20—A 1-Tube DX Wonder, Rich in Tone, by Herman Bernard. An Interchangeable Detector, by Chas. M. White.
Dec. 27—A 2-Tube Variometer Set, by Lieut. P. V. O'Rourke.
Jan. 3, 1925—A 3-Tube Portable That Needs No Outdoor Aerial, by Abner J. Gelula.
Jan. 10—A Low-Loss DX Inductance, by Herbert E. Hayden.
Jan. 17—A $25 1-Tube DX Wonder by Abner J. Gelula.
Jan. 24—A Selective $15 Crystal Set, by Brewster Lee. A Variometer-Tuned Reflex by Abner J. Gelula. An $18 1-Tube DX Circuit for the Beginner, by Feodor Rofpatkin.
Jan. 31—A Transcontinental 2-Tube Set, by H. E. Wright. An Experimental Reflex, by Lieut. P. V. O'Rourke.
Feb. 7—The Bluebird Reflex, by Lieut. P. V. O'Rourke. A $5 Home-Made Loudspeaker, by Herbert E. Hayden.
Feb. 14—A Super-Sensitive Receiver by Chas. H. M. White. A Honeycomb RFT for DX, by Herbert E. Hayden.
Feb. 21—A 1-Tube Reflex for the Novice, by Feodor Rofpatkin. A Set for Professional Folk, by Lieut. P. V. O'Rourke. A Honeycomb Crystal Receiver by Raymond B. Wallis.
Feb. 28—A Set That Does the Most Possible With 6 Tubes by Thomas W. Benson. Three Resistance Stages of AF on the 3-Circuit Tuner, by Albert Edwin Sonn.
March 7—Storage B Battery, by Herbert E. Hayden. Benson's Super-Heterodyne.
March 14—The Reflexed 3-Circuit Tuner That You Can Log, by Herman Bernard.
March 21—A Variable Leak, by Herbert E. Hayden. A 4-Tube, 3-Control Set That Gets the Most DX, by Lieut. P. V. O'Rourke.
March 28—The Improved DX Dandy Set, by Herbert E. Hayden. A 3-Tube Reflex for the Novice, by Feodor Rofpatkin.
April 4—The Diamond of the Air, by Herman Bernard. What the New Sodion Tube Is, by Sidney E. Finkelstein. Sets for the DX Devotee, by Lieut. P. V. O'Rourke.
April 11—Audio Hookups for Fine Volume and Quality as Well, by Brewster Lee. The Coils for The Diamond, by Herman Bernard. 1-Tube Distance-Getting Sets, by Lieut. P. V. O'Rourke.
May 2—The Twinplex, by J. E. Anderson.
May 9—A Set to Cut Static, by Feodor Rofpatkin. Toroid Circuit with Resistance AF, by E. L. Sidney. A Push-Pull AF Amplifier, by Lt. Peter V. O'Rourke.
May 16—A 3-Tube Reflexed Neutrodyne, by Percy Warren. The Baby Portable, by Herbert E. Hayden. One Tube More for Quality, by Brewster Lee.
May 23—Powerful 3-Tube Reflex Receiver, by H. E. Wright. The 3-Control Diamond, by Herman Bernard.

Any copy, 15c. Any 7 copies, $1.00. The whole 25 copies for $2.80, or start subscriptions with any issue. Radio World, 1493 Broadway, N. Y. City.

# O'Rourke's Set

*(Concluded from preceding page)*

It is not a vital adjunct, although a refinement. C plus goes to A minus and C minus connects to that end of R10 (.25 meg.) other than the terminal thereof that went to the grid of the last tube. About 4½ volts will suffice.

### Voltage on Plates

The B battery voltage may be higher than usual for the resistance AF stages, up to 135 working very well, but 90 will perform nicely. The detector B voltage normally will have to be higher than otherwise, nearly double, in fact. About 45 volts worked excellently. However, on the B battery voltages, always try out different voltages in any set or circuit, despite any one's advice, although not going beyond the maximum called for.

### Vernier Needed For C1

The variable condenser C1 is .0005 mfd., normally 23 plates, and should have vernier dial or other fine control, to facilitate tuning in stations on the lower waves.

As said before, the quality will be superb, due to the use of resistance-coupled AF and accurate resistors. Mountings are procurable commecially, and the AF stages may be placed conveniently in back of the RF and detector tubes. My favorite manner of constructing this set is to have the RF run from left to right (looking at front of panel) and the AF from right to left, so that the speaker jack, J2, is at extreme left on panel and the other jack to the right, between the condenser and tickler dials. The condenser dial should be to the left of the other dial. This system enables one to use even a 7x18" panel, although the baseboard, 17" wide long, should be more than the conventional 7" deep. About 9" would be better, for then the terminal strip can be mounted on the rear of the baseboard, too.

### What the RF Tube Does

The set is as selective as the 3-circuit tuning sets which are so popular, but has greater reaching-out power. The RF tube accounts for this. On local reception, however, the presence of the RF tube is scarcely notable. This holds for all sets that have a stage of RF ahead of a regenerative detector.

## AUTO RACE BROADCAST FROM FIELD BY WGN

ON MEMORIAL DAY the Indianapolis 500-mile Sweepstakes Auto Races were broadcast by WGN, the Chicago Tribune station on the Drake Hotel. Using numerous microphones about the track and with a corps of announcers and reporters on the air, WGN brought every sound and color of the big race into fan's homes.



# NAIL IN TREE A FINE AERIAL, SAYS SQUIER

A NAIL in a tree makes a good aerial for your portable set on your vacation. Maj. Gen. George O. Squier, former chief signal officer of the army, after many experiments, said:

"At this season of the year, when static is more pronounced and thousands of people are going into the open spaces on auto tours and camping expeditions, it is highly desirable that this very simple and efficient type of antenna should be tried out practically in the field.

"We have found in short that a living vigorous tree becomes an efficient antenna for a receiving set by driving a nail about three inches into the tree at an optimum point, usually about two-thirds of the total height of the tree, from the ground, and well within the tree top, and attaching the antenna binding post of the set to the nail by a piece of wire, the other terminal of the set being connected to the earth, or sometimes without any earth.

The resistance between the nail and the tree through the trunk and root system may be high, but this is thought to be an advantage since it retards the escape of the varying potential of the nail due to the broadcast message and diverts it along the wire to the receiving set. Such an aeral gives a louder signal than wire alone, and one apparently free in a large measure from external disturbances. There is no definite theory to put forward at present, as many more data would have to be obtanied from experience in the field.

"From a practical standpoint it makes it very simple to take radio in the auto, or into camp anywhere, by merely carrying along a piece of insulated wire and a nail to drive into the tree."

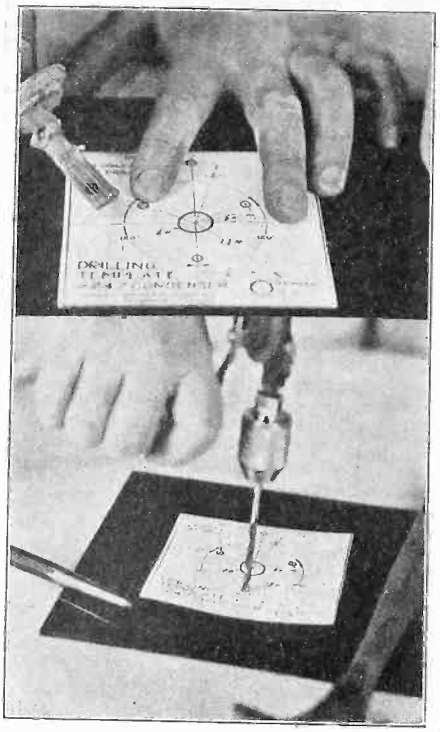
# SMOKESTACK PORTABLE SET

(*Concluded from page 6*)

adjustment. If the set does not respond to the higher wavelengths pull out the



# USE TEMPLATE RIGHT



How to paste the template of a variable condenser over the central hole, which has been already drilled (top photo). If the template is laid on panel and central hole drilled from the template, the paper is subject to tear. The lower photo shows how template will move around if not securely pasted to panel. Do not on the front, where you will have the dials. Note the pencil pointing to coiling up of template on account of poor pasting.

switch S2, which automatically puts a condenser across the antenna and the ground, and if you do not get the low waves, push in S2 and pull out S1, which automatically cuts in C6, which is connected in series with the antenna. When you are not using the audio stages, push in S3, which cuts off the filaments from the A batteries.

If the set tunes broadly, reverse the secondaries of the radio-frequency transformers L6 L4 and L2. If the set distorts, increase the C battery voltage to about 8 volts instead of the conventional 4½ volts, also ground the cores of the AFT. If the signals are weak reverse the A battery leads and increase the B battery voltage of the audio-frequency amplifier tubes.

Around the cover of your portable case wrap 22 turns No. 22 SCC spaced ¼" away from each other. This is a loop. For a ground a 5" iron pipe in the wet ground where ever you may stop, connected to the Gnd. post of the set will be just right. The loop is used as the open-end entenna pictured in Fig. 1. Hence, one end of the loop is not connected, the other end going to C6. The directional effect not very great is obtained by turning the whole case.



**THE DIAMOND OF THE AIR AS A 2-CONTROL SET**, by Herman Bernard. This is the circuit that is sweeping the country. Four tubes; loop or aerial. Send 30c for May 23 and 30 issues of RADIO WORLD, 1493 Broadway, New York City.

**EASILY-MADE CRYSTAL SETS.** Send 15c for May 16 issue, RADIO WORLD.



**A SET FOR REDUCING STATIC** with diagrams; in RADIO WORLD, dated May 9, 15c. per copy, or start your subscription with that number. RADIO WORLD, 1493 Broadway, New York City.

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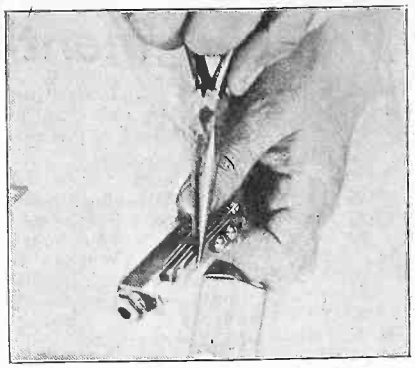
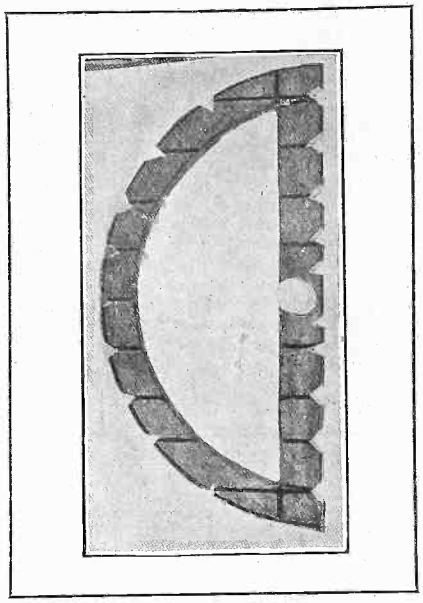
## BETTER CONTACT



LIFT the jack spring with round-nosed pliers if the contact is stiff; bend the spring toward its neighbor if the contact is poor.



ONE of the most successful substitutes for a variometer is the D coil the form for which is pictured above. It consists of a stationary coil and a rotor coil, wound on a D shaped piece of hard rubber on cardboard.







BABY PORTABLE SET. How to make it. See RADIO WORLD dated May 16. 15c per copy, or start your subscription with that number. RADIO WORLD, 1493 Broadway, N. Y. C.

A 3-TUBE REFLEXED NEUTRODYNE, by Percy Warren. Send 15c for May 16 issue, RADIO WORLD.

# Total Power of All Stations Called Merely a Fragment

COMBINE all the power used by the broadcasting stations in every land and it is virtually nothing, electrically speaking, when estimated in conjunction with the total consumption of electrical power the world over. No less than 125,000,000,000 kilowatt hours of electricity are consumed each year. Of this the United States produces and uses just about half. About eighty per cent. of this power is used in industry, the rest for homes.

There are in the United States and Canada 106 lighting, power and electric railway companies, having a yearly output each of 100,000,000 kilowatt hours. The Niagara Falls Power Company in 1924 reached the enormous figure of 2,858,482,674 kilowatt hours, with an average load of 325,419 kilowatts. The Commonwealth Edison Company and the Edison United Companies, New York, give peak loads in kilowatts of 717,000 and 615,283 respectively.

"It will thus be seen," said Joseph D. R. Freed, "that we are far away from the era of super-power in broadcasting.

"There are no really super-power stations as yet. What we have now are stations with increased power, up to five kilowatts, and we are watching with great interest the experiments being made at 1500 to 5000 watts. Power is not the only determining factor in the efficiency of broadcasting, entirely eliminating atmospheric conditions, but when it is accompanied by proper modulation and all other methods that pertain to transmission, power assumes vast importance, just as it does in the leading commercial code stations of the world.

"Suppose we have 500 broadcasting stations using an average of 500 watts, which is far ahead of the average which actually exists to-day in this country. We have only a total of 250 kilowatts to be multiplied by the hours of broadcasting. As can be easily seen, this is very very small indeed, as compared with the other figures showing the use of power in the service of mankind.

"Suppose we used the energy of Niagara for broadcasting. The imagination must run riot in contemplating the effect!"



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**A DX TRANSMITTER,** by C. H. West, May 23 issue, RADIO WORLD, 15c.

# Radio University Planned; All Teaching Via Ether

*By Thomas Stevenson*

WASHINGTON.

THERE is reason to believe that within the near future there will be inaugurated a radio university which will specialize in courses to put on the air for the benefit of those who would like to study at home.

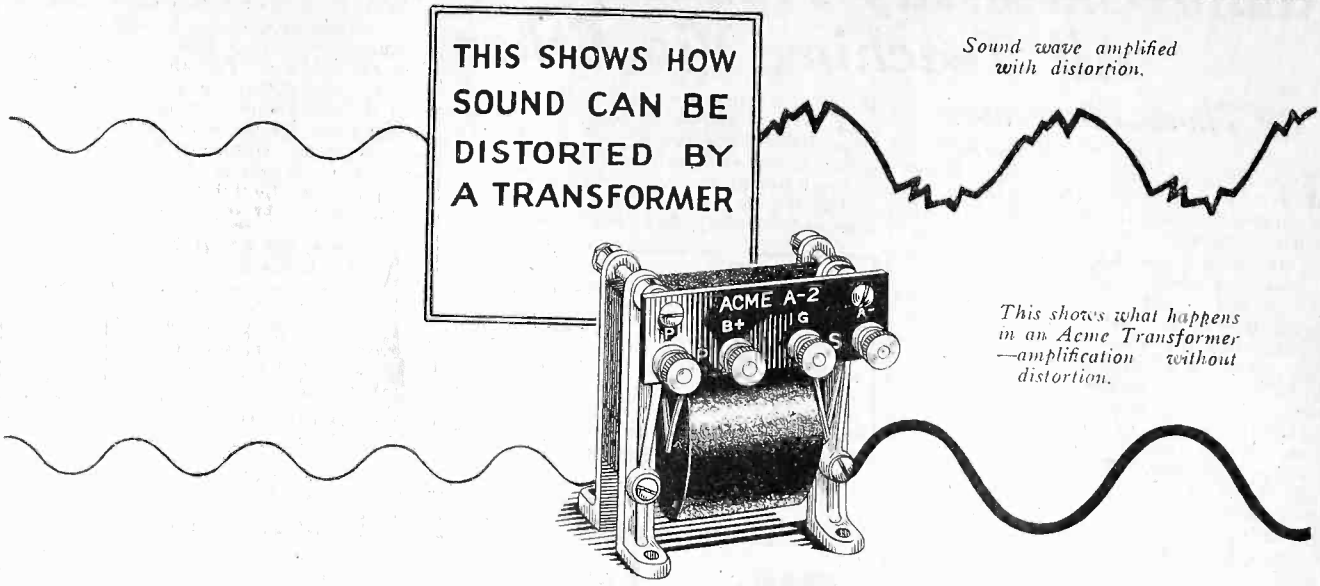
It is understood that a group of New York people are now considering the organization of such a university and that within a short time they will seek to raise money enough through popular subscriptions to put the proposition over.

It is the opinion of officials of the Government that there is a definite place for a radio university. They believe that the experiment of the Kansas State Agricultural College has proven the public would take advantage of such an opportunity to increase general knowledge.

The Kansas State Agricultural College tried out the proposition of teaching by radio during the winters of 1923 and 1924. Lectures lasting 25 minutes each were broadcast five nights a week on agricultural development, engineering, rural architecture, farm mechanics, interior decorating and other subjects. By the time the broadcasting of courses had begun, over four hundred persons, located in several state, had registered. At the end of ten weeks registrations had been made from all but nine states, and from Canada, and at the time of the completion of the courses 967 persons had enrolled while 311 took examinations in 488 courses and were awarded certificates.

So successful was the first experiment that in the fall of 1924 a more extensive course was projected. It included agriculture, engineering, home economics and general science. For this course there was enrolled 830 persons.

If the radio university is started, it may resort to the endowment plan as a means of obtaining sufficient funds. At the present time million dollar endowments are possessed by 121 U. S. universities.

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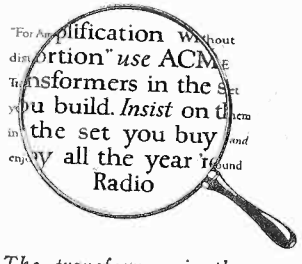


*The transformer is the magnifying glass of radio*

**Acme Transformers are sold by all radio dealers.**

WHEN you put a lot of time and money into a radio set you want to be sure that it will give the best results. You want to know that you can bring in the distant stations loud and clear, so that a roomful of your friends can enjoy it. You want amplification, but above all you want Amplification without Distortion. To do this, use amplying transformers that increase the sound without spoiling the quality.

The Acme A-2 Audio Frequency Amplifying Transformer is the result of five years of research by Acme Engineers. Whether you have a neutrodyne, superheterodyne, regenerative or Reflex, the Acme A-2 Audio Transformer will make your set better.

If you are not getting loud, clear, undistorted radio, change to Acme Transformers and note the difference.

Each Acme Transformer is tested in our factory and bears a guarantee tag; there are no Acme "seconds." Use Acme Transformers in the set you build. Insist on them in the set you buy. One of the big reasons why the Acmeflex Kitset gives such excellent results is that it uses Acme Transformers.

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