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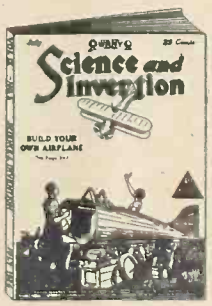

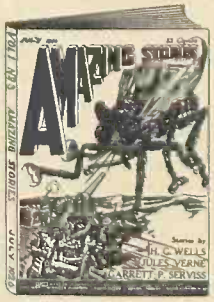

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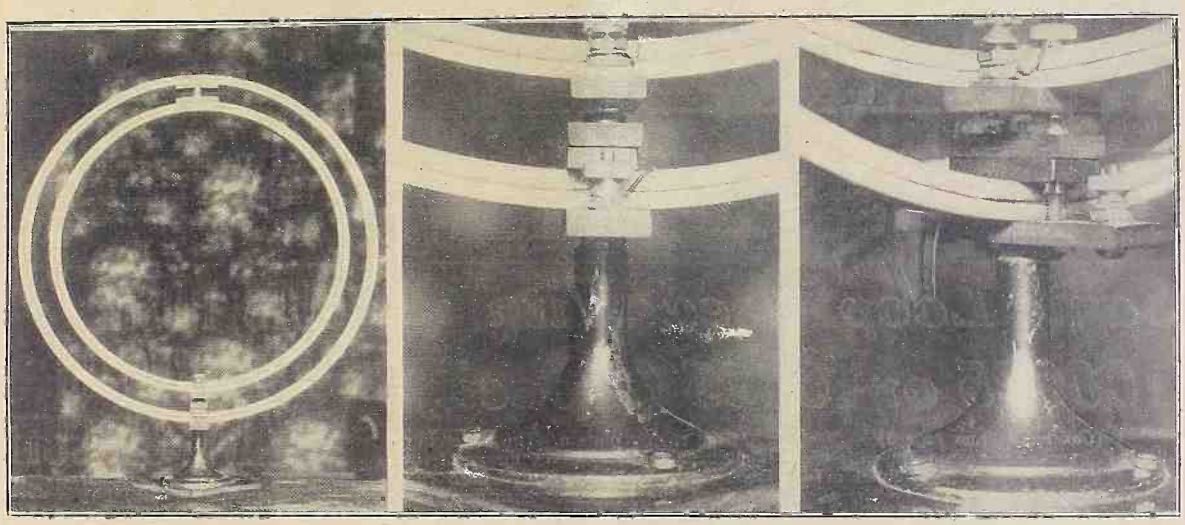
A Double Duty Loop Aerial



FIGS. 1, 2 AND 3
The finished loop and the lower pivot arrangement.

Embroidery Hoops Are Used for the Frame—One Winding Turns Inside the Other and Affords Variety of Uses.

By J. E. Anderson
Consulting Engineer

EVERYBODY knows what an embroidery hoop is, but everybody does not know that an excellent loop for radio reception may be wound on one of these hoops. An embroidery hoop consists of two wooden rings, one fitting snugly inside the other. The inside of the rings has a strip of felt glued to its outside periphery. This strip of felt is set into a groove about 1/16" deep, and about ⅜" wide. Remove this strip of felt and clean the groove of all hardened glue. When this has been done, it will be seen that the groove is slightly deeper near the side flanges. By means of the edge of a large file or other suitable instrument file down the center of the groove until the depth is the same all over. In doing so be very careful not to injure the side flanges. When the bottom of the groove has been filed flat all around drill two tiny holes (about No. 50) radially through the bottom, one near each flange. The next step is to wind the loop.

The number of turns to be put on depends on the inductance required, on the diameter of the hoop, and on the size of the wire to be used. If the loop is to be used for broadcast reception with a .0005 mfd. variable condenser, about 170 microhenries inductance will be required For this a 12" hoop is recommended. Using No. 24 double silk covered wire, 14 turns will do the trick.

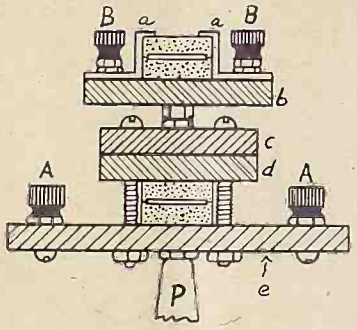


FIG. 4
The cross-sectional drawing.

The Extra Two Turns

The width of the groove is such that only 12 turns of this wire can be wound in the first layer. Hence it will be necessary to bank wind two turns to get on the 14 turns. It is convenient to wind first two turns, then put the third turn on top of the two, then continue the winding as a single layer coil until 13 turns have been put on. The fourteenth turn may be put on top of the twelfth and thirteenth turns.

If bulkier wire is used for winding the coil more turns have to be put in the second layer, but if finer wire than No. 24 is used it will not be necessary to bank wind at all. But finer wire is not recommended.

The two small holes drilled in the bottom of the groove are, of course, used for the terminals. The ends of the wire are brought through these holes and left pointing toward the center of the hoop.

The loop is now ready for use, but it is not yet finished. Just as a matter of protection of the wiring the outside hoop should now be slipped over the wound ring. It will be found that the outside ring is now considerably too large. This must be fixed. The simplest way is to put padding between the two rings. Cut strips of cardboard, fibre, or bristol board of the same width as the width of the two rings. Then lay the two rings flat on the table, one inside the other, and

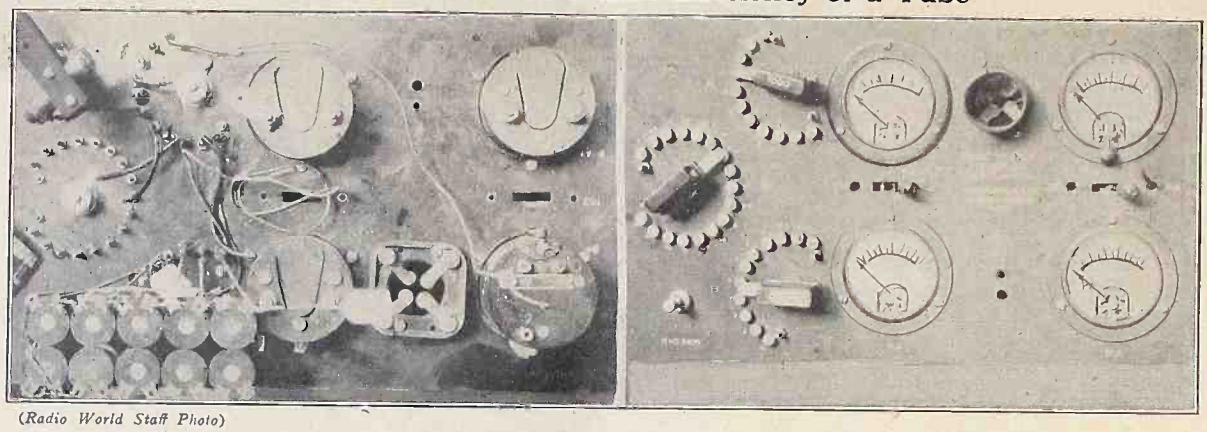
(*Concluded on page 4*)

LIST OF PARTS

One 12" embroidery hoop.
One 10" embroidery hoop.
About 80 feet of No. 24 double silk covered wire.
Four small binding posts.
A few nuts, screws and angles as suggested.
A few strips of hard rubber.
A wooden base about 1" thick and 5" diameter.

Inductance Suitable for Tuning With .0005 or .00025 Mfd. Condenser—Regeneration Made Available in Several Ways.

Tester Shows You at Glance Efficiency of a Tube



(*Radio World Staff Photo*)

THE INSIDE works of a laboratory tube tester are at left, while to the right is the panel view. The meters are wired so as to show the filament amperage, plate milliamperage, filament voltage, and grid voltage at a specified plate voltage, varied with the aid of the resistor batch to the lower left in the back view. With the varying of these resistances, it is also possible to calculate the amplification factor. The buzzer aids in determining the proper amplification of the tube. The mutual conductance is calculated from readings given by the meters.

Same Loop Used With .00025 or .0005 Capacity

(*Concluded from page 3*)

fill up the space between them with the strips of padding. Force enough in, even all the way around, to make the two rings stay firmly together. Then run some glue or cement along the sides and let dry.

Now binding posts could be provided and the loop could be used for picking up signals, but only as a simple loop. There is more to be done. Procure another embroidery hoop, one which may be turned inside the other. A ten inch hoop is about right. Prepare and wind this in the same manner as the first, except that only twelve turns should be put on it. When the two loops have had time to dry, mount the smaller loop inside the larger in such a manner that it may be turned freely. One way of mounting will be shown in detail below.

The finished loop is depicted in Fig. 1. Observe that the two loops are very nearly concentric. It is desirable to obtain this condition as nearly as possible.

The upper pivot is very simple. Two strips of hard rubber of the same width as the rings are bent to conform to the curvature of the rings, a hole is drilled in the center of each of these strips, and then they are glued in place. The glue will hold better if the glace on the rubber is removed by means of a file or sandpaper. The pivot proper is an old time inductance switch stop and a nut to match.

The lower pivot arrangement may be seen from Figs. 2 and 3, or more plainly from the cross-sectional drawing, Fig. 4. BB are the two binding posts to which the wire terminals are connected, as are two small brass angles by means of which the inner loop is held to the hard rubber plate b. This plate has three No. 29 holes, two for the binding posts and one for the pivot. The latter is simply a ¾" flat head brass screw secured to the plate by means of a nut under the plate and extending into a No. 28 hole in the double plate cd. The dotted areas in Fig. 4 represent the sections of the two loops, and the non-shaded rectangles in these areas are the two winding spaces.

AA are the two binding posts for the outside loop, and these are secured to the hard rubber plate e. The larger loop is clamped to this plate by means of two brass screws and the double hard rubber plate cd. The latter is made double for strength and also for centering the smaller loop. The lengths of the upper and lower pivots are such that the inside loop may be slipped in place by elongating the outside loop along the vertical and the inside along the horizontal, yet such that the inside loop cannot come out accidentally. The mounting of the loop assembly into the base P is similar to that of the inside loop into the plate cd.

It was at first intended to have the outside loop turn without turning the base, but it was found that this did not give satisfactory control of the loop. Hence the larger loop was rigidly secured to the base so that it is necssary to turn the base with the loop. In view of this it may be simpler to fasten the outside loop to a circular piece of wood in the same manner that the inside loop is fastened to the plate b. A base such as that used in this loop is not easy to obtain.

The outside loop alone tunes the broadcast range of wavelengths with a .0005 mfd. condenser. When the inside and outside loops are connected in series aiding, the combination tunes the same range approximately with a .00025 mfd. condenser. The inside loop may also be used for tuning in the shorter waves in case a .0005 mfd. condenser is used.

If it is desired to make the set regenerative, the inside loop makes a very good tickler, as the regeneration may be controlled by turning the inner coil. The smaller loop may also be clamped in the plane of the larger and the regeneration controlled by means of a small variable condenser.

If a .00025 mfd. condenser is employed for tuning, the circuit may still be made regenerative by connecting the two loops in series aiding, the free terminal of the large loop to the grid, the free terminal of the small loop to the plate, and the junction of the two loops to the filament. In this case the regeneration would be controlled by means of a small condenser in series with the lead to the plate.

VOLTS PUSH AMPERES IN ANY CIRCUIT

Water will not flow in a pipe line unless a force pushes it along, e.g., a pump. The water will not keep on flowing unless the pump supplies pressure. Electricity will not flow in a circuit unless there is a battery, or some other electrical source, in the circuit. The battery is similar to the pump in action, e.g., supplies pressure. This pressure is what is commonly known as voltage or electromotive force. The more cells in the battery connected in series, so that pressures will add, the greater the electric pressure and the voltage produced.

Suppose an electric current to be supplied to the motors of a trolley car, with the aid of a generator and two conductors, e.g., trolley wire and track. A steam engine supplies the mechanical energy to the generator, which is transferring this mechanical energy to electrical energy.

The changing of this energy causes current to flow when the circuit is completed through the car. Between the terminals of the trolley wire and the track exists a difference of electric potential.

All generators have for their purpose the setting up of such a difference of potential which is a difference in electric condition determining the direction of flow of electricity from one point to another.

An electric potential difference may be considered as establishing an emf, which causes a flow of electricity, when a conducting path, is provided. Therefore, electromotive force is that which drives an electric current, the volt being the unit of emf.

The current is the water in the pump parallel, while the voltage is the pump. Current is measured in amperes.

Tip Jacks Useful at Detector Output

A pair of phone tip jacks mounted in an accessible place, such as the panel, connected to the primary posts of the first audio frequency transformer or the detector output, may be used for listening to DX.

How to Measure Coupling

Close Coupling Is Less Effective Than Many Suppose — The Optimum Point Is Critical Coupling, for as Fields Are More Strongly Linked Absorption Losses Take Place.

[Following is the third of a series of articles telling how to equip yourself with a real radio laboratory at small cost. For hookup fans and manufacturers alike such a laboratory is very valuable. The first article, published in the June 19 issue, dealt with the construction of an RF oscillator, a modulated audio oscillator. The second published June 26, showed how to determine wave forms. More details along the line of the following article will be published next week, issue of July 24.]

By John F. Rider
Member, Institute of Radio Engineers

THREE more units must be constructed before we can start actual experimental work. These are a radio frequency amplifying unit, a detecting unit and an audio amplifying unit. The radio frequency amplifier is of the tuned type. The design is conventional and consists of two stages. The tuning capacities are .0005 mfd. variable condensers and the coils consist of single layer inductances. The winding forms are 2" in diameter. The secondary winding consists of 64 turns of No. 24 DSC wire. The primary winding consists of 3 turns of No. 24 DSC wound directly over the secondary winding, at the midpoint. A piece of empire paper is the insulation used to separate the primary from the secondary. The reason for the very few turns in the primary winding is the demand for utmost stability, sensitivity and energy output being secondary considerations. The layout of the system is shown in Fig. 1. All connections are made to Fahnestock clips. One rheostat is used to control the two filaments, and clips for automatic filament control devices are shunted around the rheostat.

To provide variable coupling into this radio frequency amplifying system it is necessary to construct another input coil. This consists of two separate units, a primary and a secondary. In design the secondary is an exact duplicate of the one mentioned previously. The primary, however, is a separate winding on a 1¾" diameter tubing and consists of 12 turns of No. 24 DSC. This is not fastened or attached to the secondary in any manner. When it is desired to alter the coupling between the primary and secondary the position of the primary with respect to the secondary is simply moved. This variable unit is that it will be found of great utility in later experiments.

The Detector Unit

The next unit is the detector, and will be made regenerative to increase its scope of operation. If the regenerator control is not desired, it can be shorted out of the circuit very easily, being of the tickler coil type. The detecting unit is mounted on a separate baseboard, being another open model. In fact, all the testing equipment is open models. This permits greatest accessibility. The layout and wiring diagram are given in Fig. 2.

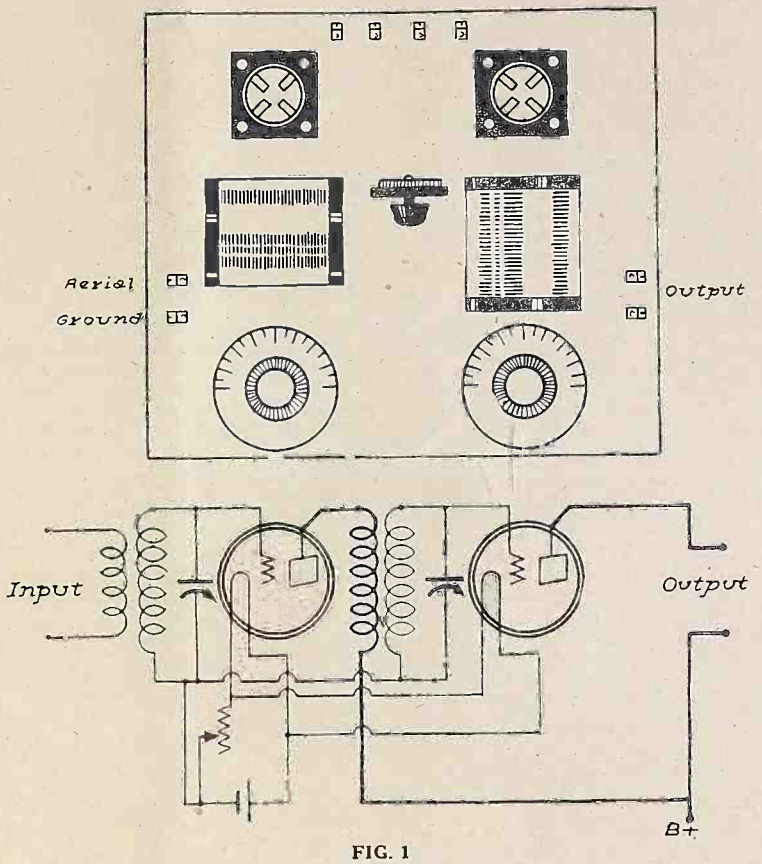


FIG. 1

THE WIRING of the radio frequency test amplifier and the suggested baseboard layout. All equipment is of the open construction type.

An individual primary and secondary are not provided for the detecting unit. When it is desired to utilize the detecting unit in conjunction with the radio frequency amplifier the coupling device between the detector and the last stage of RF is another unit similar to the regular radio frequency transformer.

When it is desired to use the detector directly connected to the aerial, without any radio frequency amplification, the variable coupler is used to replace the radio frequency transformer. As is evident, the assembly and wiring of the detecting unit are independent of the amplifying unit.

The coils which comprise the primary and secondary inductance are not fastened to the baseboard. The tickler coil consists of 25 turns of No. 26 DSC wire on a 1¾" diameter tubing. The tuning condenser is an enclosed General Radio unit of 500 mfd. (.0005 mfd.) equipped with a variable grid leak and also with clips for fixed leaks, so that either may be used at will. The grid condenser is a .00025 mfd. unit. The filament control is by means of a rheostat, but clips for filament control devices also are provided.

Binder Used on Coils

All inductances are given a thin coating of collodion and permitted to dry thoroughly. This binder substance can be applied with perfect impunity to all inductances utilized in the radio frequency amplifier and the detector unit, for the detrimental effect of the binder is entirely negligible when the binder is thoroughly dry.

The leads from the coils used in the detector unit, when the variable coupling is being utilized, are flexible so the coils may be moved with ease and remain fixed in their position, thus obviating the tendency to shift due to the tension of the connecting lead.

The First Experiment

The layout of the audio amplifying unit is given in fig. 3. Transformer coupled audio amplification is used at this time because it provides the greatest output with the minimum number of tubes, considered solely from a power angle. Resistance and impedance coupled units will be considered later. The transformers are not limited to any one manufacture. The only requisite is that they be of reputable manufacture and be of from 3½ to 4-to-1 turns ratio. The connecting posts are again Fahnestock clips. Both rheostats and automatic filament control clips are provided. The transformers are mounted as shown in the drawing. The input clips are located at the extreme left of the baseboard, permiting easy connection to the output of the detector unit. Sufficient space should be left between the second audio transformer and the second tube to permit the location of a variable resistance across the secondary of that transformer. Two B plus terminals are provided, one for each audio tube. The same applies to the C potentials. A C battery minus terminal is provided for each audio tube so as to allow separate values of negative grid bias. The rheostats are 10-ohm units and capable of carrying .5 ampere.

Assuming that the units are completed,

A Laboratory Experiment

Signal Strength Is Determined in Arbitrary But Accurate Relative Values by Rectifying Output and Hooking up a 0-to-1 Milliammeter — Deflections of Needle Show Effect Due to Coupling Variation.

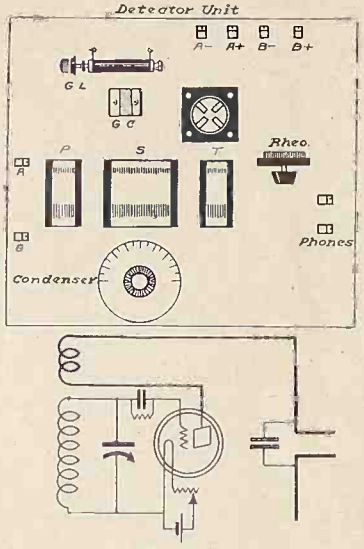


FIG. 2

we can start on a series of interesting experiments.

The first test is that pertaining to coupling, that is, the transfer of energy between coils. Coupling has been, for some unknown reason, very much neglected by radio writers, although it manifests a very great effect upon the general operation of the receiver, by virtue of its control of selectivity and volume. With the large number of broadcasting stations in operation, selectivity is of paramount importance.

Types of Coupling

Coupling is divided into various types, depending upon the medium used to transfer the energy from one circuit to the other. For instance, if a condenser is used to interlink the two circuits, and the energy when passed from one circuit to the other is caused to go across this capacity, the circuits are capacitatively coupled. If the coupling device is a resistance, the circuits are resistance coupled; if the coupling device is a choke coil, as in many audio circuits, the circuits are impedance coupled. If there is no direct connection between the circuits the energy being induced in one coil by the action of the current flowing in the other coil, the circuits are inductively coupled, and if the two circuits utilize the same coil, the circuits are conductively coupled.

Being concerned with the type which manifests its effect upon selectivity, we can devote our attention at this time to radio frequency circuits and ignore for the present methods of coupling. And since in radio frequency circuits pertaining to conventional reception, the prevalent type of coupling is inductive, we will delve into this type of coupling.

Degrees of Coupling

Now, in addition to various types of coupling, we also have various degrees of coupling, such as loose, critical and close. If one were to immediately interpret these degrees of coupling as direct indications of the transfer of energy from one circuit to the other, and interpret the energy transfer as different values of signal intensity, it would be only logical to think that maximum or close coupling would afford the greatest signal intensity and volume. Such, however, is not the case!

The reason for this phenomenon is not very difficult to comprehend. Just try to visualize two inductances. Alternating current is flowing in one of the coils. When another inductance is placed in proximity to the first one, current will be induced in the second. We are assuming at this time that the two inductances are tuned to the same frequency or wavelength.

Now, if we place a recording device into the circuit of the second inductance we find that a certain current from the first coil is induced in the second coil, let us say, with a 5" separation between the coils. We gradually reduce the separation between the two coils and note that the current in the second circuit is increasing, until when the coils are ½" apart the current indicator has passed the peak and is beginning to show a decline from the peak reading.

Measures Signal Strength

We increase the separation until the current indication is maximum and note that the separation between the two coils is ⅞". Now, it is quite safe to assume that the current indications in the second circuit can be interpreted in terms of signal intensity, for the greater the current induced in the second circuit, the greater is the energy transferred to that circuit, and if that circuit were connected to a vacuum tube amplifier or detector, the output would be greatest when the current in this arrangement shows maximum.

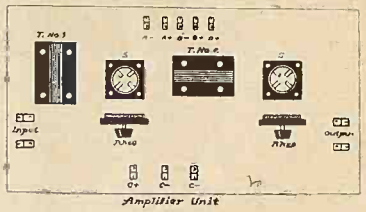


FIG. 3

LAYOUT for audio frequency amplifier.

We are now in a peculiar position. We note that the energy transfer reaches a maximum value before the coupling between the two coils is maximum, or interpreted differently, the current in the second circuit is maximum although the separation between the two circuits is not minimum. Further as the separation is now reduced, that is, the coupling is increased, the current decreases instead of increasing! The second inductance reacts upon the first, and this reaction results in a cumulative effect which reduces the amount of actual energy transferred from the first coil to the second. This effect is increased as the coupling is increased, until at maximum coupling the energy transfer is much less than at the point of critical coupling, when it is maximum.

To determine this phenomenon experimentally, set the detector unit into operation. Connect the aerial and ground to the respective posts, and tune in any local station, with 1" separation between the primary and secondary coils. It is best to select a powerful local broadcaster. With a strong signal in the phones, reduce the coupling between the primary and secondary coils (increase the separation). You will observe how the signal in the phones decreases. Now gradually increase the coupling, (decrease the separation) until the primary coil is partly within the secondary coil. You observe a gradual increase as the coupling is increased, and then a gradual decrease in signal intensity from the peak intensity as the coupling is still further increased.

The Coupling Curve

Various degrees of signal intensity are obtained with the three degrees of coupling, because of the large scope of operation of loose coupling and close coupling. Loose coupling exists until the coupling becomes critical, and then close coupling exists from critical until unity is reached. The closest coupling is obtained when all the lines of force from one coil cut all the turns of the other. The loosest coupling is obtained when the separation between the two coils is infinite. Critical coupling is obtained when the magnetic lines of force of the first coil cut the maximum number of turns of the second coil without any reaction from the second coil back to the first.

The rise and fall of this energy transfer phenomenon can be shown by what is known as a coupling curve. Revealing the transfer of energy plotted against degrees of coupling. In our case the various degrees of coupling are marked off as separations in inches between the coils.

(*Concluded next week*)

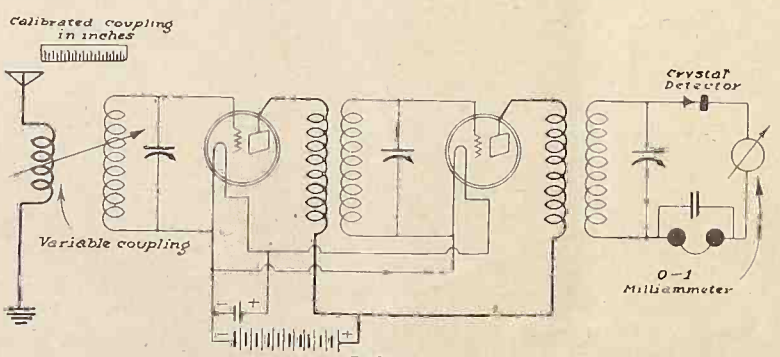
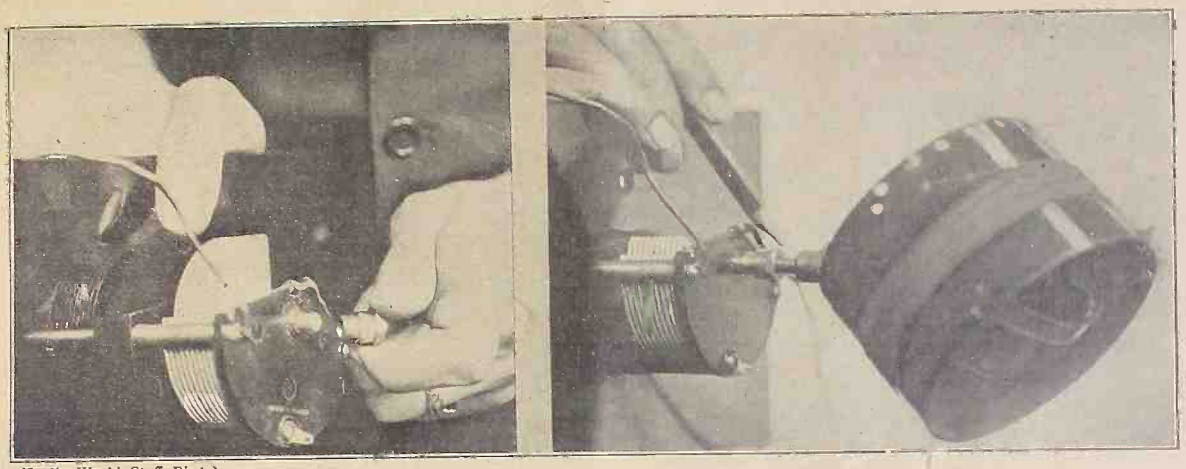


FIG. 4

METHOD of measuring the signal intensity.

A 1-Control Crystal Set



(Radio World Staff Photo)

FIGS. 2 AND 3

The method of attaching the bushing to the condenser shaft is shown at left. The rotary coil shaft (at right) then is slipped into the bushing. The rotary coil should not be at zero coupling when the condenser plates are nearly nested, as shown in the photograph.

By Smedley Lyons

MANY persons perhaps wonder at the origin of articles on how to construct a simple crystal receiver. It is always a simple set, for even engineering talent has been unable to impress any marks of complication upon the crystal receiver.

The articles originate this way:

A radio experimenter blows out all the tubes he has in the house, or his A battery runs down so low that he can not light the tubes, or the B batteries arrive at the end of their career. Hence he can not get reception that night on the family receiver. Yet he is itching to do something along radio lines, preferably something constructional.

Lo, the Poor Crystal

On a shelf he espies a crystal detector. Ah, there is the inspiration! "How To Build a Simple Crystal Set!" The idea and the title flash simultaneously upon the screen of his imagination. And he goes to work.

Building the set takes him about 40 minutes. Then he hooks aerial and ground to their proper connecting points, casts a contemptuous glance at the charging A battery, or the dead tubes, or the exhausted B batteries, and listens to programs on the simple crystal set.

Mother has to stop rattling the newspaper as she turns the pages, and all others in the house must keep quiet, too, else he will hear little if anything. The folk are not used to that, having been cured of the habit with the advent of the tube receiver in the home several years ago. But the reception is enjoyable to him, although few close relatives may feel annoyed, and the experimenter temporarily renews his admiration for one of the popular circuits of years gone by, although one not in great favor today. The underlying thought, however, and the only one that offers any solace, is that the youngsters will build the simple crystal set, and likewise those oldsters who never before built a receiver and are anxious to get started on this fascinating work. So he writes an article on the subject and it is bought by a magazine while the editor is on vacation.

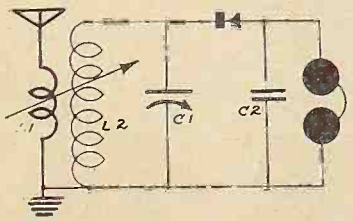


FIG. 1

Wiring diagram of a crystal receiver which may be operated with single control.

LIST OF PARTS

One 7x7" panel.
One 6x7" baseboard.
One variocoupler, L1L2.
One .0005 mfd. variable condenser, C1.
One .001 mfd. fixed condenser, C2.
One crystal detector.
One pair of earphones.

The Set in Fig. 1

So it was that the crystal receiver shown in Fig. 1 came into existence in one particular home. The diagram reveals a variocoupler, connected with primary to aerial and ground and secondary to one side of the crystal and to ground, a variable condenser tuning the secondary. With a good fixed detector, like the Carborundum, this is an acceptable set. To obtain signals, connect the phones to the other side of the crystal and to the ground, a fixed condenser, C2, bridging the phones, to bypass the radio frequency currents around them, thus avoiding the resistance effect of the magnet windings.

The tuning may be accomplished with a single control by connecting the variable condenser shaft to the rotary coil shaft. This can be done conveniently only if the shaft of the condenser protrudes at rear. A 9/32" bushing is used, if the shafts are that size, as is customary.

The rotary or primary coil is turned so that coupling is just enough to enable one to get fair volume on any low wavelength station within range. As the condenser dial is turned it will cause the coupling to become greater, that is, the primary and secondary windings come closer and closer to parallel position. This gives you greater selectivity on the lower wavelengths than if the coupling were fixed. Also you obtain single control.

Coil Data For the Set

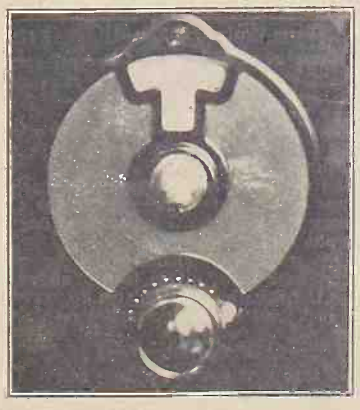
The primary coil winding depends on the dimensions of the coupler. You may use an existing 3-circuit tuner for this receiver, omitting the small winding on the stationary form, or may rewind forms of an old variocoupler, or use an old variocoupler "as is."

If the primary form is 2" to 3" diameter, put on about 18 turns of wire, preferably No. 22 double cotton covered. The secondary then would be 4" diameter and would have 40 turns of the same kind of wire, if C1 is .0005 mfd. If it is .00035, then secondary turns would number 50, while if .00025 the secondary would have 60 turns. A crystal set needs more wire than a tube set for tuning in the same wave band.

If the primary is 2" or thereabouts, put on 22 turns, and use a 3" or 3½" secondary. For 3½" put on 50 turns and for 3" put on 57 turns. This is for .0005 mfd. tuning. For lower capacity condensers, put on more secondary wire.

One end of the secondary winding is

(*Concluded on page* 8)



(Radio World *Staff Photo*)

FIG. 4

The Panel view.

Ionization Is Pivot Of Operation of Tube

Unless a cold electrode in a tube is subjected to much electron bombardment, no appreciable amount of electrons will be given off. Therefore in a two-electrode tube, if the plate is made negative with respect to the filament, no current will flow.

That is, if the plate is made negative, any current which will flow from the plate to the filament must be caused by the electrons which leave the cold plate. When a cold electrode, which may be either a plate or grid element, shows that current is flowing in such a direction as to indicate that electrons are flowing from the element, the tube has gas in it, which is serving as a means of conducting the current.

Even in the highest vacuum obtainable there is still a tremendous number of gas molecules in the supposed completely evacuated space.

Usually a gas is a fairly good insulator and provides a difficult path for the conduction of current.

However, when a gas is under low pressure, it may be made to carry a heavy flow of current, if this gas becomes ionized.

That is, when the normal gas atoms are broken into two parts, e.g., a free electron and a positively charged nucleus, ionization is taking place.

The ionization, or breaking up of the gas atoms, is equal to a breakdown of insulator when subjected to a too high voltage.

Ionization of the gas in the radio tubes occur as low as 22½ volts. The hot filament furnishes the electrons, which are so active, due to positive plate voltage, that the ionization of the gas atoms is started.

Test of Electron Action

A simple test may be used to show what action the electrons take in producing ionization.

If the plate of a known faulty tube is subjected to its usual voltage, with the filament cold, no plate current will flow and the tube naturally will not show any signs of being ionized.

But suppose the filament current is increased step by step. The emission of electrons will start. The plate current also will start to flow. At a certain filament temperature, dependent upon the amount of gas in the tube, a blue glow will appear, the latter accompanied by a surplus amount of plate current.

In this way it is possible to note that the filament must be giving off a minimum number of electrons before any ionization of the gas takes place.

It will be remembered that when the filament current was low, no plate current flowed. Therefore, if either the plate voltage or filament current is reduced or vice versa, it is possible to control the actual ionization condition of the tube. Usually the state of ionization paralyzes the proper action of the tube in power amplifier tubes only. Although ionization occurs very little in tungsten or thoriated tubes, because of the high type of vacuum usually employed, the oxide filament type of tube usually offers trouble.

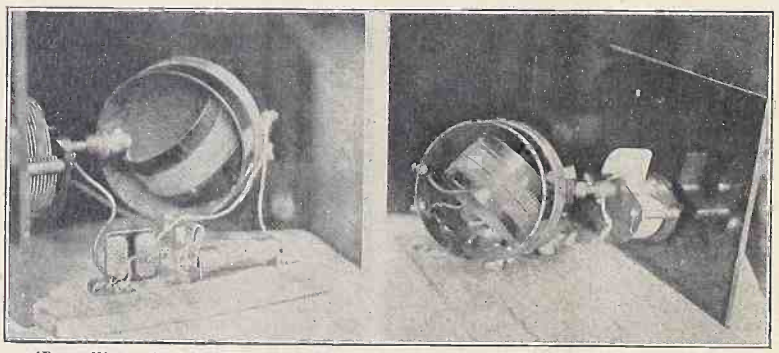
Action In Tube

That is, in these tubes much gas is present in the filament, grid and plate. When ionization starts, the electrons of the ionized gas go to plate, which is positive. The positive nuclei, however, go back to the filament, subjecting it to a bombardment, which results in the extra heating of the filament in one spot, with the resultant burning out of the filament at this one spot.

Of course, the greater the filament current, the greater the electron emission, which in turn causes the ionization to increase, increasing the return bombardment of the electrons at one spot and the consequent burning out of the filament at that one spot.

Tubes which have quantity of gas are employed with great satisfaction as detector tubes. The grid and the plate voltage must be so adjusted that it is just about enough to bring about the ionization. The small increase in grid voltage due to the incoming signal brings it up to the point of ionization with a resultant increase in plate current. This type of tube is difficult to control, although very sensitive.

Long Aerial Is Needed for Crystal Reception



(Radio World *Staff Photos*) **FIGS. 5 AND 6**

Views of a completed 1-control crystal receiver. The phones are connected to clips on the baseboard.

(*Concluded from page 7*)

soldered to one end of the primary winding. If signals are not loud reverse the secondary connections.

If the crystal has its terminals marked A and G, the A terminal goes to the secondary coil and the G terminal to one of the phone cord tips.

The variable condenser may be connected with rotor plates to ground, as in Fig. 1, or with stator plates to ground, for in a crystal set this makes no difference.

Wiring Directions

Be sure that you use a long aerial. The longer the better. But if you have an aerial you use with a tube set, and do not want to monkey with it simply to get crystal reception, putting more turns on the primary coil than were prescribed previously may get you stronger signals.

The wiring is done by connecting the aerial to one terminal of the primary and the ground to the common connection established by the other end of the primary and one terminal of the secondary. The ground lead also goes to three more points: (1) to the rotor plates of the tuning condenser, C1; (2), to one side of the fixed condenser, C2, and (3), to one of the phone cord tips. The remaining free terminal of the secondary is connected to one terminal of the crystal, the other terminal of the crystal being joined to the remaining free side of the fixed condenser and to the free phone cord tip.

That completes the wiring.

DX Heard on Crystal; Mystery Is Unsolved

The story of miraculous radio reception crops up every so often. KFI has had several well authenticated reports of DX crystal set reception, among them being notifications from Stewart Borg, who heard KFI on a crystal set in Seattle, 900 miles from Los Angeles, and G. E. Tuttle and W. L. Coon, who heard KFI on home-made crystal sets in Denver, 800 miles from Los Angeles. So far, no explanation except re-radiation from regenerative sets has been advanced to account for these super-reception records. The theory does not hold good, however, when there are no radiating receivers within a mile or so of the crystal set, which was true of Borg's reception.

As remarkable as the crystal set reception is the authentic reception of KFI on one tube in Brooklyn, Havre de Grace, Lynn and other Atlantic seaboard points. As one fan expressed it, the only explanation seems to be that some nights radio waves just naturally get together and travel high, wide and handsome.

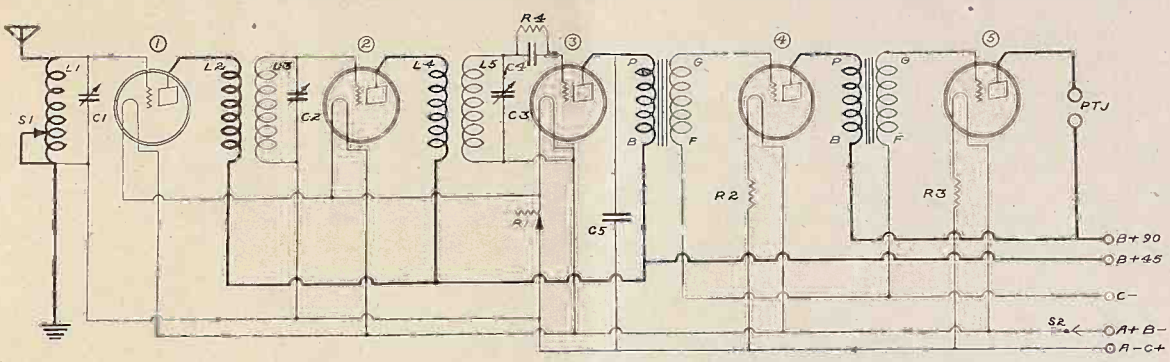
Many Requests Received for Frequency Signals

Although it is known that the Government desires to do away with transmitting standard frequency signals, letters have been received which have caused officials at the Bureau of Standards to decide to continue the sending of these signals on the 20th of each month as usual until October.

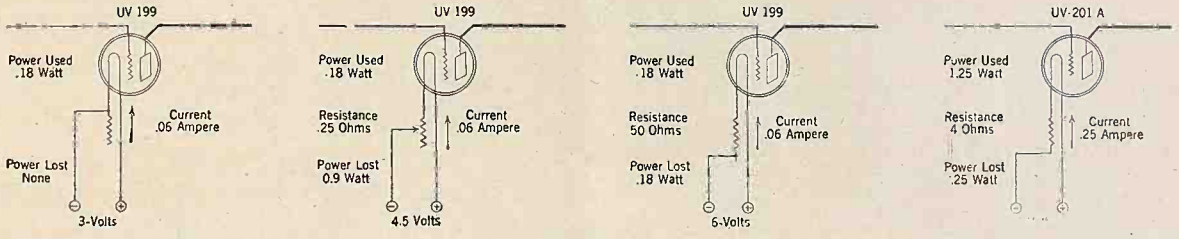
Ultimately, however, it is expected to do away with the sending of these signals, since other means of disseminating the Government standards of radio signals of definitely announced frequencies have become increasingly available. This is in part due to the increasing use of Piezo oscillators and the wide availability of reliable standards testing service from a number of laboratories that do commercial testing of frequency meters. None of these was available when the standard frequency transmissions were inaugurated three years ago.

Circuits of Losses and Gains

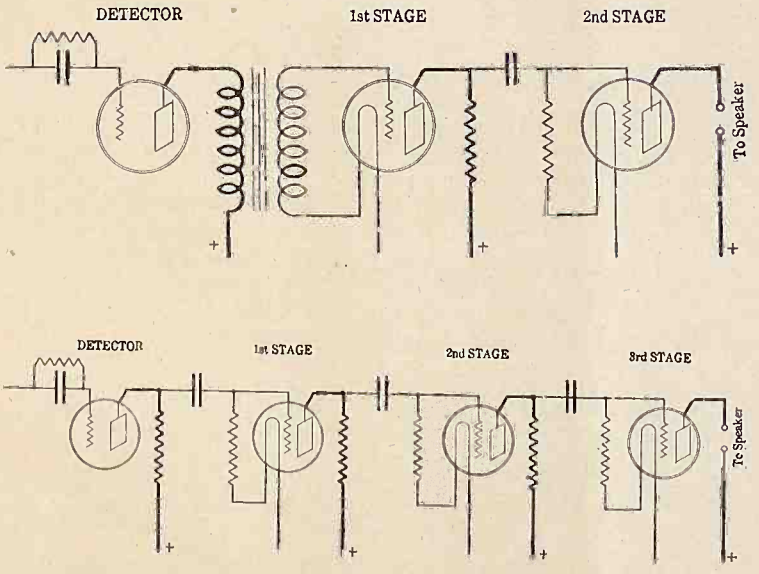
Tube Economy Is Stressed in Group of Hookups



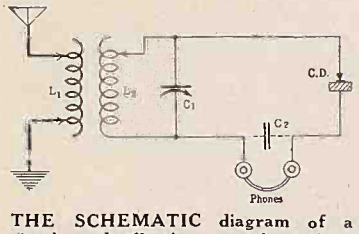
THE SCHEMATIC diagram of the Light 5 Portable, described by Herman Bernard in the June 12, 19 and 26 issues of RADIO WORLD. The antenna coupler used is of the conductive type. It is the most energetic form of antenna input that can be used. Two stages of tuned radio frequency amplification, a non-regenerative detector and two stages of transformer coupled audio frequency amplification are used. Since the filament control of the RF and the detector tubes is not critical, they are controlled by a single rheostat, R1. The filaments of each of the two audio tubes are controlled by a ballast resistor. S1 is employed for short circuiting a part of the antenna coil so that the entire waveband may be covered without using a larger condenser across the winding, than .0005 mfd.



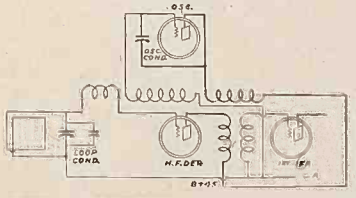
HOW IT is possible, when the —99 type tubes is used with different voltages and rheostats, to save or lose power, A complete discussion of saving power with different voltages and rheostats with various types tubes was given by J. E. Anderson in the Dec. 5, 1925, issue of RADIO WORLD. As to the above diagram, in the first case, when the —99 tube is operated directly from a 3-volt source, with no rheostat, no power is lost. However in the next case, when the same tube is operated from a 4.5 volt source, with a rheostat connected in the circuit, 0.9 watt is lost. From a 6-volt source the loss is .18 watt. At right the loss in a 6-volt tube hookup is shown.



THE CIRCUIT diagrams of two popular forms of AF amplifiers. At the bottom is shown a 3-stage straight resistance coupled AF amplifier, while on top is a diagram of a stage of transformer coupled and a stage of resistance coupled AF amplification.



THE SCHEMATIC diagram of a simple and effective crystal receiver, wherein are used a tapped radio frequency coil, which should have a variable primary; a variable condenser, having the proper capacity to shunt the secondary; a crystal detector; a .001 mfd. fixed condenser and a pair of phones.



THE ELECTRICAL diagram of the frequency changing system, or the oscillator and modulator (first detector) used in Western Electric Super-Heterodynes. The Hartley oscillator is employed.

Resistor for Regeneration

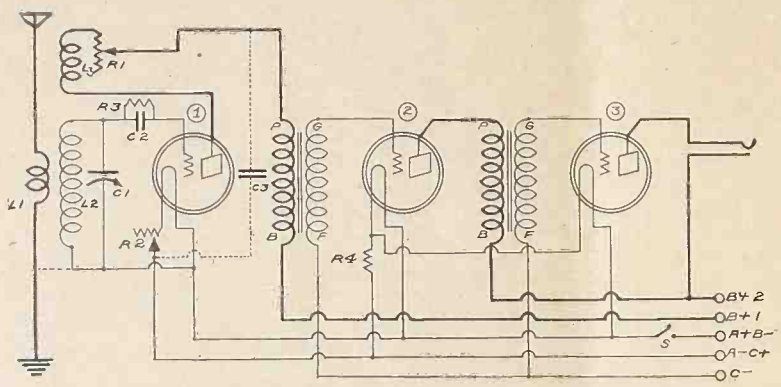


FIG. 370
The electrical diagram of the Drum Dial Type Set.

Radio University

A FREE Question and Answer Department conducted by RADIO WORLD for its yearly subscribers only, by its staff of Experts. Address Radio University, RADIO WORLD, 145 West 45th St., N. Y. City.

When writing for information give your Radio University subscription number.

PLEASE GIVE the circuit diagram, with data and any special wiring details of the set shown in the photographs in the July 3 issue of RADIO WORLD, wherein the making of a drum dial used in connection with this set, was described. The layout, etc., is very attractive and seems to be ideal for a portable.—Carolyn Jenks, Lavery, Pa.

Fig. 370 shows the electrical wiring diagram of this receiver. The coil is wound in spiderweave fashion, on 15 point, 5" cross section forms. The primary is wound toward the center of the hub, which is ½" cross section, and consists of 15 turns. The secondary, wound immediately after the primary, consists of 50 turns. The dowels, over and under which the wire is wound, are ⅛" in diameter. The windings should be very close to each other. If this is done the entire coil will take up no more space than 3". The dowel sticks should be so inserted that they may be taken out. That is, either a commercial or home-made spiderweave form, which can be taken apart, should be used. The plate coil, if wound on such a form as just mentioned, consists of 40 turns. It is placed close up against the primary and secondary windings and held together with tape or some other binding substance. When winding the primary and secondary, use No. 24 single silk covered wire. When winding the plate coil, use No. 26 or 28 ssc. If a variable resistance having a small barrel is used, it may be placed through the hub or center of the coils and held there with small angle brackets, which are bolted to a piece of Bakelite or hard rubber placed over the plate and primary-secondary windings, which have also been bolted together with small screws through their centers. Binding posts, to which are attached the terminals from the coils, are also placed on these mounts. If the variable resistance is of the rheostat mounted type, it may be placed directly in front of the two windings and also mounted on the form with angle brackets, or on the panel. The knob of the variable resistance, R1, is shown protruding from the panel, to the right, in the July 3 photos. The knob in the center of the panel is that on the shaft of the rheostat, R2, which is of the 10-ohm type. The single circuit jack is to the right, while the antenna and the ground posts are to the upper left. R3 is 2-megohm grid leak. The secondary is shunted by a .0005 mfd. variable condenser, C1. C2 is a .00025 mfd. fixed grid condenser, C3 is a .001 mfd. fixed condenser, which as indicated by the dotted lines, is not an absolutely essential unit. R4 is a 10 ohm rheostat, but not variable. That is, once the correct filament temperature of a specific tube is found, the resistance is not varied again. This unit is placed on one of the socket shelves. Both the AFT used are of the low ratio type. The —99 type tubes are employed, although larger tubes may be used. The plates of the amplifier tubes should receive 90 volts, while the plate of the detector tube should receive about 45. A 4.5 volt C battery should be used for grid biasing. Two other such batteries, connected up in parallel, are used as the A battery to light the filaments of the tubes.

Be very sure that the rotary plates of the variable condenser are connected to the low potential point of the coil, e. g., positive A, and beginning of secondary winding, which is adjacent to the end of the primary winding, is connected to the ground.

* * *

Speaker Goes Inside Cabinet, Size 8 1-2 x 24 in.

I WOULD like to have the electrical diagram, circuit data, etc., of the set built in a 8½" deep, 7" high and 24" long cabinet, wherein a midget speaker was included. A 7x24" panel was used. The description of the placing of the speaker was described in the May 22 issue of RADIO WORLD.—Thomas Stephens, Montgomery, Ind.

The circuit diagram of this set appears in Fig. 371. The primary, L1, and the secondary, L2, are a fixed radio frequency transformer. The primary, L3 and the secondary L4, represent a tuned radio frequency transformer. This primary consists of 10 turns. The secondary consists of 50 turns. It is wound on a tubing 3 in. in diameter, using No. 22 double cotton covered wire. There is a ¼ in. separation between the two windings. The secondary winding is tapped at the 8th turn from the beginning. C1 is a .0005 mfd. variable condenser, while C2 is a .00025 fmd. variable condenser. This condenser tunes the plate and controls the regenerative action of the tube. C3 is a .00025 mfd. fixed grid condenser. R6 is a 2 megohm grid leak. R1 is a 1.0 megohm grid leak, while R2 is also a 1.0 megohm grid leak. C4 is a 1 mfd. fixed condenser, although a .25 mfd. fixed type will work satisfactorily. R5 is a ¾ ampere ballast resistor. AFT1 and AFT2 are of a low and high ratio type respectively. J1 is the single circuit jack. R3 and R4 are 10—ohm rheostats. The beginning and the end of the primary winding of the tuned radio frequency transformer do not go to the plate and B plus posts directly. Instead they are brought to binding posts. The plate and the B plus posts are also brought to binding posts. In this way, the RF tube may be cut out of the circuit and the antenna and the ground connected to the beginning and the end of the primary winding. The stationary plates of both variable condensers are connected together and then to the beginning of the secondary winding of the TRFT. The tapped portion of this coil is brought to the plus post of the socket holding the detector tube. The plates of the detector, first and second amplifier tubes are connected to one B voltage. The detector plate is connected to the amplifier B source, because of the resistance in the plate detector plate circuit. This voltage should range from 67½ to 90. From 45 to 67½ volts (B plus 1), is applied to the plate of the RF tube. The plate of the last amplifier tube should receive at least 112½

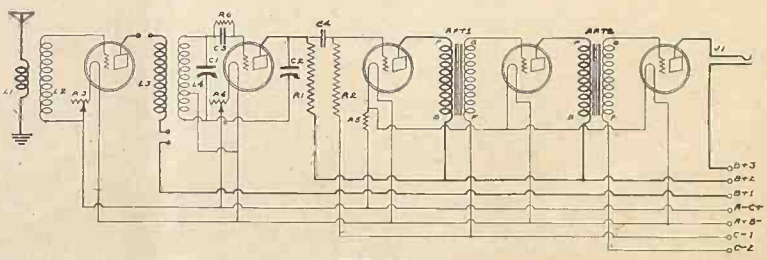


FIG. 371
The electrical diagram of the set requested by Thomas Stephens.

How to Make an RF Choke

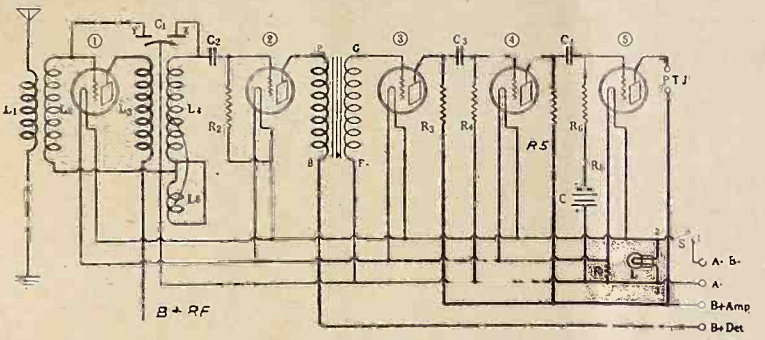


FIG .372

The winding diagram of the new model Powertone. L5 has both of its terminals connected to A minus. Also the beginning of each secondary, L2 and 4, goes to A minus.

volts. It will be noted that there are two C voltages, one for the grids of the first two AF tube and one for the grid of the last AF tube. The first C voltage should be 4.5, while the second C voltage may vary from 6 to 9. A filament switch, S, is inserted in series with the A plus B minus lead. The —01A tube are used throughout the set, with a 6 volt A supply.

* * *

The New Powertone With Novel Gain Knob

PLEASE GIVE the circuit diagram of the new Powertone, with data on the coils, condensers, and a brief wiring description of the set.—Frank Hardrans, Unionville, Mass.

Fig. 372 shows the circuit diagram. The primaries and the secondaries, L1 and L3, consist of 10 turns. The secondaries, L2 and L4, consist of 53 turns. These are wound on a tubing 2½ in. diameter and 4 in. high. No. 22 double cotton covered wire is used. C1 is a double condenser, each section having a capacity of .0005 mfd., with a total capacity of .001 mfd. One ballast resistor, R1, is used to control the filaments of all the tubes. If the —01A type tubes are used, then this ballast resistor should be of the 1¼ ampere type. If a 112 power type tube is used in the last stage, a 1½ ampere ballast resistor should be used. The tickler coil, L5, is used for non-regenerative purposes. The coil here is in the grid-filament circuit, conductively coupled to the secondary, L4, and is used as a volume control. The tickler coil should have only 6 turns on a 1 in. diameter. C2 is a .00025 mfd. grid condenser, while R2 is a 2-megohm grid leak. R3, R4, R5 and R6 are all 1.0 megohm resistors. C3 and C4 are .006 mfd. fixed condensers. The AFT used may be of a high ratio type. LS is a Bruno light switch. The —01A type tubes are used. The detector B voltage is about 45, while the amplifier voltage is 90. The plate of the radio frequency tube also has a special B voltage, ranging from 45 to 67½. This voltage is quite critical and should be adjusted with care. The ends of both secondary windings (outside points) are brought to the respective stationary plate connections of the condenser, posts, Y and Z. The beginnings of both these coils (adjoining secondary) are connected together and thence to the common rotary plate connection of C1 and to A minus. This same terminal is also brought to both terminals of the short-circuited tickler coil, L5. The grid leak is connected in shunt to the positive filament circuit. It should not be shunted across the grid condenser, C2. The C battery is connected in series with the grid return of the last tube only. If 90 volts are used as the amplifier plate supply, then a 4.5 volt C battery should be used. If the 112 tube is used, then a 6-volt C battery should be used. The phone tip jacks PTJ, may be substituted with a single circuit jack. Upon the coil, L5, falls the entire honors of this set. This coil stabilizes the set, serving as a fine volume control.

* * *

Fine Wire Advisable In Winding Choke Coil

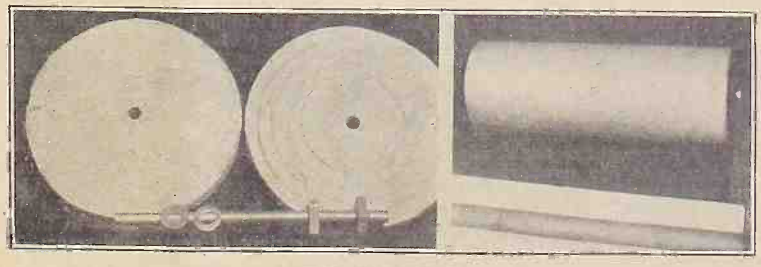
I READ with interest J. E. Anderson's article in the July 10 issue on how to make a coil winder. Please show photograph of parts used. (2) Details are requested on how to wind a radio frequency choke coil.—Elmer Hunt, Scarsdale, N. Y.

(1) Fig. 373 shows the requested photograph. (2) In many circuits RF chokes of the order of 5 millihenries are required. It has been the practice of using honeycomb coils for this purpose, but these coils are rather bulky despite the compactness of the winding method. The bulk, of course, is due to the heavy wire used in winding these coils. For chokes it is not always necessary nor desirable to use heavy wire, and it is at all times desirable to use choke coils with fields concentrated as much as posible. Fig. 374 shows the finished coil alongside of a ruler. The form upon which the wire is wound is a wood dowel 1" in diameter and 3" long. Before winding, polish the dowel with fine emery cloth, finishing up with the non-abrasive side of it. For terminals two wood screws are driven into the centers of the ends of the dowel. Temporarily one of these screws is very long and a sleeve made of small brass tubing is placed between the wood and the head of the screw. This is for facilitating chucking the coil form in a hand drill. The drill is placed in a bench vise, and the coil is ready to be wound. The wire used is No. 40 enameled copper. This fine wire is very difficult to handle. It will be necessary to mount a stock wire spool on a reel so that the spool will turn easily yet not so freely that the spool will continue to unwind for more than a turn or two after the winding is stopped. It is probable that during the process of winding one of these coils it will be necessary to stop several times to correct errors and to straighten out kinks. If the stock spool continues to unwind after stopping the winder there will be a thousand kinks formed for every one that is taken out. To prevent the wire from breaking the distance between the stock spool and the winder should be at least ten feet, and to make the winding easier the axes of rotation of the two rotating parts should be parallel and the feed wire should make as nearly as possible a right angle with either of these axes. Slow speed of winding will invariably give rise to trouble from kinking, breaking and faulty winding. The wire should be guided toward the wound portion of the coil just a little rather than straight on. If it is guided straight on there will invariably be vacant spaces on the coil. If it is guided toward the wound portion, with a slight tension on the wire, the winding will be smooth and uniform. In case the wire is guided too far toward the wound portion, with too light tension, the winding will double back, requiring stoppage of the winder and correction of the error. The better the polish on the form the less the trouble will be. After a little experience there will practically be no trouble. With this size of diameter and this small gauge of wire it will require 750 turns to give an inductance of approximately 5 millihenries. This will make the winding about 2.5" long. This will leave ¼" at each end free from wire. To bring the wire from the coil to the terminals cut tiny grooves axially on the convex surface and radially on the ends, place the wire terminals in these grooves and cover up with beeswax. When the wire terminals have been fastened, remove the coil from the hand drill, replace the long screw and sleeve with a short screw, and then solder the fine wire to the screw heads. It is well to put lugs under the two terminal screws for connection to other apparatus. To protect the fine wire on the coil cover the entire dowel with a layer or two of manila paper, preferably treated with paraffine.

* * *

2-Tube Reflex Gives Good Speaker Operation

PLEASE GIVE the wiring diagram, panel layout, with complete wiring description, coil, condenser, data, etc., on a



FIGS. 373 AND 374

Detail of coil winder parts at left and photograph of a choke coil form at right.

Tickler Affords Volume

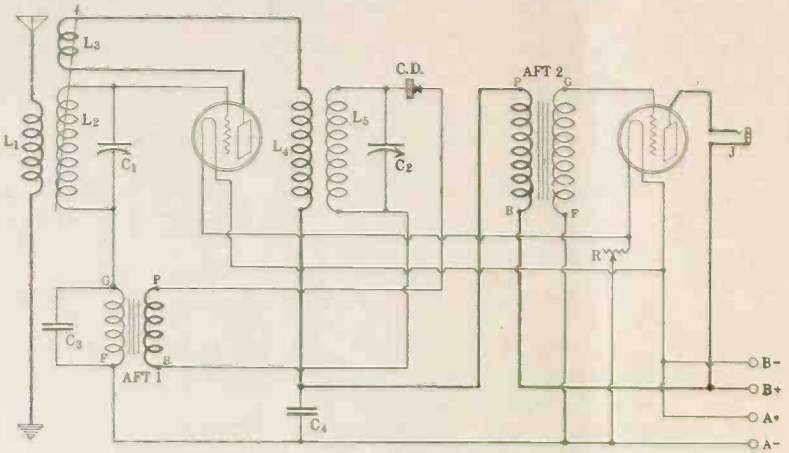


FIG. 375
The circuit diagram of the set requested by Henry Schultz.

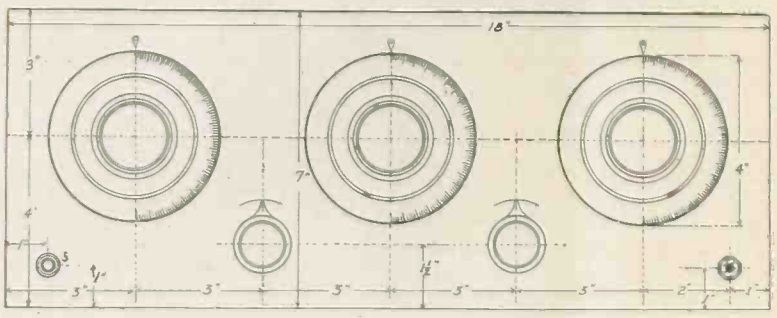


FIG. 376
The panel layout for the set shown diagrammatically in Fig. 375

2-tube set, employing a regenerative radio frequency amplifier, a crystal as a detector and a stage of transformer coupled audio frequency amplification. I have two transformers, one of a high ratio and one of a low ratio. Can these be used?—Henry Schultz, Warrick, Mont.

The diagram of such a set is shown in Fig. 375. A 3-circuit tuner and a radio frequency coil are used. The primaries of both these coils have 10 turns. The secondaries, L3 and L5, consist of 50 turns. Tubing 3¼ in. in diameter is used. No. 22 double cotton covered wire is used as the conductor. The tickler consists of 36 turns of No. 26 single silk covered wire, wound on a tubing 2¾ in. in diameter. C1 and C2 are .0005 mfd. variable condensers, shunting the secondaries. The filaments of both tubes are controlled by a single rheostat. However two single rheostats to control the filaments of both rheostats may be used with better success. In the panel layout this latter method is used. As to the wiring. The beginning of the primary winding, L1, is brought to the antenna post on the strip. The end of this winding is brought to the ground. The beginning of the secondary winding, L2, is brought to the rotary plate connection of C1 and to the G post on the first AFT. This same connection is extended to one terminal of the fixed condenser, which has a capacity of .001 mfd. The F post of this AFT is brought to the A minus post on the strip to one terminal of another fixed condenser, having a capacity of .001 mfd. and the other terminal of other fixed condenser. The end of the secondary winding, L2, is brought to the stationary plate connection of C1 and to the grid post of the RF tube socket. The plate post of this socket is brought to the beginning of the tickler coil winding, L3. The end of this winding is brought to the beginning of the primary winding, L4, the end of which is brought to the other terminal of C4 and to the P post on the second AFT. The P post on the first AFT is brought to the low potential point of the crystal detector. The high potential point of this detector is brought to the end of the secondary winding, L5 and to the stationary plate connection of C2. The rotary plate connection of this condenser is brought to the beginning of the secondary winding, L5 and to the B post on the first AFT. The B post on the second AFT is brought to the 67½ volt B post. The G post on the second AFT is brought to the G post on the second and last socket, with the F post going to the A minus post on the strip. The plate post of this socket is brought to the top terminal of the single circuit jack. The bottom terminal of this jack is brought to the B plus 67½ volt post. If a single rheostat is used, then the F minus posts on both sockets are connected together and to one terminal of the rheostat. The other terminal of this rheostat is brought to the A minus posts. The F plus posts of both sockets are connected to the A plus post on the strip. This is regardless of whether one or two rheostats are employed. If two rheostats are employed, then the rheostats are inserted in series with the minus legs of the filaments. The center dial controls the tickler coil, while the condenser tuning the secondary of the tuning coil and the condenser tuning the secondary of the RFT are controlled by dials to the left and the right of center dial respectively. For convenience, a switch, such as is placed in the lower left hand corner of the panel, may be inserted in series with positive A lead.

How Switch Works In the 1-Turn Receiver

PLEASE DESCRIBE the exact operation of the filament switch, S, in the Set with A 1-Turn Primary, described by Herman Bernard in the July 3 issue of RADIO WORLD. A brief description of the filament wiring of the second RF tube would be appreciated.—Nathan Catan, Far Rockaway, N. Y.

The set is turned on or off as a unit by the A battery switch S, with the exception that the sixth tube is turned on by a rheostat. The switch, however, if "off," will turn out all six tubes. You must use the rheostat independently to turn the sixth tube on or off as an individual unit, although the switch controls the chain. It is impossible to have any tube burning if the switch S is in an "off" position.

The single loop design next to the switch in the Fig. is the lamp that you should insert in the switch socket. This lamp is of the 6-volt variety (flashlight type) and draws about .23 ampere at that voltage. It causes the ruby window to shine very prettily when the set is in operation. When the tubes are extinguished the switch lamp goes out with them.

The actual wiring of the circuit is along orthodox lines. Remember that the tubes 1 and 2 are connected in parallel, that is grid to grid, plate to plate, F plus to F plus. Note that the rheostat interrupts the F minus lead of tube 2, while a ballast resistor is in the negative leg of tube 1. These resistors, all marked R1, are No. 1-A Amperites, for the —01A tubes. If a 112 power tube is used in the last stage, however, the 112 Amperite should be used in place of the 1-A type.

* * *

A 5-Tube, 1-Control Resistance AF Set

I WOULD like to build a single-control receiver with 3 stages of resistance coupled AF.—Julian Stone, Hudson, N. C.

Fig. 377 shows the electrical wiring diagram of the set you request. The primary L1, consists of 6 turns. The secondary, L2, consists of 50 turns. The primary, L3, consists of 10 turns. The secondary, L4, consists of 50 turns. Tubings 3¼ in. in diameter are employed for L2, L3 and L4. No. 22 double cotton covered wire is used. The primary, L1, is variable and wound on a tubing 2¾ in. in diameter and placed inside of the secondary winding, L2. C1 is the double condenser, having two sections, each of which has a capacity of .0005 mfd., making a total capacity of .001 mfd. R1 is a 10 ohm rheostat. C2 is a .00025 mfd. grid condenser. R4 is a megohm grid leak. R2 is a ¼ ampere ballast resistor. The filament of the last tube is controlled by a singular ballast resistor, which facilitates the use of the power tube. It will be noted that the plates of the detector, RF and the amplifier tubes are connected to separate B voltages. A few pointers on the wiring. The beginning of the variable primary winding, is brought to the antenna. The end of this winding is brought to the ground. The beginning of the secondary winding, is brought to the common rotary plate connection of C1, as well as to the beginning of the secondary winding, L4. The stationary plate connections are brought to the ends of the secondary windings, L2 and L4, respectively. The end of the secondary winding, L2, is brought to the grid post of the RF tube socket, while the end of the secondary winding, L4, is brought to one terminal of the grid condenser. The other terminal of the grid condenser is brought to one

How to Work Single Control

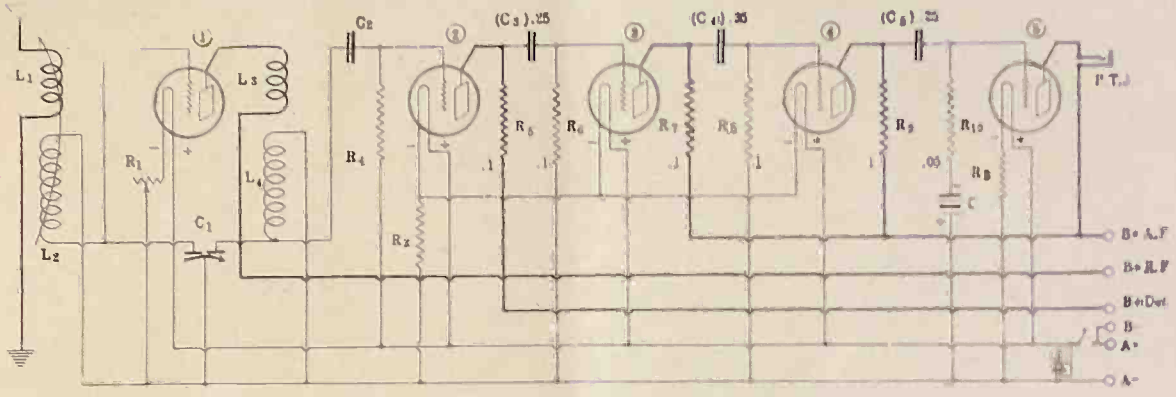


FIG. 377

The electrical wiring diagram of the 1-control, 5-tube receiver using resistance coupled audio

terminal of R4. The other terminal of this resistance is brought to the A plus post. The rheostat and ballast resistances are connected in series with the negative legs of their respective tubes. The plates of the three audio tubes receive 135 volts. The plate of the detector tube receives 90 volts although it might be found necessary to increase this voltage, since there is a big drop in the resistance in the plate circuit. The plate of the RF tube receives 67½ volts. A phone tip jack or single circuit jack is placed on the output. The —01A type tubes should be used throughout this set, with a 6 volt source of filament supply. The grid bias on the last tube should be 9 volts, if 135 volts (B) are used. Higher B voltage, e. g., 180, may be used with success. The C battery voltage should be increased to 12. In this last stage of audio, the 112 or 171 type tube can be used, the grid and plate voltages corresponding with the individual characteristics of the tubes. However, when using these tubes, it is best to supply the plate with a separate B voltage. Otherwise, the others will become parallelyzed.

* * *

Test for Determining Series-Aiding Hookup

I WOULD like to have the circuit diagram of a method of testing an AF transformer, when it is used as a choke coil, to determine which way affords series-aiding relationship. Please give a short description of the method of operation and the reason for testing it.—Herbert Valert, Greele, Ala.

Fig. 378 shows the electrical diagram illustrating that point. When AFT are employed as choke coupling coils in an inpedance coupled AF amplifier it is very important that the two windings be connected in series aiding, rather than in series opposing. Therefore, it is important to know how to connect the windings, to get them connected in the manner which will give the best results. Taking for granted, that the majorityy of AFT do not have the same markings, or that we are doubtful as to the positiveness of the markings we will employ that method diagrammed in Fig. 377, which is operated in the following manner. First throw the switch to point 2, to give the condenser a charge of 45 volts. Then quickly transfer the switch to point 1. The charged condenser C, now discharges through the headset and the transformer windings. The discharge is highly damped, but the oscillations persist long enough to give the nature of the pitch

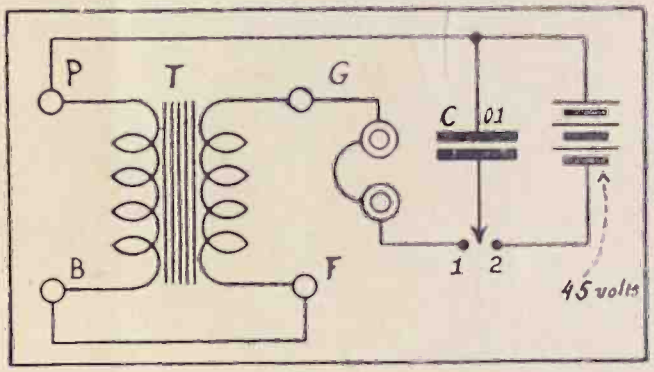
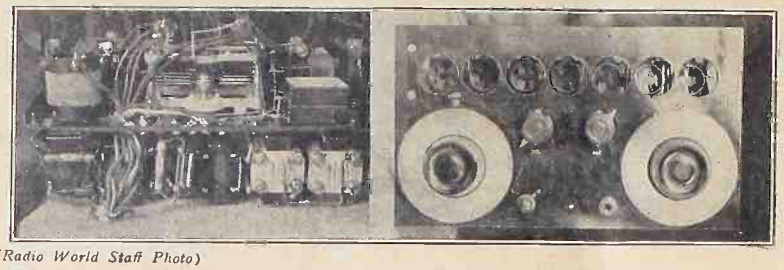


FIG. 378

The circuit diagram illustrating the method whereby a series-aiding or series-opposing connection with an AFT when used as a choke coil can be known.

of the oscillations. Charge and discharge the condenser in rapid succession a number of times, until the pitch of the sound in the headset is firmly fixed in mind. Then reverse one pair of leads on the transformer and repeat the process of charging and discharging. The pitch is now different, it being higher or lower. The connection which gives the lower pitch is the series-aiding. The actual sound to listen to, is that which is ordinarily called the "click." The duller this "click" sounds, the lower the pitch. The marking on the transformer shown in the diagram is that of a great many. However, some have P1, P2, S1, S2 markings. P1 is usually the plate terminal; P2 the B plus post; S1 the grid post and S2 the filament minus post. Be sure that the battery has plenty of life and is of the 45 volt type, or higher. If it is lower, it will be difficult to charge the fixed condenser, etc., and obtain the differential oscillating frequency.

An 8-Tube Set on 7x14" Panel



(Radio World Staff Photo)

A FAN wanted an 8-tube set on a 7x14" panel. Photos show how this was accomplished, using the Super-Heterodyne circuit.

Some Short Waves Turn Day Into Radio Night

An investigation of the "skip-distance" effect and other phases of short-wave radio transmission has been carried on at the experimental station of the Bell Telephone Laboratories at Deal Beach, N. J. The results of these studies were described in a paper presented to the Institute of Radio Engineers by R. A. Heising and J. C. Schelleng of the Laboratories and G. C. Southworth of the American Telephone and Telegraph Company.

Most of the questions of short-wave work have been touched upon during the investigation. Field strength variations over twenty-four-hour periods were measured as were the variations with change in frequency and distance. Fading and its effect on intelligibility and quality, night versus day transmission and overland versus overwater transmission have also been investigated. Tests were made comparing vertical and horizonal antenna structures. Observations were made with field-strength measuring sets and automatic recorder, both of which were developed in the laboratories.

In the overhead wave theory it is assumed that a portion of the wave travels by an indirect path and is finally deflected to earth by an ionized layer existing above the earth. It was found that as the wavelength is shortened the "skip-distance" becomes larger, and the signals become weaker. Fading was found to be less on longer waves in most instances. The quality varies somewhat when the carrier and side bands fade simultaneously but the greatest variation is noted when the frequencies do not fade at the same time.

For distances between a few hundred miles and 1,000 miles there is little difference between overwater and overland transmission. Night transmission is better than day on high wave lengths and day is better than night transmission on some of the short waves. Tests are still in progress and their scope has been extended to include observation points as far west as Seattle.

Four Win Scholarships In Westinghouse Test

PITTSBURGH.

Fifty-two applicants contested in the 1926 examination for War Memorial Scholarships established in remembrance of employes who served in the World War by the Westinghouse Electric and Manufacturing Company.

Four scholarships are awarded annually and the winners for 1926 are Robert R. Lockwood, an employe of the company and student in the night school at Carnegie Institute of Technology, Pittsburgh; William J. Morlock, graduate of McKeesport, Pa., High School; Frank M. Redman, graduate of Grant High School, Portland, Oregon, and Harry W. Thiemecke, company employe and student at Carnegie Institute of Technology.

By terms of the award they are now eligible to a full engineering course in an approved technical school. Each award provides for an annual payment of $500 for a period of not more than four years.

Expert Flies Abroad to Get Data for Fans

Major Lester D. Gardner, editor of "Aviation," and expert on aviation matters for Station WJZ, is now making an extensive airplane trip in Europe and the Near East. He has already flown more than 8,000 miles and is scarcely half way through his journey. He intends to return to America in the Fall and relate his experiences on WJZ's wavelength.

KNX Has Enormous Remote Control Line

LOS ANGELES.

KNX, the "Evening Express" radio station, is claiming the distinction of having one of the longest remote control lines in the country. With the completion of the Edgewater Club, on the beach of Santa Monica, programs almost every evening are sent out by remote control.

The Edgewater Club has obtained Henry Halstead's orchestra to play in the Marigold supper room every evening for an hour.

The Halsted Orchestra, formerly at the Palace Hotel in San Francisco, has received a great deal of favorable comment throughout Southern California.

Deaf Man Can Hear Stations on Earphones

Radio meant the gift of a new sense to Ewald Emling of 305 North Street, Waukesha. His deafness seemed to disappear by magic when he put on the headphones at the request of friends who had heard of instances where those similarly afflicted had been able to detect music and speech by radio.

"I was surprised indeed to ascertain that I could hear music," stated Mr. Emling in a letter to the Freed-Eisemann Radio Corporation. "Now I keep time by swinging my hand as the music plays, like the leader of an orchestra with his baton." Mr. Emling says that he listens to WEAF, WGN, KYW, WJAZ, and WDAF regularly.

TUBE ACTS LIKE MOTOR GENERATOR

When an alternating potential difference is impressed upon the grid of a tube, the plate current increases and decreases at specific periods. The pulsating plate circuit is made to produce fluctuations in the succeeding grid potential by means of a transformer, wherein the primary is connected in the plate circuit and the secondary is connected between the filament and the grid. When the proper capacity condenser is shunted across either of these windings, so as to obtain a natural period in the circuit, the fluctuations in the plate current are kept up by their relative action on the grid voltage. Using this scheme, the current in the plate circuit fluctuates between maximum and minimum values. The voltage of the grid alternates and alternating current flows in the condenser, regardless of circuit in which the condenser is connected. In this way the tube becomes a generator of alternating-current power. It might be even given a better name by calling it a converter or motor-generator. The inductance and the capacity of the circuit determine the frequency of the alternating current. The total amount of power at hand depends upon the average value of the plate current and the voltage of the battery, which is at the supply source.

Inattention to Receiver Spoils Joy of Reception

The self-evident maxim that a receiving set should be properly serviced cannot be stressed too often. After money, care and time have been put forth to broadcast a fine program, loose connections, poorly seated tubes, faulty insulations or any one of a number of other easily remedied defects in a set will prevent good reception. According to the technical staff of KFI, a radio expert should be called in whenever the pleasure of radio reception begins to pall. The loss of radio appetite may be due to a fault in the set rather than in the fare offered which is generally of uniform quality.

A good investment is a voltmeter, and a recharging outfit, by means of which the batteries may be kept at their maximum strength.

Many letters received at KFI indicate that receptionists are equipping their sets with an inside loop and an outside aerial so that either may be used at will, according to the need of the moment.

The surest method of getting the most out of a receiving set investment is to buy only reputable merchandise from reputable dealers.

WAAM Player Uses Banjo As a Violin

Radio orchestras are forever bringing to light odd ways of playing well-known instruments. The latest musical freak is one being used by a member of the Dorn-Bauer Orchestra which broadcasts from WAAM, Newark, N. J. This man plays the banjo in the orchestra, but on occasion discards the pick and, holding the banjo in vertical position, plays with a bow, employing violin technique. He plays on all strings.

Variety Characterizes The Making of the Grid

The grids used in the manufacture of most tubes vary from a very fine mesh of the best obtainable tungsten wire to a network of fairly coarse tungsten wire. The grid usually takes either the flat or cylindrical shape. The plates used are also various. Either a zig-zag shaped tungsten wire about 6 cm. long, or a small thimble, 0.4 cm. in diameter, or two heavy plates 6 cm. long are used. Nickle or molybdenum is also used for grids and plates.

Mother Uses Broadcast; Gets Back Her Boy

James Toohey, of Yonkers, 11 years old, after being missing for three days from his home in Yonkers, N. Y., was returned to his anxious mother's arms, due to a "missing persons alarm," broadcast at her request.

James, who explained that he ran away because he thought he had failed in his examinations at the Monastery School in Yonkers, heard the radio announcement in the home of Mrs. John Adams in Thornhan, N. Y., a little village in the Adirondack Mountains.

He discovered when he arrived at home that he did not fail in his examinations after all. He made the return trip in an automobile with David J. Luddy of 154 Court Street, Brooklyn. Mr. Luddy had been on a camping trip to the Adirondacks, and offered to bring James back with him when he learned of his plight. The boy said he had obtained automobile rides to the mountains, and had worked for a while at a New Yorker's Summer home there.

Keep Set from Window During the Summertime

If you have a receiver which employs an outdoor antenna, and one aerial terminal is near the window so as to enable a short leadin for maximum efficiency, it is best, at this time of the year, to move the set far from the window. This is to prevent dampness, prevalent during the summer, from injuring part of the receiver, especially during rain.

Antenna Measurement

(Radio World *Staff Photo*)

REDUCING THE antenna resistance, by interposing a resistance until the radiation current is reduced one-half, is a popular way of measurement. The radiation resistance of the antenna is then equal to the amount of substituted resistance. Sidney Norton Baruch, inventor, is shown making such measurement.

Tide Data from Station Asked by Fisherman

Among the unusual requests for broadcasting service received at KGO, General Electric Pacific Coast station, was a letter from a bass fisherman asking that time of high and low tides be broadcast daily with the weather report.

"I have talked with several sportsmen," wrote George Roberts, San Francisco fisherman, "and it will be valuable for us to know the time to leave our homes for the various fishing grounds when tide occurs."

WNYC Broadcasts Subway Strike News

Broadcasting was invoked to warn listeners that a strike had been called on the subway lines of the Interborough Rapid Transit Company in New York City.

When at 9 p. m. it became evident that the strike was inevitable, Commissioner Albert Goldman of the city's Department of Plant and Structures obtained permission from the Transit Commissioner to notify the public from the municipal broadcasting station, WNYC. After making the announcement he also had Mayor Walker's notice to the public giving details of emergency transit service read in detail.

New Resistors Handle Heavy Loads Easily

Stoner & Heath, New York representatives, are showing the new Centralab rheostats and power controls designed especially for socket power equipment and the extra amount of current required with power tubes of all kinds. One rheostat is ribbon wound, something entirely new in rheostat construction, and is rated at 2 and 3 ohms; the other is wire wound with a rating of 6-10-20-30 ohms. Both are of the usual Centralab construction. Laboratory tests of 50 M. H. D. Variable Resistance designed for detector and radio frequency control in B eliminators showed that the actual ranges were 64 ohms to 57,000, 64 ohms to 43,000 and 33 ohms to 83,000. They were found to work very smoothly. The rating of three watts is conservative, as severe tests showed that five watts could be dissipated without harming the units. The heavy duty radiohm is designed for socket power equipment for eliminator use exclusively. Tests show that this unit has full resistance and variation with a single turn on the knob; that resistance value remains permanent as adjusted; that resistance value remains the same for any knob setting; that it is variable from 50,000 ohms to approximately zero, will not heat up excessively with a load of three watts and will stand up permanently under this load. It will carry five watts on an overload test. It will also stand a ground test between the live parts and the mounting bushing of 1,500 volts without breaking down. Full information on these new units may be had from Stoner & Heath, 122 Greenwich Street, New York City. Mention Radio World.

Conducts Orchestra

NICOLAI BEREZOWSKY, conductor of the Atwater Kent Orchestra, heard during the Atwater Kent Radio Hour through WEAF, WEEI, WGR, WCAP, WWJ, WSAI, WGN, WCCO and KSD every Sunday evening from 9:15 to 9:45

Resistance Measurement

(Radio World *Staff Photo*)

THE RESISTANCE of a rheostat at any setting may be determined by using an 0-to-1 ammeter and a voltmeter. Resistance equals voltage divided by the amperage.

Mardon Is Nominated for Section Management

Fred H. Mardon of 1309 West Farms Road, the Bronx, New York City, owner of short wave station 2CWR and for the past two years assistant manager of the Hudson Division of the American Radio Relay League, was nominated by local amateurs for the post of Section Communication Manager of the League. The position carries with it control of the traffic work of transmitting amateurs in the five boroughs of New York and Long Island.

Pending the outcome of the balloting, F. E. Handy, National Communication Manager of the A. R. R. L., requested Mardon to occupy the position temporarily and to supervise local transmitting activities.

Sets Puzzle Russian Hinterland

(*Wide World*)

THE MARVELS of radio are just becoming known in the outlying provinces of Russia. Here are some Russian children in the out-of-the-way village of Lientseve gathered around a radio set with expressions of awe. The set is a battery excited crystal receiver.

Single Station Proposed For Those Sharing Time

Dean D. S. Kimball, of Cornell University, announced that the American Engineering Council will seek to solve many pressing radio problems.

An investigating committee will be named by the Council to examine the entire situation, which, he declared, threatens to create "a radio chaos of inestimable complexity," affecting 20,000,000 listeners.

"Many of the problems," Dean Kimball said, "are fundamentally of an engineering nature, and will be studied by a special committee in an unbiased, broadminded, and comprehensive way, so that accurate conclusions may be made generally available in convincing form."

Puts Sales at $500,000,000

"The annual sales of radio equipment exceed in value $500,000,000," Dean Kimball said. "It is estimated that there are some 20,000,000 listeners in the United States. Hence radio questions are of almost universal concern and of tremendous commercial significance.

"There is no doubt that they affect the public interest at every point. It is probably fair to state that there is no disinterested agency of national scope which has attacked these problems with the thought of a public-service solution.

"It is evident that these problems involve many engineering considerations. The subject appears, therefore, a logical matter for consideration by the engineering profession.

"The investigators will seek the cooperation of every interest concerned. The aid of the legal and administrative officials of the Department of Commerce or any other radio regulating body that may be established by Congress will, it is believed, be readily obtained.

Has Trade Value

"We feel sure that the trade and commercial questions involved will be adequately and promptly presented by the business interests that are responsible," said Dean Kimball.

"The large broadcasting interests have expressed no opposition to an engineering study of radio. Rather they seem indifferent to it, apparently being in doubt as to how such a study could serve any useful purpose. In our opinion, however, this indifference results wholly from a lack of appreciation of the usefulness which might be served through having an impartial, judicially minded committee of technical men studying the problems and recommending certain principles for general adoption. Factual studies of the radio broadcasting problem will usefully serve the public interest through the application of engineering principles.

Cost Data to Be Obtained

"Special attention will be given to an analysis of the relative costs, effectiveness and difficulties of the various methods used in broadcasting educational, religious and like programs. Another important field of inquiry involves the economic soundness of division of time between expensive stations as contrasted with the use of multi-studio system with a single broadcasting station.

"Numerous conflicts of interest are arising, and difficulty is increased as the religious, the educational and other fields of broadcasting enlarge their activity. There can be at the present time no generalization made as to the proper solution of these differences. Each local problem must be separately considered and a decision appropriate to the local circumstances reached.

"There are now 540 broadcasting stations of which at least 200 give regular programs of considerable interest, commanding substantial audiences. There are approximately 650 additional applicants to whom broadcasting licenses have not been granted by the Department of Commerce."

Artists

(Radio World *Staff Photos*)

A NEW development at WBNY is of the carrier wave, so that the artist h volume on certain notes, by drawing av mitter. This has developed forms of sin cast listener, are near perfection. Some v limits within which they must keep the her own voice as it sounds in a receive

A Vital Adjustment

(*Radio World Staff Photo*)

IF you adjust your speaker unit to handle the loudest station you need not set it again. The wrong setting often prevents reception.

Jersey Coast Beacon Changes Inaugurated

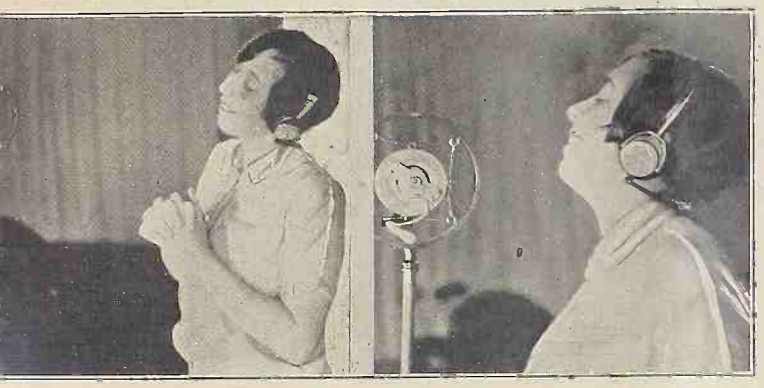
The characteristics of several of the radio beacons in the trans-Atlantic traffic lane approaching New York Harbor have been changed.

The Fire Island Light Ship sounds every 180 seconds in groups of two dashes for 60 seconds and silent 120 seconds; Ambrose Channel Light Ship sounds every 180 seconds, single dashes for 60 seconds and silent 120 seconds; Sea Girt Light Station sounds every 180 seconds.

THREE ASK STATION LICENSE

Bringing the number of applications up to 637, the following applied for permission to broadcast: Austin Kleis, Poughkeepsie, N. Y.; Southwestern University, Georgetown, Tex., and First Unitarian Church, Los Angeles.

re Taught Trick of Improving Quality



raining of vocal artists. The necessity of modulating their voices within the limits her voice just as the radio listener hears it, is taught. The artist must reduce rom the microphone, to stay within the modulation limits of the broadcast trans- that in the studio sound very peculiar, but which, when received by the broad- are distorted and unpleasant due to the artists' lack of understanding of the olitude of their voices for broadcasting. The pupil singer uses earphones to hear d governs herself accordingly. Loud notes are uttered at a distance from the microphone.

What—No Dinner?

(Radio World Staff Photo)

WHEN mother returned from a matinee she found that her son, an ardent radio experimenter, had usurped the dining room table. Mother, in the interest of science, ordered dinner served in the kitchen.

Actress a Broadcaster

DOROTHY BROWN, soprano and principal player in musical comedy, is heard with great delight from WBNY. She is playing in "Sweetheart Time."

Four Husbands' Alibis Shattered by Broadcast

BOSTON.

Babe Herman, featherweight, was scheduled to box Chick Suggs for the featherweight championship at the Braves Field ball park recently, but weather conditions caused the postponement of the fight until the following night. During his visit in Boston, Herman stayed at the Hotel Brunswick, where the studio of WBZ is located, and with another evening to while away he elected to visit the broadcasting studio.

W. Gordon Swan, the WBZ announcer, on finding out who his visitor was, invited him to say a few words to the radio audience. At first, Herman, to whom flying fists mean nothing, shied at the thought of talking into a microphone, but the studio staff prevailed upon him and convinced him that the microphone was harmless.

While broadcasting an interesting little talk on fighting and incidents that have happened in the squared ring, Herman casually mentioned that his fight with Suggs had been postponed until the following night.

The evening of the scheduled bout, four husbands, friends of one another, left their cozy homes to see the much anticipated conflict. They arrived at the ball park only to be disappointed to find that the match had been postponed. Opportunities for an evening out came few and far between, they agreed, and decided that to relinquish this one was out of the question. Arrangements were soon made for a quiet game of poker.

In the early morning to four different homes trudged four weary husbands who believed that they had covered their tracks well. But four wives were waiting for their appearance and in vain did the husbands explain. The damage had been done and unknowingly the husband's idol, Babe Herman, had let the cat out of the bag.

Horseshoe Pitching Prompts Song Parody

In accordance with the recent announcement that WAAM, Newark, N. J., would conduct an inter-studio horseshoe-pitching contest, members of the studio staff have been spending all their spare time in the front yard of the studio on Bond Street practicing horseshoe-throwing. This prompted I. R. Nelson, Jr., the manager of the station, to announce that the official WAAM song now goes: "Crazy over horseshoes — horseshoes, horseshoes!"

ALASKAN BEACON NEAR READY

It is expected that it will be only a short time until the new radio beacon will be established at Cape Spencer Light Station in Alaska. It will be located in Cross Sound every 120 seconds, single dashes for 60 seconds and silent for 60 seconds.

NO RADIO LEGISLATION

The Senate passed the Dill bill. The House did not. Congress adjourned until December.

New Fog Signal Cuts Need For Lighthouses

LONDON.

A fog-signalling device, brought out by the Marconi Company of London, operated by radio, and actuated from a central point, promises to replace lighthouses. The first fog-signal has been installed in the Firth of Clyde, Scotland. When the fog is seen, by the keeper at the central point, a special transmitter is started. This emits timed impulses, which start a gun firing.

Shaw Called Best Artist; Lauder and Wales Next

LONDON.

The British Broadcasting Company, which has a monopoly in England, has made known its opinion that Sir Harry Lauder and George Bernard Shaw are among the best performers before the microphone. Their voices are particularly good for transmission, the company says.

Shaw's only appearance before the microphone was several months ago, when he read one of his short plays. That performance, however, placed him at the top of the radio company's list.

The Prince of Wales also is said to have an admirable delivery over the radio. The voices of 90 per cent. of stage comedians are, for one reason or another, unsuitable for broadcasting, according to the radio officials.

The statement aroused much interest.

OFFICIAL LIST OF STATIONS

(Corrected and Revised Up to July 7)

Station	Owner and Location	Meters
KDKA	Westinghouse E. & M. Co., Pittsburgh, Pa.	309
KDLR	Radio Elec. Co., Devils Lake, N. D.	231
KDYL	Newhouse Hotel, Salt Lake City, Utah	246
KFAB	Nebraska Buick Auto Co., Lincoln Neb.	340
KFAD	Electrical Equipment Co., Phoenix Ariz.	273
KFAF	A. E. Fowler, San Jose, Calif.	217
KFAU	Ind. School Dist. of Boise, Boise, Idaho	280
KFBB	F. A. Buttry Co., Havre, Mont.	275
KFBC	W. K. Azbill, San Diego, Cal.	216
KFBK	Kimball Upson Co., Sacramento, Cal.	248
KFBL	Leese Bros., Everett, Wash.	224
KFBS	School District No. 1, Trinidad, Col.	238
KFBU	Bishop N. S. Thomas, Laramie, Wyo.	270
KFCB	Nielson Radio Co., Phoenix, Ariz.	238
KFDD	St. Michael's Cathedral, Boise, Idaho	278
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. Iberson, Minneapolis, Minn.	231
KFEC	Meier & Frank Co., Portland, Ore.	248
KFEL	Winner Radio Corp., Denver, Colo.	254
KFEQ	J. L. Scroggin, Oak, Neb.	268
KFEY	Bunker Hill & Sullivan, Kellogg, Idaho	233
KFFP	1st Baptist Church, Moberly, Mo.	242
KFGQ	Crary Co., Boone, Iowa	226
KFH	Hotel Lassen, Wichita, Kans.	268
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 H. S., Spokane, Wash.	266
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., Marshaltown, 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
KFJY	Tunwall Radio Co., Ft. Dodge, Iowa.	246
KFJZ	W. E. Branch, Fort Worth, Tex.	254
KFKA	State Teachers College, Greeley, Colo.	273
KFKU	University of Kansas, Lawrence, Kans.	275
KFKX	Westinghouse E. & M. Co., Hastings, Neb.	288
KFKZ	Chamber of Commerce, Kirksville, Mo.	226
KFLR	University of N. M., Albuquerque, N. M.	254
KFLU	San Benito Radio Club, San Benito, Tex.	236
KFLV	Swedish Evangelist Church, Rockford, Ill.	229
KFLX	George R. Clough, Galveston, Texas	240
KFLZ	Atlantic Auto Co., Annita, Ia.	273
KFMR	Morningside College, Sioux City, Iowa	261
KFMW	M. G. Sataren, Houghton, Mich.	263
KFMX	Carleton College, Northfield, Minn.	337
KFNF	Henry Field Seed Co., Shenandoah, Iowa	263
KFOA	Rhodes Company, Seattle, Wash.	454
KFOB	KFOB Inc., Burlingame, Cal.	226
KFON	Echophone Radio Shop, Long Beach, Cal.	233
KFOO	Latter Day Saints University, Salt Lake City, Utah	236
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. Paul, Minn.	252
KFPL	C. C. Baxter, Dublin, Texas	252
KFPM	New Furniture Co., Greenville, Texas	242
KFPR	Forestry Department, Los Angeles, Cal.	231
KFPW	St. John's Church, Carterville, Mo.	258
KFPY	Symonds Investment Co., Spokane, Wash.	266
KFQA	The Principia, St. Louis, Mo.	261
KFQB	Searchlight Publishing Co., Ft. Worth, Texas	263
KFQD	Chovin Supply Co., Anchorage, Alaska	227
KFQP	G. S. Carson, Jr., Iowa City, Ia.	224
KFQU	W. C. Riker, Holy City, Cal.	217
KFQW	F. C. Knierim, North Bend, Wash.	216
KFQZ	Taft Products Co., Hollywood, Cal.	226
KFRB	Hall Bros., Beeville, Texas	248
KFRC	City of Paris, San Francisco, Cal.	268
KFRU	Stephens College, Columbia, Mo.	500
KFRW	G. and G. Radio and Electric Shop, Olympia, Wash.	219
KFSD	Airfan Radio Corporation, San Diego, Cal.	246
KFSG	Echo Park Evangelistic Ass'n., Los Angeles, Cal.	275
KFUL	T. Googan & Bro., Galveston, Tex.	258
KFUM	W. D. Corley, Colorado Springs, Col.	240
KFUO	Concordia Theo. Seminary, St. Louis, Mo.	545
KFUP	Fitzsimmons General Hospital, Denver, Colo.	234
KFUR	Peery Building Co., Ogden, Utah	224
KFUS	Louis L. Sherman, Oakland, Cal.	256
KFUT	University of Utah, Salt Lake City, Utah	261
KFUU	H. C. Colburn and E. L. Mathewson, Oakland, Cal.	220
KFVD	Charles & W. J. McWhinnie, San Pedro, Cal.	205
KFVE	Film Corp., St. Louis, Mo.	240
KFVG	1st Meth-Epis. Church, Independence, Kan.	236
KFVI	56th Cav. Bridgade, Houston, Tex.	240
KFVN	C. E. Bagley, Welcome, Minn.	227
KFVS	Cape Girardeau Battery Station, Cape Girardeau, Mo.	224
KFVY	Radio Supply Co., Albuquerque, N. M.	250
KFWA	Browning Bros. Co., Ogden, Utah	261
KFWB	Warner Bros. Pictures, Inc., Hollywood, Cal.	252
KFWC	L. E. Wall, San Bernardino, Cal.	211
KFWF	St. Louis Truth Center, St. Louis, Mo.	214
KFWH	F. Wellington Morse, Jr., Chico, Cal.	254
KFWI	Radio Entertainers, Inc., South San Francisco, Cal.	220
KFWM	Oakland Educational Soc., Oakland, Cal.	207
KFWO	Lawrence Mott, Avalon, Cal.	211
KFWU	Louisiana College, Pineville, La.	238
KFWV	Wilbur Jerman, Portland, Ore.	213
KFXB	B. O. Heller, Big Bear Lake, Cal.	203
KFXD	Service Radio Co., Logan, Utah	205
KFXF	Pikes Peak Broadcasting Station Co., Colo. Springs, Colo.	250
KFXH	Bledsoe Radio Co., El Paso., Texas.	242
KFXJ	Mt. States Radio District, Inc., (Portable), Col.	216
KFXR	Classen Film Finishing Co., Okla. City, Okla.	214
KFXY	Mary M. Costigan, Flagstaff, Ariz.	205
KFYF	Carl's Radio Den, Oxnard, Cal.	205
KFYJ	Houston Chronicle, Houston, Tex., (Portable)	238
KFYO	Buchanan Vaugn Co., Texarkana, Tex.	210
KFYR	Hoskins Meyers, Inc., Bismarck, N. D.	248
KGO	General Electric Company, Oakland, Ca.	361
KGTT	Glad Tidings Tabernacle, San Francisco, Cal.	207
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, Spokane, Wash.	273
KJBS	J. Brunton & Sons Co., San Francisco, Cal.	220
KJR	Northwest Radio Co., Seattle, Wash.	384
KLDS	Reorganized Church of Jesus Christ of Latter Day Saints, Independence, Mo.	441
KLS	Warner Bros., Radio Co., Oakland, Cal.	250
KLX	Tribune, Oakland, Cal.	508
KLZ	Reynolds Radio Co., Denver, Colo.	266
KMA	May Seed & Nursery Co., Shenandoah, Ia.	252
KMJ	Fresno Bee, Fresno, Cal.	234
KMMJ	M. M. Johnson Co., Clay Center, Nebr.	229
KMO	Love Elec. Co., Tacoma, Wash.	250
KMOX	St. Louis Globe-Democrat, St. Louis, Mo.	280
KNRC	C. B. Juneau, Hollywood, Cal.	208
KNTR	D. S. Garretson & K. M. Turner, Los Angeles, Cal.	238
KNX	Express, Los Angeles, Cal.	337
KOA	General Electric Co., Denver, Col.	322
KOAC	Oregon Agricultural College, Corvallist, Ore.	280
KOB	College of Agri., State College, N. M.	349
KOCH	Omaha Central High School, Omaha, Neb.	258
KOCW	Okla. College for Women, Chickashia, Okla.	252
KOIL	Monarch Manufacturing Co., Council Bluffs, Ia.	278
KOWW	Blue Mountain Radio Ass., Walla Walla, Wash.	256
KPO	Hale Brothers, San Francsico, Cal.	429
KPPC	Pasadena Presbyterian Church, Pasadena, Cal.	229
KPRC	Houston Print Co., Houston, Tex.	297
KPSN	Pasadena Star-News, Pasadena, Cal.	316
KQP	H. B. Read, Portland, Ore.	213
KQV	Doubleday Hill Elec. Co., Pittsburgh, Pa.	275
KQW	First Baptist Chuch, San Jose, Cal.	227
KRE	Gazette, Berkeley, Cal.	256
KSAC	Kansas State Agricultural College, Manhattan, Kans.	341
KSD	Post Dispatch, St. Louis, Mo.	545
KSL	Radio Service Corp., Salt Lake City, Utah	300
KSMR	S. M. Valley R. R. Co., Santa Maria Cal.	210
KSO	A. A. Berry Seed Co., Clarinda, Ia.	242
KTAB	Tenth Ave. Baptist Church, Oakland, Cal.	240
KTBI	Bible Inst., Los Angeles, Cal.	294
KTBR	Brown's Radio Shop, Portland, Ore.	263
KTCL	American Radio Tel Co., Inc., Seattle, Wash.	306
KTHS	New Arlington Hotel, Hot Springs, Ark.	375
KTNT	N. Baker, Muscatine, Ia.	256
KTW	1st Presbyterian Church, Seattle, Wash.	454
KUOA	University of Ark., Fayettesville, Ark.	300
KUOM	State University of Montana, Missoula, Mont.	245
KUSD	University of S. D. Vermillion, S. D.	278
KUT	University of Texas, Austin, Tex.	231
KVOO	Voice of Oklahoma, Bristow, Okla.	375
KWCR	H. F. Paar, Cedar Rapids, Ia.	278
KWG	Portable Wireless Tel. Co., Stockton, Cal.	248
KWKC	Wilson Duncan Studios, Kansas City, Mo.	236
KWKH	W. K. Henderson L. W. & S. Co., Shreveport, La.	261
KWSC	State College, Pullman, Wash.	349
KWUC	Western Union College, Le Mars, Ia.	252
KWWG	City of Brownsville, Brownsville, Tex.	278
KYW	Westinghouse E. & M. Co., Chicago, Ill.	535
KZKZ	Electric Supply Co., Manila, P. I.	270
KZM	P. D. Allen, Oakland, Cal.	240
KZRQ	Far Eastern Radio, Inc., Manila, P. I.	222
NAA	U. S. Navy, Arlington, Va.	435
WAAD	Ohio Mech. Institute, Cincinnati, O.	258
WAAF	Drovers Journal, Chicago, Ill.	278
WAAM	L. R. Nelson Co., Newark, N. J.	263
WAAW	Omaha Grain Exchange, Omaha, Neb.	278-384
WABB	Harrisburg Radio Co., Harrisburg, Pa.	204
WABC	Asheville Battery Co., Inc., Asheville, N. C.	254
WABI	First Universalists Church, Bangor, Me.	240
WABO	Lake Avenue Baptist Church, Rochester, N. Y.	278
WABQ	Haverford College Radio Club, Haverford, Pa.	261
WABR	Scott High School, Toledo, O.	263
WABW	College of Wooster, Wooster, O.	207
WABX	H. B. Joy, Mt. Clemens, Mich.	246
WABY	John Magaldi, Philadelphia, Pa.	242
WABZ	Coliseum Place Baptist Church, New Orleans, La.	275
WADC	Allen T. Simmons, Akron, O.	258
WAFD	A. B. Parfet Co., Port Huron, Mich.	275
WAHG	A. H. Grebe Co., Richmond Hill, N. Y.	316
WAGM	R. L. Miller, Royal Oak, Mich.	225
WAIT	A. H. Waite & Co., Taunton, Mass.	229
WAIU	American Ins. Union, Columbus, O.	294
WAMD	Radisson Co., Minneapolis, Min.	244
WAPI	Alabama Polytechnic Inst., Auburn, Ala.	248
WARC	American Radio Res. Corp., Medford Hillside, Mass.	261
WATT	Edison Electric Illuminating Co. (Portable), Mass.	244
WBAA	Purdue University, West Lafayette, Ind.	273
WBAK	State Police, Harrisburg, Pa.	276
WBAL	Gas and Electric Co., Baltimore, Md.	246
WBAO	James Millikia University, Decatur, Ill.	270
WBAP	Star Telegram, Fort Worth, Tex.	476
WBAW	1st Baptist Church, Nashville, Tenn.	236
WBAX	J. H. Stenger, Jr., Wilkes-Barre, Pa.	256
WBBL	Grace Covenant Presbyterian Church, Richmond, Va.	229
WBBM	Atlas Investment Co., 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
WBBW	Ruffner City High School, Norfolk, Va.	222
WBBY	Washigton Light Infantry, Charleston, S. C.	268
WBBZ	C. L. Carrell, (Portable), Chicago, Ill.	216
WBCN	Foster McConnell, Chicago, Ill.	266
WBDC	Baxter Laundry Co., Grand Rapids, Mich.	256
WBES	Bliss Electrical School, Takoma Park, Mich.	222
WBOQ	A. H. Grebe & Co., Richmond Hill, N. Y.	236
WBNY	Miss S. Katz, New York City	210
WBRC	Bell Radio Corp., Birmingham, Ala.	248
WBRE	Baltimore Radio Ex., Wilkes-Barre, Pa.	231
WBT	Charlotte Chamber of Commerce, Charlotte, N. C.	275
WBZ	Westinghouse E. & M. Co., Springfield, Mass.	333
WBZA	Westinghouse Electric and Mfg. Co., Boston, Mass.	242
WCAC	Agricultural College, Mansfield, Conn.	275
WCAD	St. Lawrence University, Canton, N. Y.	263
WCAE	Kaufman & Baer, Pittsburgh, Pa.	461
WCAJ	Nebraska Wesleyan University, University Place, Neb.	254
WCAL	St. Olaf College, Northfield, Minn.	337
WCAM	Galvin Radio Supply Co., Camden, N. J.	236
WCAO	Brager of Baltimore, 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	Universal Broadcasting Co., Philadelphia, Pa.	278
WCAX	University of Vermont, Burlington, Vt.	250
WCBA	C. W. Heinbach, Allentown, Pa.	254
WCBD	W. G. Voliva, Zion, Ill.	345
WCBE	Uhalt Radio Co., New Orleans, La.	263
WCBH	University of Mississippi, Oxford, Miss.	242
WCMA	Culver Military Academy, Culver, Ind.	222
WCMB	Hotel Chapeau, Baltimore, Md.	229
WCBR	C. H. Messter (Portable), R. I.	210
WCBQ	1st Baptist Church, Nashville, Tenn.	236
WCCO	Gold Medal Station, Minneapolis, St. Paul, Minn.	416
WCK	Stix Baer & Fuller Co., St. Louis, Mo.	273
WCLO	C. E. Whitmore, Camp Lake, Wis.	231
WCLS	H. M. Church, Joliet, Ill.	214
WCOA	Municipal Broadcasting Station, Pensacola, Fla.	222

Station	Owner and Location	Meters
WCSH	Henry P. Rines, Portland, Me.	256
WSCO	Wittenberg College, Springfield, Ohio.	248
WCWS	C. W. Selen, Providence, R. I.	210
WCX	Detroit Free Press & Jewitt Radio and Phonograph Co., Pontiac, Mich.	517
WDZ	J. L. Bush, Tuscola, Ill.	278
WDAD	Dod's Auto Accessories, Inc., Nashville, Tenn.	226
WDAE	Tampa Daily News, Tampa, Fla.	273
WDAF	Kansas City Star, Kansas City, Mo.	366
WDAG	J. L. Martin, Amarillo, Tex.	263
WDAH	Trinity Metr. Church, El Paso, Tex.	268
WDAY	Radio Equipment Corp., Fargo, N. D.	261
WDBE	Gilham-Schoen Elec Co., Atlanta, Ga.	278
WDBJ	Richardson Wayland Elec. Co., Roanoke, Va.	229
WDBK	M. F. Broz, Furn., Cleveland, O.	227
WDBO	Rollins College, Winter Park, Fla.	240
WDBZ	Boy Scouts of America, Kingston, N. Y.	233
WDCH	Dartmouth College, Hanover, N. H.	250
WDGY	Dr. G. W. Young, Minneapolis, Minn.	263
WDND	Dod's Auto Accessories, Inc., 160-164 8th Ave., N., Nashville, Tenn.	226
WDOD	Chattanooga Radio Co., Chattanooga, Tenn.	256
WDZ	J. L. Bush, Tuscola, Ill.	278
WDRC	Doolittle Radio Corp., New Haven, Conn.	268
WDWF	Dutee Wilcox Flint, Inc., Cranston, R. I.	441
WEAF	Broadcasting Company of America, N. Y. City, N. Y.	492
WEAI	Cornell University, Ithaca, N. Y.	254
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	Willard Storage Battery Co., Cleveland, O.	390
WEAU	Davidson Bros. Co., Sioux City, Ia.	275
WEBC	W. C. Bridges, Superior, Wisc.	242
WEBD	Elec. Equipment & Service Co., Anderson, Ind.	246
WEBH	Edgewater Beach Hotel, Chicago, Ill.	370
WEBJ	Third Avenue R. R. Co., New York, N. Y.	273
WEBL	Radio Corp. of Ama. (Portable)	226
WEBQ	Tate Radio Co., Harrisburg, Ill.	226
WEBR	H. H. Howell, Buffalo, N. Y.	244
WEBW	Beloit College, Beloit, Wisc.	268
WEBZ	Savannah Radio Corp., Savannah, Ga.	263
WEEI	Edison Electric Illuminating Co., Boston, Mass.	349
WEHS	Robert E. Hughes, Evanston, Ill.	203
WEMC	Emm. Missionary College, Merrien Springs, Mich.	286
WENR	All-Amer. Radio Corp., Chicago, Ill.	266
WEW	St. Louis University, St. Louis, Mo.	248
WFAA	Dallas News & Journal, Dallas, Tex.	476
WFAM	The Times, St. Cloud, Minn.	273
WFAV	University of Nebr., Lincoln, Nebr.	275
WFBC	1st Baptist Church, Knoxville, Tenn.	250
WFBE	J. V. De Walle, Seymour, Ind.	226
WFBG	W. F. Gable Co., Altoona, Pa.	278
WFBI	Galvin Radio Supply Co., Camden N. J.	236
WFBJ	St. Johns University, Collegeville, Minn.	236
WFBL	Onondaga Hotel, Syracuse, N. Y.	252
WFBM	Merchants Lighting Co., Indianapolis, Ind.	268
WFBR	Maryland National Guard, Baltimore, Md.	254
WFBZ	Knox College, Galesburg, Ill.	254
WFDF	F. D. Fallain, Flint, Mich.	234
WFI	Strawbridge & Clothier, Philadelphia, Pa.	395
WFKB	F. K. Bridgman, Chicago, Ill.	217
WFRL	R. M. Lacey, Brooklyn, N. Y.	205
WGAL	Lancaster Elec. Supply Co., Lancaster, Pa.	248
WGBB	H. H. Carman, Freeport, N. Y.	244
WGBC	1st Baptist Church, Memphis, Tenn.	278
WGBF	The Finke Furniture Co., Evansville, Ind.	236
WGBI	Scranton Broadcasters, Inc., Scranton, Pa.	240
WGBR	Marshfield Broadcasting Association, Marshfield, Wis.	229
WGBS	Gimbel Brothers, New York, N. Y.	316
WGBU	Florida Cities Finance Co., Fulford By-the-Sea, Fla.	278
WGBX	University of Maine, Orono, Maine.	234
WGES	Oak Leaves Broadcasting Station, Oak Park, Ill.	250
WGHB	G. H. Boules, Developments, Clearwater, Fla.	266
WGN	The Tribune, Chicago, Ill.	303
WGMU	A. H. Grebe & Co., Inc., Richmond Hill, N. Y.	236
WGCP	Grand Central Palace, N. Y. City	252
WGHP	G. H. Phelps, Inc., Detroit, Mich.	270
WGR	Federal Telephone Mfg. Co., Buffalo, N. Y.	319
WGST	Ga. School of Tech., Atlanta, Ga.	270
WGY	General Elec. Co., Schenectady, N. Y.	380
WHA	University of Wisconsin, Madison, Wis.	535
WHAD	Marquette University, Milwaukee, Wis.	275
WHAM	Eastman School of Music, Rochester, N. Y.	278
WHAP	Taylor Finance Corp., 426 West 31st St., New York City	241
WHAR	E. P. Cook's Sons, Atlantic City, N. J.	275
WHAS	The Courier Journal-Times, Louisville, Ky.	400
WHAV	Wilmington Elec. Spec. Co., Wilmington, Del.	266
WHAZ	Rensselaer Polytechnic Institute, Troy, N. Y.	280
WHB	Sweeney School Co., Kansas City, Mo.	366
WHBA	Shaffer Music House, Oil City, Pa.	250
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
WHEC	Hickson Elec. Co., Rochestr, N. Y.	258
WHBJ	Laver Auto Co., Ft. Wayne, Ind.	234
WHBL	C. L. Carroll (Portable), Ill.	216
WHBM	C. L. Carroll (Portable), Chicago, Ill.	233
WHBN	1st Ave. Methodist Church, St. Petersburg, Fla.	238
WHBP	Johnstown Auto Co., Johnstown, Pa.	256
WHBR	Scientific E. & M. Co., Cincinnati, O.	216
WHBQ	St. Johns Meth. Church, Memphis, Tenn.	233
WHBU	B. L. Bing's Sons, Anderson, Ind.	219
WHBY	St. Norbit's College, De Pere, Wis.	250
WHBW	D. R. Kienzle, Philadelphia, Pa.	216
WHDI	Wm. Hood Dunwoody Ind. Inst., Minneapolis, Minn.	278
WHEC	Hickson Elec. Co., Rochester, N. Y.	258
WHN	George Schubel, New York, N. Y.	361
WHK	Radio Air Service Corp., Cleveland, Ohio	273
WHO	Bankers Life Co., Des Moines, Ia.	526
WHT	Radiophone Broadcasting Corp., Derrfield, Ill.	400
WIAD	H. R. Miller, Philadelphia, Pa.	250
WIAS	Home Electric Co., Burlington, Ia.	254
WIBA	Capital Times, Madison, Wis.	236
WIBG	St. Paul's E. P. Church, Elkins Park, Pa.	222
WIBH	Elite Radio, New Bedford, Mass.	210
WIBI	Frederick B. Gittell, Flushing, N. Y.	219
WIBJ	C. L. Carrell, Chicago, (Portable)	216
WIBO	Nelson Bros., Chicago, Ill.	226
WIBM	Billy Maine, Chicago, Ill.	216
WIBR	Thurman A. Owings, Weirton, W. Va.	246
WIBS	Lieut. Thomas F. Hunt, Elizabeth, N. J.	203
WIBU	The Electric Farm, Poynette, Wis.	222
WIBW	Dr. L. L. Dill, Logansport, Ind.	220
WIBX	Grid-Leak, Inc., Utica, N. Y.	205
WIBZ	A. B. Trum, Montgomery, Ala.	231
WIL	Benson Radio Co., St. Louis, Mo.	273
WIOD	Carl S. Fisher Co., Miami, Fla.	248
WIP	Gimbel Brothers, Philadelphia, Pa.	508
WJAD	Jackson's Radio Elec. Co., Waco, Tex.	353
WJAG	Norfolk Daily News, Norfolk, Nebr.	270
WJAK	Kokomo Tribune Station, Kokomo, Ind.	254
WJAM	D. M. Perham, Cedar Rapids, Ia.	268
WJAR	The Outlet Co., Providence, R. I.	306
WJAS	Pittsburgh Radio Supply House, Pittsburgh, Pa.	275
WJAX	Voice of Jacksonville, Fla.	337
WJAZ	Zenith Radio Corp., Mt. Prospect, Ill.	322
WJBA	D. H. Lentz, Jr., Joliet, Ill.	207
WJBB	L. W. McClung, St. Petersburg, Fla.	254
WJBE	Financial Journal, St. Petersburg, Fla.	254
WJBC	Hummer Furniture Co., 2nd and Joliet Sts., La Salle, Ill.	234
WJBI	R. S. Johnson, Red Bank, N. J.	219
WJBK	Ernest F. Goodwin, Ypsilanti, Mich.	233
WJBL	Wm. Gushard Dry Goods Co., Decatur, Ill.	270
WJBO	V. Jensen, New Orleans, La.	268
WJBQ	Bucknell University, Lewisburgh, Pa.	211
WJBR	Omro Drug Store, Omro, Wis.	228
WJBU	Bucknell University, Lewisburg, Pa.	212
WJJD	Loyal Order of Moose, Mooseheart, Ill.	370
WJR	Detroit Free Press and Jewett Radio and Phonograph Co., Pontiac, Mich.	517
WJY	Radio Corp. of Ama., New York, N. Y.	405
WJZ	Radio Corp. of Ama., N. Y.-Bound Brook, N. J.	455
WKAF	WKAF broadcasting Co., Milwaukee, Wis.	261
WKAQ	Radio Corp. of Porto Rico, San Juan, P. R.	341
WKAR	Mich. Agricultural College, Lansing, Mich.	286
WKAV	Laconia Radio Club, Laconia, N. H	224
WKBB	Sanders Bros., Joliet, Ill.	214
WKBE	K. & B. Electric Co., Webster, Mass.	231
WKBG	C. L. Carrell, (Portable) Chicago, Ill.	216
WKRC	Kodel Radio Corp., Cincinnati, O.	326-422
WKY	C. E. Hill and H. S. Richards, Oklahoma City, Okla.	275
WLAL	1st Presbyterian Church, Tulsa, Okla.	250
WLAP	W. V. Jordan, Louisville, Ky.	275
WLB	University of Minn., Minneapolis, Minn.	278
WLBL	Wisconsin Department of Markets, Stevens Point, Wis.	278
WLIB	Liberty-Weekly Inc., Elgin, Ill.	303
WLIT	Lit Brothers, Philadelphia, Pa.	395
WLS	Sears Roebuck Co., Chicago, Ill.	345
WLSI	Lincoln Studio Inc., Providence, R. I.	441
WLTS	Lane Technical High School, Chicago, Ill.	258
WLW	Crosley Radio Corp., Cincinnati, Ohio	422
WLWL	Missionary Society of St. Paul the Apostle, N. Y. City	288
WMAC	C. B. Meredith, Cazenovia, N. Y.	275
WMAF	Round Hills Radio Corp., Dartmouth, Mass.	441
WMAK	Norton Laboratory, Lockport, N. Y.	266
WMAL	Leese Optical Co., Washington, D. C.	213
WMAN	1st Baptist Church, Columbus, O.	278
WMAQ	Chicago Daily News, Chicago, Ill.	448
WMAY	Kings Highway Presbyterian Church, St. Louis, Mo.	248
WMAZ	Mercer University, Macon, Ga.	261
WMBB	American Bond and Mortgage Co., Chicago, Ill.	250
WMBC	Michigan Broadcasting Co., Detroit, Mich.	256
WMBF	Fleetwood Hotel, Miami Beach, Fla.	384
WMC	The Commercial Appeal, Memphis, Tenn.	500
WMCA	Hotel McAlpin, Hoboken, N. J.	341
WMSG	Madison Square Garden Broadcasting Corporation, N. Y. City, N. Y.	213
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
WNAT	Lenning Bros. Co., Philadelphia, Pa.	250
WNAX	Dakota Radio App. Co., Yankton, S. D.	244
WNBH	New Bedford Hotel, New Bedford, Mass.	348
WNJ	Radio Shop, Newark, N. J.	252
WNOX	Peoples Tel. & Tel. Co., Knoxville, Tenn.	268
WNYC	Municipal Station, New York, N. Y.	526
WOAI	South East Equipment So., San Antonio, Texas	395
WOAN	Vaughan Con. of Music, Lawrenceburgh, Tenn.	283
WOAW	Woodmen of the World, Omaha, Nebr.	526
WOAX	F. J. Wolff, Trenton, N. J.	240
WOC	Palmer School of Chiro, Davenport, Ia.	484
WOCL	Hotel Jamestown, Jamestown, N. Y.	275
WODA	O'Dea Radio and Victrolla Shop, Paterson, N. J.	224
WOI	Iowa State College, Ames, Iowa	270
WOK	Neutrowound Radio Mfg. Co., Homewood, Ill.	217
WOKO	Earl B. Smith, Patterson, N. J.	233
WOO	John Wanamaker, Philadelphia, Pa.	508
WOOD	Grand Rapids Radio Co., Grand Rapids, Mich.	242
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
WOWL	Owl Battery Co., New Orleans, La.	270
WOWO	Main Auto Supply Co., Ft. Wayne, Ind.	227
WPAK	N. D. Agricultural College, Agricultural College, N. D.	275
WPCC	N. Shore Congregational Church, Chicago Ill.	258
WPDQ	H. L. Turner Buffalo, N. Y.	205
WPG	Municipality, Atlantic City, N. J.	300
WPRC	Wilson Printing & Radio Co., Harrisburg, Pa.	216
WPSC	Penn State College, State College, Pa.	261
WQAA	H. A. Beale, Jr., Parkersburg, Pa.	220
WQAC	Gish Radio Service, Amarillo, Tex.	234
WQAE	Moore Radio News Station, Springfield, Vermont	246
WQAM	Electric Equipment Co., Miami, Fla.	263
WQAN	Scranton Times, Scranton, Pa.	250
WQAO	Calvary Baptist Church, New York, N. Y.	360
WQJ	Calumet Rainbo Broadcasting Co., Chicago, Ill.	448
WRAF	Laporte Radio Club, Wash., D. C.	224
WRAK	Economy Light Co., Escanaba, Mich.	256
WRAM	Lombard College, Galesburg, Ill.	244
WRAV	Antioch College, Yellow Springs, O.	263
WRAW	Avenue Radio Shop, Reading, Pa.	238
WRAX	The Berachah Church of Philadelphia, Gloucester City, N. J.	280
WRBC	Immanuel Lutheran Church, Valparaiso, Ind.	278
WRC	Radio Corp. of America, Washington, D. C.	469
WRCO	Wynna Radio Co., Raleigh, N. C.	252
WREC	Wooten's Radio Shop, Cold Water, Miss.	254
WREO	Reo Motor Co., Lansing, Mich.	286
WRHF	Washington Radio Hospital Fund, Wash., D. C.	256
WRHM	Rosedale Hospital, Minneapolis, Minn.	252
WRK	Doron Bros., Elec. Co., Hamilton, O.	270
WRM	University of Illinois, Urbana, Ill.	273
WRMU	A. H. Grebe & Co., Inc., Motor Yacht Mu-I, N. Y. City	234
WRNY	Experimenter Publishing Co., (Radio News) N. Y. City	257
WRR	City of Dallas, Tex.	246
WRST	Radiotel Mfg. Co., Inc., 5 First Ave. Bay Shore, N. Y.	216
WRVA	Laurus & Bros., Co., Richmond, Va.	256
WRW	Tarrytown Research Laboratory, Tarrytown, N. Y.	273
WSAI	U. S. Playing Card Co., Cincinnati, O.	326
WSAJ	Grove City College, Grove City, Pa.	229
WSAN	Allentown Call, Allentown, Pa.	229
WSAR	Doughty & Welch Elec. Co., Fall River, Mass.	254
WSAX	Zenith Radio Corp., Chicago, Ill.	268
WSAZ	Chase Electric Shop, Pomeroy, Ohio.	244
WSB	The Atlanta Journal, Atlanta, Ga.	428
WSBC	World Battery Co., Chicago, Ill.	210
WSBF	Stix Baer and Fuller, St. Louis, Mo.	273
WSBT	South Bend Tribune, South Bend, Ind.	275
WSDA	Seventh Day Adventist Church, N. Y. City	263
WSKC	World's Star Knitting Co., Bay City, Mich.	261
WSM	National Life and Accident Ins., Nashville, Tenn.	283
WSBM	Saenger Amusement Co., New Orleans, La.	319
WSMH	Shathick Music House, Owosso, Mich.	240
WSMK	S. M. K. Radio Corp., Dayton, O.	275
WSOE	School of Engineering, Milwaukee, Wisc.	246
WSRO	H. W. Fahlander, Hamilton, Ohio.	251
WSSH	Tremont Temple Baptist Shurch, Boston, Mass.	261
WSUI	State University of Iowa, Iowa City, Ia.	484
WSVS	Seneca Vocational School, Buffalo, N. Y.	219
WSWS	S. W. Straus & Co., Woodale, Ill.	275
WTAB	Fall River Daily Herald, Fall River, Mass.	266
WTAD	R. E. Compton, Carthage, Ill.	236
WTAG	Worcester Telegram Publishing Co., Worcester, Mass.	268
WTAL	Toledo Radio & Elec. Co., Toledo, O.	252
WTAM	Willard Storage Battery Co., Cleveland, Ohio	389

(Concluded on page 29)

A THOUGHT FOR THE WEEK

SUMMER is here. So is radio. So is good reception—if you are sensible enough to do all the things that help the careful listener-in to get what he wants. Don't kick at ether disturbances. See if your set is as ship-shape as it should be. Then go ahead and get what you should reasonably expect to get.

RADIO WORLD

REG. U.S. PAT. OFF

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

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EDITOR, Roland Burke Hennessy
MANAGING EDITOR, Herman Bernard
TECHNICAL EDITOR, Lewis Winner
ART DIRECTOR, J. Gerard Sheedy
CONTRIBUTING EDITORS, John F. Rider, J. E. Anderson

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ADVERTISING RATES

General Advertising

1 Page, 7¼"x11"	462 lines	$300.00
½ Page, 7¼"x5⅛"	231 lines	150.00
½ Page, 3¼" D. C.	231 lines	150.00
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JULY 17, 1926

Bigger Income for Talent

THE broadcasting studio is unlike the stage, in that the studio produces great reputations without much remuneration attaching thereto, whereas stage celebrities are sometimes even less celebrated than their salaries. For instance, it is not unusual for the leading man in a musical comedy in New York City to receive $1,500 a week, while announcers, more famous than he by far, may receive only twice that in a year! The famous announcer's soothing syrup may be bottled up in the fact that he works all year round and gets a two weeks' vacation, with pay, whereas, the musical comedy star works, say 40 weeks a year, the other 12 being a vacation granted without pay and without option of refusal.

Often the public is staggered to learn of the tremendous salaries received by famous and gifted persons. In cases where the facts are constantly before the public, only occasional comment is made of the enormity of the pay. For instance, Jack Dempsey will get nearly a million dollars for his next fight, if ever he does fight, but this has received so much publicity that it is virtually taken for granted.

The key to the pay situation lies in the financial drawing power of the performer. None can deny that Dempsey should get a substantial percentage of the gate receipts, for it is he who draws the crowd that pays the fancy prices. Likewise the actor has a cash value on the same basis. Quite on the other side is the broadcast performer, be he announcer or artist, since all he will bring tangibly are applause letters!

Many would like to see their favorites of the air gain more substantial financial recognition. About the best paid microphone performers are those who are in the actor class, indeed, have been recruited from the stage. They are heard on advertising programs or so-called sponsored programs, and are paid by the concern whose name is uttered into the microphone quite frequently for the goodwill that such reiteration may engender.

As for other artists heard at stations, including studio artists on the station payroll, these, as well as announcers, are gaining the benefit of special bureaus that more and more stations are inaugurating, to develop a concert and recital field for these deserving entertainers. Many a mothers' club would feel flattered to have the favorite announcer of the vicinity appear in person at the inevitable entertainment and dance. Indeed, last winter broadcast favorites united to give a concert in New York City, and the listening public crowded the auditorium. This shows a demand exists, and it is well indeed that stations are helping to find extra money for the announcers and others. Organizations might well draw on this fund of talent.

The Misannouncing Evil

ANNOUNCERS should be careful to avoid misannouncing. The trouble exists mostly at large stations, where remote control broadcasting is done. The microphone may be at a hotel, the amplified speech and music being telephoned, as it were, to the studio, where it is put on the air. Lack of teamwork between announcer and the orchestra conductor or other worthy at the point of remote control results in the announcement that a certain song will be sung or played, whereas, a different one ensues. The apology that precedes the next announcement is necessarily crippled.

The listening public experiences a strange feeling over a misannouncement. It is an admixture of censure for the announcer and station, sympathy for the artist, and general distraction. Somehow the effect of a song, especially if sung, is almost lost if the rendition is preceded by the announcement of a different piece. For instance, if something merry in its music is announced, and instead a sentimental waltz song is heard, one wonders whether the soprano will sing the other song afterwards, how the announcer came to make the mistake, or perhaps whether this is indeed the very song that was announced. All this is so distracting to the audience, that, however credible may be the performance of the unexpected piece, the effect is vitiated.

WJZ, the Radio Corporation of America's station in New York City, recently has been offending repeatedly in this respect, accompanying this annoyance with sagging modulation, and even complete cutoff of transmission a few times on given nights, lasting for a few seconds each time.

The Patent Suits

THE injunction suit activities of the Radio Corporation of America and allied corporations are livelier than ever before, although lately having received some deadly blows.

Most recent of the cases to be decided was that brought against the Independent Radio Manufacturers, as the combined makers of the Hazeltine Neutrodyne receivers are known. The charge was that the Hazeltine neutralization method was an infringement of the Rice and Hartley patents, owned by the plaintiffs. The complaint was dismissed in Federal Court, Brooklyn, the Judge holding that the Hazeltine method was an original one. The Court went so far as to say some uncomplimentary things about the R. C. A. and its associate corporations, all of which concerns are under investigation by the Federal Trade Commission, on a charge of monopoly in restraint of trade.

The suit brought by the R. C. A. against the Splitdorff Co., alleging that the making of tuned radio frequency sets was an infringement of other patents owned by the plaintiff, has not been decided at this writing, for it is the most recent important injunction suit to be brought by the frequent plaintiffs.

Surely whatever patent rights the R. C. A. and the other members of the radio combine may own are entitled to and will receive full protection under the law, but the R. C. A. should not expect to finance departmental deficits in the operation of their regular business out of the revenues of other and more successful receiver manufacturers that the R. C. A. hopes are infringing some of its patents. Judge Inch, in deciding the Hazeltine patent case, clearly inferred in his published opinion that the R. C. A. and the other plaintiffs, realizing that the Neutrodyne manufacturers were making considerable money, decided, after years of inactivity, to try to scoop in some of this money for themselves. The failure to achieve this end was pronounced, since dismissal of a complaint is about the severest slap in the face that a plaintiff can receive, short of being adjudged in contempt of court.

There is good and bad in the R. C. A. in particular. Some of the companies that are joined as co-plaintiffs in the suits are drawn in due to intermingled patent ownership arising from previous co-operative arrangements. In some instances the former friendly feeling among these commercial brethren has cooled off considerably. But a lawsuit makes strange bedfellows, even as politics.

The R. C. A. represents in some respects the best, in others, the worst. Let it be hoped all its conduct will be on the lofty plane henceforth.

Some of the bad spots in R. C. A. conduct have the ungracious habit of getting aired in court, of all places, and do so even in suits begun and strenuously prosecuted by the R. C. A.

One cannot help recall the shame that every friend of the radio industry must have felt when it was revealed, in the suit by the De Forest Co. to enjoin the R. C. A. from spying on the De Forest tube works, that the R. C. A. had paid De Forest employes to report to the R. C. A. on the innermost secrets of the De Forest tube factory. When that case came up in court, counsel for the R. C. A. said that the practises complained of had ceased, and asked therefore that no injunction be issued. The court scoffed at this plea of "mercy on the basis of guilt" and the attorney, probably himself a warden of a church and a well-behaved citizen, had to bear the brunt of the court's ire, while the R. C. A. had done the dirty deeds.

The R. C. A. should prosecute infringements of its patents, indeed, must do so lest the patent rights be deemed to be waived, but it had better beware of echoing empty charges and wringing unclean hands in the faces of sensible judges and juries in the expectation that from such soiled conduct it may wring the sweet fruits of success.

R. C. A. Neutrodyne Suit Thrown Out of Court as Bold Scheme to Cash In

Radio Trust Alleged Hazeltine's Method Infringed Rice and Hartley Patents—Court Sarcastic About Usefulness and Efficiency of R. C. A. and Associates.

IMPUGNS SINCERITY

Remarks That No Action Was Even Attempted Until Long After Success of Hazeltine's Circuit.

The suit brought by the Radio Corporation of America and others against the Independent Radio Manufacturers, Inc., makers of the Hazeltine licensed Neutrodyne sets, alleging that the Hazeltine patent infringed the Rice and Hartley patents, was thrown out of Federal Court in Brooklyn. Judge Inch, who heard the arguments of both sides in the suit for injunction and heavy damages, in his opinion openly charged the plaintiffs—the R. C. A., General Electric, Westinghouse and the American Telephone and Telegraph Co.—with having made not even an attempt to act on their alleged claims until the popularity of the Neutrodyne was well established, and good profits were being earned.

The judge also referred sarcastically to the R. C. A. and its associate members of the Trust as "useful corporations" with "various efficient and large research departments."

The judge further wrote:

"The first radio receiving set that, if properly constructed, would not squeal or whistle and was not a nuisance to the neighborhood, was the so-called Hazeltine neutrodyne apparatus."

Last-Minute Grab

Judge Inch declared in his decision that "after Hazeltine gave to the commercial world a new receiving set, there has arisen almost overnight a great and important industry in the making and selling of receiving sets, a substantial portion of which, $50,000,000 worth, were employing the Hazeltine idea."

Then, the decision pointed out, the Radio Corporation of America and its associated companies, brought the suit charging Hazeltine had infringed their patents on radio inventions by Rice and Hartley.

A Dig at the Trust

In dismissing the suit the judge said:

"Only after success by those dealing in these (Hazeltine) radio sets, the plaintiffs (Radio Corporation and others) come and claim that this defendant's apparatus and circuit infringe certain patents which, so far as I can see, have been quietly resting, with others, in the archives of the various efficient and large research departments of these enormous and useful corporations.

"By broad claims which state a discovery of a principle already given to the world, this suit is an endeavor to prove infringement of new instrumentalities. Wherefore the defendant is entitled to a decree dismissing the complaint."

Decision Removes Menace to Dealers

The suit which the R. C. A. lost, regarding the Neutrodyne patent, was known as the Garod case. The plaintiffs sued, among others, the Twentieth Century Radio Corporation, of 102 Flatbush Avenue, Brooklyn, N. Y., distributors of Garod Neutrodyne receivers. The charge was that the Garod set, using the Hazeltine neutralization method, infringed the inventions of Ralph Hartley and Chester Rice.

The Garod corporation is a member of the Independent Radio Manufacturers, Inc., which in 1922 obtained from Professor Hazeltine licenses to make and sell radio sets embodying his inventions. Had Judge Inch's decision been favorable to the Radio Corporation the decision might have given that corporation a virtual monopoly of the manufacture and distribution of sets, since the R. C. A. controls the regeneration and Super-Heterodye patents and is claiming the tuned radio frequency patent on the Splitdorff case. The Judge said in the Garod case:

"It seems to me that this suit is an endeavor, by proof of broad claims, which state in slightly different words a discovery of a 'principle' already given to the world, to prove infringement of new instrumentalities expressly covered by claims not sued upon.

"The valid claims of the Hartley and Rice patents would seem to be for 'instrumentalities.' Each may represent slight steps in the art without disturbing the other. The claims in suit set forth a 'principle' well known to the prior art. The claim covering the 'instrumentalities' is not sued on. Wherefore the defendant is entitled to a decree dismissing the complaint."

Ira Adams, head of the patent department of the Radio Corporation, admitted that a favorable decision on the corporation's claims would mean that hundreds of small dealers now selling Neutrodyne sets, as well as firms manufacturing such sets, would probably go out of business. "We shall very probably appeal this case," he added.

Speaker Aids Business

(Courtesy Wave Radio Corp.)

CUSTOMERS are attracted to the Try-Mo Radio Store, 9 West Broadway, New York City, by a speaker hung to the plate glass window by means of a rubber suction cup. The speaker leads are connected to a set inside the store. Passersby are attracted to the speaker and window by the music. Moe Lager, proprietor, is shown adjusting the Wave Cone.

Edelson Vice-President Of Insulating Company

Samuel Edelson was elected vice-president and director of the Insulating Company of America, Inc., New York City. This concern, originally known to the trade as the Radio Panel & Parts Corp., has atracted widespread attention in radio circles because of its phenomenal growth under its founders, A. G. Heller and S. J. Spector.

The Insulating Company of America is operating one of the largest and best equipped plants of its kind, occupying the entire building at 59 Warren Street. They are manufacturers of insulating materials and parts which enjoy a world-wide reputation for quality. Through their radio panel and parts division they have become an important factor in the radio trade.

Mr. Edelson brings to his company a record of marked achievement in the business world, in the sales field and as a directing executive.

Australia to Investigate Validity of Many Patents

WASHINGTON.

A conference of all interests concerned with radio broadcasting was held recently in Sydney, Australia, according to a report to the Department of Commerce. Representatives were present from the Federal Government, the Institution of Engineers, the English Speaking Union, the Listener's League, the broadcasting companies and the radio dealers.

The report on the committee of research stated that it was the policy of the Wireless Institute of Australia to establish a scientific laboratory along the lines of the subsidized laboratories existing in other countries. The committee on broadcasting and copyrights recommended the appointment of a royal commission to inquire into the whole question. The committee on patent royalties also recommended an investigation by the royal commission with a view to ascertaining whether the claims to patent rights by certain companies were valid. Further recommendations of the committee dealt with the cost of operating stations and revenue obtained from the importation of radio material.

A request was also made to the Postmaster-General to increase the margin of wavelengths between certain of the stations now operating.

Literature Wanted

THE names of 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,
145 West 45th St., N. Y. 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 .....

W. E. Scharlach, Corwith, Ia.
Hef Candy, 33 Chester Ave., Toronto 6, Canada.
Gaspar Arias, Infanta 18, Havana, Cuba.
D. M. Hilsabeck, Mt. Grove, Mo.
D. K. McLean, 2737 Chamta St., Denver, Col.
H. Falconer, 351 Summit Ave., Jersey City, N. J. (Dealer).
Malden Radio Co., 2 Washington St., South, Malden, Mass. (Dealer).
Paul W. Newman, 1916 Cropsey Ave., Brooklyn, N. Y.
Fred W. Schaefer, Platteville, Wis. (Dealer).
A. Beauregard, 43 St. Michel St., St. Hyacinthe, Quebec, Canada.
J. W. Selfe, 4127 Westway, Toledo, O.
Oscar W. Kirsten, 470 39th St. Milwaukee, Wis.
J. E. Whitney, 617 N. East St., Indianapolis, Ind.
Mortimer & Kay, 405 Hoke Building, Hutchinson, Kans.
Chas. H. Jones, Etowah, Tenn. (Dealer).
G. N. Rang, S.S. Utacarbon, care Union Oil Co., Wilmington, Cal.

Drawing Card Features Adopted by Coast Show

LOS ANGELES.

The committee in charge of the fourth annual National Radio exposition, to be held in the Ambassador Auditorium here from September 5 to 11, has adopted suggestions believed to bear an important influence in carrying out the dual motive of the show.

J. A. Hartley, general chairman, declared these features will consist of educational programs for the general public, a preview for dealers only, a partly paid ticket for distribution by the dealers, an elimination of costly souvenir programs and substitution of a concise directory of exhibits, standardized booth equipment and the use of a complete and experienced exposition organization, headed by Waldo T. Tupper, Pacific Coast exposition expert.

Outstanding among the reasons for adoption of the educational program, it was said, is the fact it insures heavy afternoon attendance. Each patron of the program is to be tendered a free admission to the exposition.

Heretofore expositions have had light crowds when they opened their afternoon sessions, but as was proven at last year's radio show, the programs of radio technical talks, personal appearances of announcers and the presence of noted radio stars, have drawn such throngs that when the radio show gates were opened at least 2,000 persons entered immediately. The educational programs are to be timed to conclude coincidentally with the opening of the show.

By means of the partly paid ticket, each radio dealer in Southern California will be able to offer his patronage a reduced rate order on the box office. He will distribute these free, and the balance due will be paid at the exposition. Each patron records his name, as well as that of his dealer on the partly paid ticket, and these names are listed and returned to the distributor, thus affording a double check on his mailing list.

New Tuning Condenser Is Made By Unitrol

A new type of die-cast variable condenser has been introduced by the Unitrol Condenser Corporation. The rotor and stator blocks are two complete castings, respectively, which form the main structure. An alloy of aluminum, copper and silicon is used to produce an accurate surface. Straight line frequency is obtained through tapered circular segments without the usual offset plates, which are used by many manufacturers to obtain this result.

Only twelve parts are used in the complete condenser, the cubic contents of which are about one-half that of other condensers of the same capacity. In this condenser the inter-leaving blades rotate parallel to the axis of the condenser and differ from other condensers in that respect.

A novel shaft construction is employed and cone bearings substituted for cylindrical bearings.

One of the bearings is of semi-floating type, held under spring tension to compensate for any wear on the bearings. The engineer who designed the device explains that the advantage of this construction is that no "end play" or "side play" will be noticed when the knob is turned, no matter how long this condenser is in service.

Industries Banquet To Be Held September 15

The third annual radio industries banquet will be held in New York on Wednesday, September 15, Paul B. Klugh, chairman of the committee, announced.

More than 1,400 attended the second annual banquet held during the radio shows last year, while an attendance of over 2,000 is forecast for the third annual affair.

New Move to Tax Radio Opposed by Manufacturers

BUFFALO, N. Y.

The Board of Directors of the Radio Manufacturers' Association appointed a committee on radio receiving installation, H. H. Frost, chairman, to co-operate with organizations in the construction industry in wiring of houses for proper radio receiving installation as a means of improving service to the public. The committee will make an intensive study of the principles and methods underlying efficient installation of radio receiving apparatus and work for their adoption in schools, hotels, homes and other types of buildings.

In line with the suggestion of Secretary Hoover at the time of the convention at Atlantic City a statistical committee, J. B. Hawley, chairman, was formed with instructions to make a survey of the statistical needs of the industry and to present plans for a competent statistical service to the association. Such a service, it is thought, will be of distinct value in helping to stabilize the industry.

Authorize Official Organ

Authorization for publishing "The R. M. A." news as the official medium of the association under the direction of B. W. Ruark, executive secretary, was voted.

The directors opposed taxes specifically directed against the products of the industry, in view of the growing tendency to single out radio products for taxation. Among the reasons advanced in support of such opposition were the following: radio is already taxed as personal property and additional taxes therefore would constitute double taxation; radio is an agent of education and instruction and its use should be encouraged and it should not be subjected to hindrances brought about by specific taxation; and the imposition of such taxes would be reflected in higher distribution or maintenance costs and would be a burden both to the industry and the public.

The fair trade practice committee, C. C. Colby, chairman, was authorized to formulate a code of fair trade practices or principles of business conduct for presentation to the association as a means of providing machinery for the self-government of the industry and thereby reduce to a minimum the necessity of regulation from without.

Seek Farmers' Business

Important changes in the government of the association were forecast in the proposed new constitution and by-laws presented by President A. T. Haugh. This contemplates associate membership for jobbers, creation of a technical group in the association, election of officers under the Australian ballot system and various other matters. It will be presented to the association at its forthcoming New York meeting in September.

The board of directors approved the national contest proposed by the Department of Agriculture to intensify interest in radio among farmers and recommended that members of the association cooperate through the donation of prizes and otherwise to carry the contest to a successful conclusion. The importance of the farm market to radio manufacturers cannot be over-estimated and the contest will develop data of value in reaching that market, it was said.

Present were: A. T. Haugh, L. G. Baldwin, P. C. Lenz, Jr., B. W. Ruark, C. D. Boyd, C. C. Colby, Godfrey Gort, S. B. Trainer, D. MacGregor, H. H. Frost, T. K. Webster, W. W. Dowdell, J. B. Hawley, H. H. Eby and H. W. Simpson.

The headquarters of the R. M. A. are at 32 West Randolph Street, Chicago.

Business Opportunities Radio and Electrical

Rates 10c per word; Minimum, $1.00; Casb with order

INVENTIONS WANTED WHICH ARE simple to manufacture and possible of volume distribution through national sales organization; cash or royalty basis; submit full description. United Factories Bureau, 210 Woodward Building, Washington, D. C.

EXPERIENCED ENGINEER DESIGNS, develops, builds small electrical and mechanical devices; reasonable charges. Miller, 120 West 64th St., N. Y. C.

RADIO OUTDOOR AERIAL PATENTED, demountable, fits any roof five minutes; want party to finance same. Box K, Radio World.

A Battery Substitutes Called Unsubstantial

Optimism was the keynote of the meeting of the National Battery Manufacturers Association, held in New York City at the Roosevelt Hotel. It was the annual meeting and reports of the various activities of the departments operating in the association were given. President Kelly, re-elected to succeed himself for the coming year, made a ringing speech on the work of the organization and offered many recommendations as to the reorganization and replanning of the work for the coming year.

The program for the convention represented a continuance of the policy planned at the Chicago meeting and included several technical papers. Among them was a paper by W. C. Brooks, of the Hartford Battery Mfg. Company, on the trickle charger and combination A battery units. This had to do with a question that is attracting a great deal of attention among manufacturers because of the publicity given to eliminators. Mr. Brooks was impartial in his remarks and placed the exact facts before the members.

[His article, elsewhere in this issue, embodies the gist of his remarks to the meeting.]

Business Conditions

One of the interesting features of the meeting was a composite report of business conditions as reported by various members. This was given by O. B. Towne and showed a varied experience on the part of manufacturers in different lines. Some of those who were confining themselves to only certain features of the battery business indicated a falling off of business during certain months in their main line and picking up of other lines. Manufacturers of farm lighting storage batteries and battery plates showed a substantial increase in their business. Automobile battery business remains about the same.

Lawrence A. Nixon, secretary of the Radio Trade Association of America, gave a very comprehensive address on the outlook for radio batteries. He encouraged particularly improvements in radio batteries which would eliminate certain objections. However, his remarks were more encouraging for the radio batteries than anything heard for some time. He did not seem to feel that inventions which have been heralded recently about doing away with storage batteries in radio, were anywhere nearly through the experimental stage, and consequently were offering nothing of substantial nature in improvements. It is Mr. Nixon's opinion that improvements are bound to come and that the battery people should be among those to take the lead.

Officers Elected

In departmental activity of the Association, a report was given by C. H. Smith, of the Westinghouse Union Battery Company, Chairman of the Cost Committee, on profit leaks or waste in the industry, and indicated a very remarkable advance in cost systems. Mr. Smith had arranged a complete chart giving the outline of a cost system in each plant.

The following officers were elected for the coming year:

President, D. H. Kelly, U. S. Light & Heat Corp.

Vice-President, R. D. Mowry, Universal Battery Co.

2nd Vice-President, O. L. Schutz, Grant Storage Battery Co.

Secretary, T. D. White, Victor Storage Battery Co.

Treasurer, P. M. Marko, Marko Storage Battery Co.

Membership of the Board of Directors is made up of the officers of the Association and the following directors especially appointed for that purpose:

C. H. Smith, Westinghouse Union Battery Co.

L. A. Doughty, Carlile & Doughty, Inc.

The Association will meet again in Cleveland or Detroit during the last of September or early part of October.

Prize From England To Be Awarded at Show

LONDON.

A gold medal from England, in addition to the Radio World's Fair medal and other awards, will go to the winner of the international amateur set contest, to be held at the Radio World's Fair in Madison Square Garden, New York City, Sept. 13-18. The prize is offered by the "Wireless Magazine." An elimination contest will determine the sets to be sent to New York to compete with the receivers built by Americans, as well as a number from France, Belgium, Italy, Spain and Australia.

Sets of exceedingly novel construction and those of proven extraordinary efficiency will be judged in New York. The winning sets in all classes will be given places of honor, too, at the Fifth Annual Radio Show in Chicago.

NEW CORPORATIONS

Asparad Radio Corp., Asbury Park, N. J., radio supplies, &c., $100,000; Hobate W. Simpson, Ocean Grove; W. T. Jackson, Allenhurst; Robert McMichael, Asbury Park, N. J. (Atty., Robert McMichael, Asbury Park, N. J.)

Ray-Ad Co., N. Y. City, moving pictures by radio, $5,000; S. E. Merriam, L. Mushen, H. Harrison. (Atty., B. H. Sandler, 150 B'way., N. Y. City.)

CAPITAL INCREASES

Radio Service Corporation of New York, Wilmington, Del., $50,000 to $300,000.

Man and Girl Alone In Dark as Iron Fails

The value of having a real good soldering iron lies in the assurance that it will keep on functioning properly and, if it is of the electric type, will not cause you to blow a fuse in your home power wiring (the DC or AC main).

Recently a radio engineer was using a poor iron which had been giving fair service for a few months. A girl friend telephoned him that her set was out of order. He rushed for the garage. Taking some radio tools with him, he sped over to the girl friend's house. You see, they were in love.

When he got there he found that the A battery switch was disconnected at the point where the battery lead should have been in constant contact with the switch lug. Obviously this was a soldering job, so he fished the iron out of his little bag and plugged into the electrolier socket.

He Explains Fuses

And nothing happened, except that the lights went out! Imagine his embarrassment, and incidentally hers, at their being left alone in a dark house!

"The fuses went!" he exclaimed.

"Can you fix them up?" she inquired anxiously, although with some confidence at that, for she knew he was well versed in things electrical.

"Have you any fuses?" he asked.

"Fuses?" she inquired innocently. "What are fuses?"

"Why, a fuse is something that you put in the fuse box," he explained darkly. "It's a piece of wire in a sort of contraption and it melts if the house wiring is shorted. That avoids trouble elsewhere, you see."

"No," she confessed, "I don't see. I'm all in the dark."

He was not of a mind to laugh at her joke. He asked where the fuse box was. She did not know. There was nobody else at home. Maybe some neighbor could tell, she suggested.

"Never mind," he counselled, "I'll go into the cellar and find the fuse box."

Not Even One Fuse

So he did, with the aid of his pocket flashlight. But there was not an extra fuse to be found. So he made the rounds of the neighbors, without any better luck. The nearest electrical store was two miles away, and likely closed by this time, as he was well aware. The clock had struck 10:30 p. m. Strictly speaking, it had merely struck once, but he knew it was 10:30 and, to make matters worse, was P. M. besides.

He helped the girl into his car and together they drove to the electrical store, which was locked and dark. They found out where the electrician lived, wrung him away from a poker game back to the store to find a few fuses, and then sped away with the precious safety devices. These the engineer quickly installed in the fuse box and all was happy.

"What caused the lights to go out?" she asked.

"Why, my soldering iron shorted," he explained. "We'll have to heat the iron on a gas stove."

A Fire Solves Problem

"We have no gas," she politely informed him.

"Then we'll build a fire."

And so, in the back yard, he built a bon fire and heated the iron so that he could complete his originally simple, but by this time frightfully complicated, job.

When his work was finished she thanked him and said:

"I have an alcohol lamp, if that's any good to you."

He groaned. "No, not now," he said, containing himself with superb exhibition of will power. "Everything is all right now, except the iron. Tomorrow I'll buy the best iron that the market affords. It's cheap insurance."

Children at the Dials Compel Program Care

"The child in the home can and does tune in to any program that is available and can absorb many things which he would not otherwise hear. Under these conditions it is important that if radio is to accomplish the greatest good for the greatest number it be in the hands of those who realize their responsibility to the listening public, rather than in the hands of those who for publicity or other selfish purposes will depreciate this medium of communication."

So said William E. Harkness, vice-president and general manager of the Broadcasting Company of America, which operates WEAF, New York City.

He reported that a survey by WEAF determined the average listeners per set are 5 and brought out the very interesting fact that WEAF and a chain of sixteen broadcasting stations in the northeastern section of the United States served 61.6% of the total number of receiving sets in the United States and 52% of the nation's total population.

As the result of another questionnaire, Mr. Harkness pointed out the fact that due to the children's choice of operatic and classical music it would seem to indicate that the efforts of the city and town schools to stimulate an interest in these classes of music have been effective.

In speaking of radio and the newspaper, Mr. Harkness stated that the radio would never supplant the paper, but both would have their own place, particularly in the field of education.

CHANGES OF ADDRESS

should be sent to Subscription Department at least two weeks in advance of publication in order to insure early and proper attention. RADIO WORLD'S subscription list is so large that it is necessary that changes be sent in as requested. Address, Subscription Department, RADIO WORLD, 145 W. 45th St., New York.

Better Programs Keep Interest High in Summer

By Charles B. Popenoe

Manager, Stations WJZ and WJY

The program, after all, is the foundation of the broadcasting structure. Were it not for the steady flow of increasingly good program features, radio would have but a limited appeal to the American public. Especially is this emphasized during Summer, when radio must allow for the vastly increased diversions that come with the transition from an indoor to outdoor life.

Broadcasters fully recognize this and radio program directors have prepared accordingly. This season, therefore, will witness a genuine radio Summer in the matter of suitable radio programs quite as much as in ample transmitting power and improved reception.

Highly significant, so far as this Summer's programs are concerned, is the marked change that has taken place in broadcasting practice during the past few months. Gradually broadcasting has progressed from a rather amateur and haphazard means of entertainment to a professional and thoroughly stablished institution.

The Great Improvement

Instead of a steady procession of amateur talent, with just an occasional sprinkling of professional performers, present-day programs consist virtually of all-star talent, so far as the leading broadcasting stations are concerned. For the first time, through the medium of the sponsored program, the program director has the necessary means at his disposal to summon the best of professional talent. Today the program director, like the theatrical manager, plans his program and then selects and arranges his features with a view to providing maximum enjoyment and value to his invisible audience which, by its steadily increasing attendance, repays both the program director and the program sponsor for the effort and expense involved.

And, under the new circumstances, the program director may plan his programs for the maximum Summer-time appeal. This choice makes for variety and correct balance. Thus the radio audience is assured the highest class of entertainment in Summer as well as Winter, borne on powerful radio waves capable of combatting atmospheric disturbances, while the radio performers and their sponsors are assured a full house, in a manner of speaking.

Continuity Is Result

This new-day program makes for a continuity in radio that has heretofore been most difficult to maintain. Thus the same program features and the same radio personalities who have come to the radio audience week after week through the Fall, Winter and Spring, are, for the most part, to continue through the Summer season. There is no reason whatever for breaking off one's radio acquaintances that have been formed during the cooler seasons. Even if the Summer takes the radio listener to the distant farm or remote camp, the long arm of the high-power broadcasting station assures friendly contact amid the new surroundings, whether the home receiver be brought along for the purpose or whether it be a portable receiver included in the vacation luggage. Thus, with very few exceptions, indeed, the established program features are to continue through the present season, for the program sponsors realize fully the importance of continuity in maintaining the public good-will which they have been building up from week to week.

New Direction Finders Save Extra Patrol Work

The Bureau of Standards has developed for the Coast Guard a simple type of radio direction finder that will enable one ship to locate another, to relieve it from patrol duty. Also to locate ships in distress. Likewise to spot a rum runner.

The new direction finder will be installed on a fleet of small coast patrol boats recently aded to the Coast Guard Service which already have been equipped with radio telephone and telegraph transmitting and receiving apparatus which operates at a frequency of 2,100 kilocycles per second. The direction finder functions on the same frequency.

The Coast Guard direction finder coil consists of four turns of ignition cable wound on a 20" frame. It is installed over the pilot house and rotated from below. A tuning unit and coupling transformer have been designed so that the direction-finder coil may be used on the ship's receiving set without changing its tuning adjustments, which are locked in the 2,100 kilocycle position.

Canada a Good Neighbor On Air as Well as Earth

That several American stations, notably KOA, Denver, joined in celebrating Canada's Dominion Day, June 30th, was a reminder that Canada, with its 4,000 miles of unguarded border separating her from the United States, has proved as good a neighbor on the air as otherwise. Through a gentlemen's agreement, and without the aid of a treaty of any sort, the United States occupies 90 wave bands and Canada 5 in the Class B assignment of from 280 to 545 meters.

There was quite a flurry recently when an American station took possession of one of the Canadian wave bands and it was feared in some quarters that this might disturb the friendly air relations between the two countries, but this did not materialize.

HIGH FREQUENCY TESTS

For conducting tests between 8,000 and 27,000 kilocycles, Dr. A. Hoyt Taylor, of the Naval Research Laboratory, started for St. Nazaire aboard the U. S. S. Memphis.

Trickle Charger Used With Small A Battery

Expert Classifies Restorers and Explains How They Operate—Prophesies Dry Crystal Charger Will Be on Market Soon

By H. C. Brooks
Hartford Battery Mfg. Co.

During the last radio season there was popularized a new expression among the many others connected with the radio trade, that of trickle charger. Strictly speaking this refers to a charger for a radio A battery, but often it refers to a combination charger and battery.

While the majority of radio sets are operated from a large A battery having about 100 ampere hours' capacity, there is an increasing demand for a combination battery and charging unit so that the radio fan will always have his battery charged when it is required.

To keep the cost of the combination as low as possible and at the same time eliminate mental effort required to keep the battery in its best condition, a charger has been designed to charge at such a slow rate that it may be used to charge the battery at all times when the set is not in use. It is obvious that this convenient arrangement would be desirable, and there has been considerable pressure upon battery companies to produce such a combination.

This idea is not new, having been used for several years in railroad signal work with very good success. The service in this case is somewhat different. Since the railroad signal service requires an absolutely certain source of current at all times, the trickle charger is kept connected continuously and a Plante type of battery is used to withstand this continuous charge. Then if the source of charging current fails temporarily, the battery continues the service, so this is really a standby and voltage regulating battery combined.

In the combination A battery and charger, a small 6-volt storage battery is permanently connected to a rectifier which in turn is provided with a standard plug, just as a flat iron, toaster or other appliance is equipped. There are four types of rectifiers used for changing alternating to direct current after it has been transformed to the proper voltage for charging the battery. All these rectifiers are similar to radio detectors.

Four Types Explained

The four types are, first, bulb or vacuum type, more familiarly known as tungar and rectigon; second, electrolytic, which is divided into alkaline and acid; third, vibrator; fourth, crystal.

In the bulb type of rectifier, with which you are all familiar, a small 2-element vacuum tube is used. This is perhaps the most popular type thus far.

The electrolytic rectifier was developed and most commonly used in the alkaline type, being formed of a single cell having aluminum and lead electrodes and a borax solution. This rectifier was developed and had considerable use in the ignition battery trade fifteen years ago. It was not found successful, however, nor has it been in its revival of the past few years, on account of its uncertainty of operation and its high internal resistance.

The second type of electrolytic rectifier, which is a newer development, uses an acid electrolyte and some rare metal or alloy electrode and a lead electrode. The most familiar combination, of course, is the tantalum rectifier. This has been very successfully used and is a desirable arrangement, it has about the same electrolyte as that of the battery. The only difficulty with this type is a tendency to go dry in continuous operation, especially in a warm place, but if it is properly proportioned it will need water no oftener than the battery and may act as a protection to that neglected article.

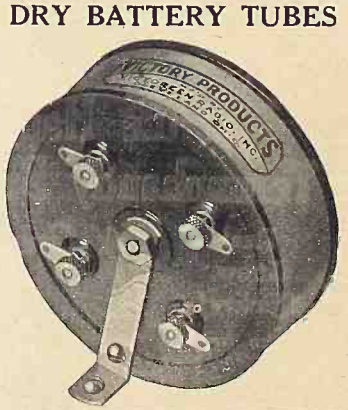
The third division of rectifiers, that of the vibrating type, may well be dismissed from our consideration since it depends upon a vibrating armature which creates sparks that produce interference. While this might be overcome it is extremely difficult and since there are no compensating advantages in this type it will not be further considered.

Crystal Charger Prophesied

A new type of rectifier for this service, which will probably have increasing application in the future, is the dry crystal. You are all familiar with the crystal detector and since the trickle charger will require only small current, it seems easily possible to multiply the number of detectors until they have sufficient current carrying capacity to operate a trickle charger. There is considerable work being done on this charger at present and undoubtedly in the near future some of these will be on the market.

We may now consider the effect of continuous charging on the life of the battery. Some engineers are firmly opposed to the use of anything like a trickle charger, since they claim that the continuous charge has a disintegrating effect on the plates and grids to a greater extent than a higher charging rate. This view of the matter may be correct if we consider the matter as being purely continuous charge. If, however, we balance the charging rate properly and the user is careful that he does not allow the battery to charge for weeks at a time without using the set, we believe that in normal operation the battery will not be injured.

Since most trickle chargers operate at about 5/10 of an ampere and the average 5-tube radio set requires approximately 1¼ amperes, if the average use of the radio set be taken at four hours, we will remove six ampere hours from the battery, then, in the remaining twenty hours



of the day the charger will replace ten ampere hours, which will be an overcharge of approximately 2½ ampere hours.

Unusual Demands

This is really a little more than is necessary and it is required to take care of the few cases where people operate sets for longer than the average or have more than the usual five tubes and an additional drain caused by the use of a one ampere detector or a horn which uses about one ampere A battery current. Since there are these variations in requirements, some of the trickle chargers are provided with means to change the charging rate. This is obtained either by taking different taps off the transformer or a small variable resistance is placed in series with the battery. The former method is more economical and will give sufficient gradations of current. In this way one type of charger will vary the charging rate from 2/10 to 7/10 of an ampere.

Various sizes of batteries are produced for the combination. Theoretically, the battery need be no more than 10 ampere hours capacity, which would be enough to take care of a set for one evening. This is not good policy, however, since it would mean almost a complete discharge for the battery every day and also would leave no reserve supply. At the same time it would be giving such a battery a complete charge at its normal rate daily and that would shorten its life very materially.

Run 30 to 50 Hours

Most of the batteries, therefore, which are being used in this combination will run from thirty to fifty ampere hours in capacity. Even the smallest of these therefore will provide the average 5-tube set for five or six nights without a charge. This reserve capacity is very desirable. It is conceivable that the owner may forget to plug in the charger after an unusually long session with his radio set and he naturally wants sufficient reserve capacity to take care of him the next night.

The one real disadvantage of this combination is the fact that if the battery is allowed to become discharged there is not sufficient capacity in the charging outfit to restore the charge quickly enough to operate the set the same day, which may cause the fan to lose an evening's entertainment. This, however, is no worse than his condition in the ordinary case if he had not discovered the discharged condition of a standard A battery until he wanted to use it. Some combination sets are so equipped with filters and chokes that the battery may be used while the charge is in operation. This method does not meet with general approval, as it requires a charger of enough current capacity to carry the load directly and introduces the usual noise and hum which seem to be unavoidable when an alternating current transformer is used near a radio set.

The advantage of the electrolytic charger is apparent when one considers that the low power required is probably not sufficient to start the average watt hour meter of your line supply. Since most of the time this charger is operated when no other current is being used the recharge is mostly free and even when added to other load the continuous operation at 18 watts will cost the owner only 3¼c per day at 10c per kw. hour. However, the bulb type at 30 watts will cost 5.4c per day. Both above estimates are based on eighteen hours charge. It is obvious that bulb type chargers must be less efficient at low charging rates, since the filament current must be applied in addition to the charging current.

Personal Radio Phoning Marks German Air Travel

BERLIN.

Whether their friends or relatives are traveling in air or on land, telephone subscribers throughout Germany are now able to communicate with them with the same ease as when talking over the stationary land phone, due to radio telephony. Thirty-six express trains of the Berlin-Hamburg line and the huge air liners of the German Air Service employ this service. Although a three months' trial on the trains did not prove financially profitable, such great scientific success resulted, that the Ministry of Posts and Telegraphs and the Railway Administration decided to extend the service to the entire express service. Experiments are being carried out on the Berlin-Munich express trains, the results being watched by many experts, as it is feared that the high voltage cables, which run parallel to the tracks for many miles, may interfere with reception and transmission.

No difficulty has been encountered by the 'plane service, despite the roar of the three 120-horsepower motors. Even during a thunderstorm a pilot circling over Stockholm talked with officials at Templehofer Field in Berlin for approximately five minutes. Directors of the Air Service announce that transmitters and receivers will be placed at the passengers' disposal on the routes between Berlin-Paris, Berlin - Stettin - Stockholm and Berlin - Danzig-Konigsberg. The instrument, as the passenger sees it, resembles the common telephone.

Is is very easy to use.

Connecticut to Give School Courses Via Air

HARTFORD, CONN.

With the co-operation of WTIC, the Travelers Insurance Company station in this city, the state Board of Education will begin the broadcasting of a regular educational course in the schools of Connecticut, during the next school year. It is thought that this program will become New England wide, as representatives of New Hampshire, Vermont and Massachusetts education department have been appointed to act with the Connecticut board. Even authorities in Maine have signified their intention to cooperate. Music appreciation will be the topic of discussion during the broadcasts.

Prize Winning Soloists To Perform at Stadium

The concerts of the New York Philharmonic Orchestra from the Lewisohn Stadium are being broadcast by WJZ each Wednesday and Saturday night at 8:30 Eastern Daylight Saving Time, with WRC of Washington, D. C., participating in the broadcasting on Saturday nights only.

The orchestra is the second oldest orchestral organization in the world, the London Philharmonic, organized early in the nineteenth century, being first. Founded on April 2, 1842, the Philharmonic has never had to cancel a single concert, out of more than 2,000 it has given, and only two have been postponed, one on account of the death of President Lincoln and the other because of the sudden death of a conductor, Anton Seidl.

Dates of Concerts

The Philharmonic will be under the leadership of four conductors during the series, Willem Van Hookstraten and guest conductors Nikolai Sokoloff, Henry Hadley and Frederick Stock. The dates on which they will conduct are as follows:

Van Hoogstraten, July 27; August 10 to August 17; August 25 to August 31; Sokoloff, July 28 to August 3; Hadley, August 4 to August 9; Stock, August 18 to August 24.

Among the soloists to be heard in the Stadium concerts will be the winners of the auditions recently conducted by WJZ. They are Nora Fauchild, soprano; Guiseppe Martino-Rossi, baritone, and Enrique Ros, pianist, with Allice Godillot, George Harold Miller and Margaret Hamilton as alternates.

The Four Conductors

Born in Holland, but now an American citizen, Van Hoogstraten has been the main conductor of the Stadium concerts since 1922, when he shared the season with Henry Hadley. He has appeared as conductor of the Philharmonic in the Winter season with Willem Mengelberg and the past Winter found him as conductor of the Portland Symphony Orchestra, to which post he will return next season. He has also appeared as a guest conductor with the Philadelphia, Detroit and Los Angeles Orchestras, and also at the Hollywood Bowl.

Sokoloff is a graduate of Yale University and is now conducting the Cleveland Symphony Orchestra. This will be his second year as a guest conductor at the Stadium.

After studying at the New England Conservatory and in Vienna, Hadley served as conductor of the Seattle Symphony and San Francisco Symphony Orchestras. Since 1915 he has devoted himself largely to composition, and among his works are several operas, tone poems and numerous works for solo and chamber instruments.

Stock studied at the Cologne University and upon graduation with highest honors was chosen from among fifty competitors as the first violinist of the famous Municipal Orchestra. In the latter part of the nineteenth century he came to America to the Chicago Symphony Orchestra and in 1905 succeeded Theodore Thomas as its conductor, a post which he still holds.

Radio a Peace Agency, Says Haiti's President

In two addresses, one delivered in French for his people in Haiti and the other in English spoken for listeners in the United States, Louis Borno, president of Haiti, sent messages on the air from the studio of WGY recently. President Borno is deeply impressed with the possibilities of radio as a peace preserving agent and pictured for American listeners the little island republic which is endeavoring to achieve and maintain real independence.

"The United States," he explained, "has undertaken to assist, by treaty, the Republic of Haiti in reorganizing its economic, social and political life. This work is being done through cordial cooperation between the Haitian and the American governments, and gratifying progress has been made.

"Assistance by the United States Government has taken the form of lending American personnel to the Haitian Government. These Americans are nominated to certain offices in Haiti by the President of the United States and are appointed by me. Activities supervised by Americans under the terms of the treaty of 1915 are the constabulary, the finances, public works, public health and agriculture. Marked progress has been made in placing each of the foregoing functions of government on a solid basis, and it is wise statesmanship to continue, according to our treaty, the cooperation between Haiti and the United States for a period which to some may seem too long, rather than to terminate such cooperation prematurely and thereby undo all the spendid progress which has been accomplished in recent years through this arrangement."

Experts Debate Waves As Trespass on Property

By Thomas Stevenson

WASHINGTON.

Would it be possible for a land owner to prevent broadcasting stations from sending out programs or from interfering with other stations? This interesting question has arisen in governmental and legislative circles in connection with discussions of various radio bills.

Leading legal authorities contend that until there is a Congressional declaration that the ether belongs to the Federal Government, "every radio transmission which traverses the sky above a man's land constitutes legal trespass." These authorities base their argument upon the ancient maxim—"he who owns land owns to the heavens above and to the center of the earth, from the zenith to the nadir."

Must Prove Ether Exists

If it can be proven that radio signals constitute trespass, it would be entirely possible for the landowner to appeal to the courts for relief from bad programs or from undue interference, these authorities say.

Other authorities contend, however, that "existence of the ether must be proven before trespass can be claimed." The very basis of property is possession, they say, and all ownership is postulated upon possibility of control and that which may not be possessed may not be owned.

For want of a better term, scientists have designated as the "ether" the hypothetical substance which is supposed to exist between and surrounding the atoms and electrons of all matter and through which the radio wave is assumed to travel. What the ether is and whether it really exists is not susceptible of positive demonstration.

An Expert's Opinion

Here is an opinion on the subject by a leading legal authority of the Federal Government:

"The claim of ownership of the upper air has been made by landowners who have suffered damages from airplanes. To uphold such absolute title would be to prohibit aerial navigation; for every flight would constitute innumerable trespasses. The tendency of the courts has been to allow damages for actual injury but not upon the theory of nuisance or trespass on the upper air.

"A radio wave passing through air, earth, rock, brick or timber causes no change in the material. The particles of matter remain the same as before, their quality unchanged and position unaltered.

"If we could imagine the space above and below the surface of the land to be a vacuum, the radiation would still pass through it. Nothing is added to it and nothing taken away. There is no appreciable effect whatever, certainly no physical entry. The wave cannot be seen, felt or detected by any of the senses except with artificial aid. It is invisible, intangible and imponderable.

Question of Annoyance

"It becomes of some importance to determine whether or not the sending into land of an impulse of this sort constitutes a trespass. If it is a trespass, an action would lie by the landowner, nominal damages could be recovered without proof of actual injury or negligence or perhaps repetition could be enjoined. It it is a trespass, proof of actual damage and negligence or other similar ground of liability would be essential elements to a recovery.

"If the landowner could prove that a particular kind of program was of an annoying nature, or if it could be established that the signals of a station trespassed to the extent of preventing the fuil enjoyment of the programs of other stations, it is entirely possible that the courts might allow damages and enjoin repetition."

Eleanor Edison Joins WHN Staff of Singers

Eleanor Edison, soprano, formerly with the Aborn Opera Company and leading lady in the "Clinging Vine" two years ago, is now singing at WHN, New York. She is a Washington girl who was started on a stage career as a singer by her mother, a pianist. She came to New York to study under Abbott Jeanett and Dr. Ernest Knoch. She began her stage career as a dancer in "The Poor Little Rich Girl," but preferred singing and now plans to return to opera.

STATIONS

(*Concluded from page 19*)

Station	Owner and Location	Meters
WTAP	Cambridge Radio Elec. Co., Cambridge, Ill.	242
WTAQ	S. Van Gordon & Son, Osseo, Wis.	254
WTAR	Reliance Radio & Elec. Co., Norfolk, Va.	261
WTAW	Agricultural & Mech. College, College Station, Tex.	270
WTAX	Williams Hardware Mfg. Co., Streator, Ill.	231
WTAZ	T. J. McGuire, Lambertville, N. J.	261
WTIC	Travelers Insurance Co., Hartford, Conn.	476
WUBO	V. Jansen, New Orleans, La.	268
WWAE	Electric Park, Plainfield, Ill.	242
WAO	Michigan College of Mines, Houghton, Mich.	263
WWGL	Radio Engineering Corp., Richmond Hill, N. Y.	213
WWI	Ford Motor Co., Dearborn, Mich.	266
WWJ	Detroit News, Detroit, Mich.	353
WWL	Loyola University, New Orleans, La.	275

Attention, Radio World Subscribers!

Subscribers will note that the end of their subscriptions is indicated on the labels on wrappers. If your wrapper shows a date earlier than the current issue, please send payment for renewal. Changes in expiration dates on wrappers appear two weeks after receipt of renewal.

RADIO WORLD, 145 West 45th St., New York City. (Phones: Bryant 0558-0559.)

Good Back Numbers of RADIO WORLD

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

1925:

Sept. 19—The 1-Dial, 2-Tube Speaker Set, by Percy Warren. Anderson's Theory of Fading. The Way of the Frequency Dial, by Capt. P. V. O'Rourke.

Oct. 24—The 3-in-1 RF Receiver, by Sidney E. Finkelstein. A Phonograph Cabinet Set, by Lewis Winner. How To Use Fixed Condensers, by J. E. Anderson.

Nov. 7—A 3-Tube Dry-Cell Circuit, by Capt. P. V. O'Rourke. One of the Best Crystal Sets, by Herbert E. Hayden. 1-Tube DX Set, Herman Bernard.

Nov. 28—The Zero Potential Loop, by Frank Freer. The 1-Tube Headset Receiver, by J. E. Anderson. A Discussion of AF Amplification, by Wm. Forlington.

Dec. 12—A Self-Contained Receiver, by H. E. Hayden (Part 1). B Battery Eliminator, by Lewis Winner (Holiday Gifts No.).

Dec. 26—The Regeneratite Wave Trap, by John F. Elder. The 5-Tube Tuned RF Set, by Capt. P. V. O'Rourke.

1926:

Jan. 2—The 2-C Set for Simplicity, by Capt. P. V. O'Rourke.

Jan. 9—The 4-Tube DX Symphony Set, by A. Irving Witz. A Skillfully Made 1-Dial Set, by Herman Bernard.

Jan. 16—Anderson's 5-Tube Quality Receiver, The Raytheon B. Eliminator, by Lewis Winner.

Jan. 30—An Individual AF Amplifier, by H. E. Hayden. The Antennatrol, by Herbert Hayden (Part 2). Trapping Out Super-Power in New Jersey, by Capt. P. V. O'Rourke.

Feb. 6—The Fenway (4 or 9 tubes), by Leo Fenway (Part 1). The Great 1-Tube DX Set, by Herman Bernard.

Feb. 13—Anderson's 5-Tube Economical Receiver. Trouble Shooting for Novices, by M. B. Strock. The Fenway, by Leo Fenway (Part 2).

Feb. 20—The 8-Tube Victoreen, by Herbert E. Hayden. The Fenway, by Leo Fenway (Part 3). Quality Stressed in 3-Tube Set, by Brainard Foote.

Feb. 27—The 4-Tube DX Dandy, by Herbert E. Hayden. Umbrella Aerial for DX, by Hugo Gernsback. Part 2 of The Victoreen.

Mar. 6—The 1-Tube Set, By Capt. O'Rourke. The Chemistry of Batteries, by A. R. Reid. The Victoreen Set (Part 3), by Herbert E. Hayden.

Mar. 13—The Non-Regenerative Browning-Drake Set, by M. B. Sleeper. The Tectron Eliminator (Part 1), by Lewis Winner. Curing Victoreen Trouble, by Herbert E. Hayden.

Mar. 20—The Super-Heterodyne, by J. E. Anderson. A 2-Tube Speaker Set, by Percy Warren. The Browning-Drake Set (Part 2), by M. B. Sleeper. A 2-Tube Eliminator, by Lewis Winner.

Mar. 27—An Economical 4-Tube Set, by Edgar T. Collins. A Practical B Battery, by Capt. P. V. O'Rourke. Tectron Trouble Shooting, by Lewis Winner.

April 3—The Bernard Portable, by Herman Bernard (Part 1). How to Get DX, by Capt. P. O'Rourke. A Compact B Supply, by Lewis Winner.

April 10—The Bernard Portable, by Herman Bernard (Part 2). Two Eliminators for DC, by Lewis Winner. A Super From An Old Set, by C. King.

April 17—The New 1-Dial Powertone, by Capt. P. V. O'Rourke. The Bernard Portable (Part 3), by Herman Bernard. The Action of Transformers, by Lewis Winner.

April 24—All Waves on One Set, by Capt. P. O'Rourke. Bernard's Portable (Conclusion). Control of Feedback, by Barney Feete.

May 1—New Multiple Tube, by Herman Bernard. The Aero All-Wave Set, by Capt. O'Rourke. Kilocycle-Meter Chart. Official List of Stations. An Analysis of Detection, by J. E. Anderson.

May 8—A study of Detection, by J. E. Anderson (Part 2). To Wind a Loop on a Cardboard Frame. How to Reflex Resistance AF, by Theo. Kerr.

May 15—Super-Heterodyne Results Brought Up to Maximum, by Herman Bernard. The Truth About Coil Fields, by J. E. Anderson.

May 22—A Built-in Speaker Set, by Herbert E. Hayden. The Powertone in Operation, by Capt. P. V. O'Rourke. Confessions of a Super Bug, by James H. Carroll.

May 29—Aerials in Ground and Water, by Lewis Winner. Economized Filaments, by J. E. Anderson. How to Get DX, by John F. Rider.

June 5—Five-Tube Compact Receiver, by J. E. Anderson. A Tester for Tube Circuits, by Spencer Hood. Problems of Portables, by Hugo Gernsback.

June 12—The Light 5-Tube Portable, by Herman Bernard (Part 1). The Rogers-Schudt Receiver, by Wm. A. Schudt, Jr. (Part 1). The Freshman Masterpiece, by A. W. Franklin.

June 19—Selectivity's Amazing Toll, by J. E. Anderson. The Light 5-Tube Portable Set, by Herman Bernard (Part 2). The 4-Tube Rogers-Schudt, by Wm. A. Schudt, Jr. (Part 2).

June 26—The Victoreen Portable, by Herman Bernard (Part 1). The Manufacture of a Tube, by F. C. Kelley. The Light 5-Tube Portable, by Herman Bernard (Part 3). The Rogers-Schudt Circuit (Part 3 concluded), by Wm. A. Schudt.

July 3—Set with A 1-Turn Primary, by Herman Bernard. Part 2 of the Victoreen Portable, by H. Bernard. Trouble Shooting Article for The Light 5-ttube Portable.

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Circuits Simmer Down To Five Important Groups

By Leon L. Adelman

The Chas. Freshman Co., Inc.

There are so many circuits—good, extra good and others—that a beginner is likely to become bewildered and exclaim, "I give up." However, there is no need to give up, since, if one has the least bit of interest in radio, he will be willing to spend a little while in learning more about it.

Most likely you are using one of five different fundamental types of radio receivers: (1) The non-regenerative set; (2) the regenerative set; (3) the tuned radio frequency receiver; (4) the Super-Regenerative; and (5) the Super-Heterodyne.

These are the five groups in which all existing receiving circuits can be classified. The theory of operation of each type differs from the others.

The Simplest One

The simplest type is the non-regenerative. This includes the hookup wherein the antenna is conductively or inductively coupled to the tuning circuit. Again, we are not limited to the type of detector which can be used with such a circuit. Thus, we can employ the coherer, the crystal (with or without a battery), the microphonic detector, the electrolytic, magnetic, colloidal, the tickler, the heterodyne, the 2-element and the 3-element tubes.

Each type of detector has its own peculiar characteristics and theory of operation, and although one rarely finds non-regenerative sets being used, crystal and the tube detectors are being used extensively.

With the discovery of the 3-element tube came the regenerative detector. Regeneration, by the definition generally used, is the process of feeding a signal back from the plate circuit to the grid circuit of a tube by means of inductive or capacitative coupling.

Effect of Regeneration

Regeneration increased the volume and sensitivity of a set to a very large degree. There is one drawback, however, —that of radiation when the set starts to over-oscillate. Thus, if you are using a single circuit regenerative set, it is strongly advised that you change it to the 3-circuit tuner, which will not cause nearly so much trouble with your neighbors. In the regenerative classification are the direct connected and inductively coupled antenna systems, both of which may be used with regenerative sets employing inductive or capacitative feedback. Reflex circuits of the regenerative variety also fall into the same classification.

Undoubtedly the most widely used type of set is that using radio frequency amplification.

Reflex circuits, there are hundreds of them, found great favor in the eyes of the experimenter. They are either straight reflex or inverse reflex type. The reflex need not be classified as an independent circuit.

In coupling radio frequency amplifier tubes together, there have been discovered several means which have certain points of merit. The coupling arrangement can be either of the tuned or untuned type. The tuned type produces superior results. Thus, tuned impedance and tuned-transformer coupling may have positive feedback, negative feedback, potentiometer stabilization, absorption circuit stabilization or Hazeltine, Rice or Farrand neutralization.

Classifying the Neutrodyne

If, for instance, you have a Neutrodyne, you would classify it as follows:

It belongs to the radio frequency classification, and employs tuned transformer coupling. The antenna system may be either conductively or inductively coupled. It is neutralized by the Hazeltine method and uses in combination, a non-regenerative detector and two stages of transformer coupled audio frequency amplification.

The Super-Heterodyne is much more complex in its fundamental operation than any of the others. Likewise the Super-Regenerative receiver is a very interesting development which requires a thorough knowledge of radio technique.

"Which is the best circuit and why?" is a question often asked. It is hard to answer. One can not tell what the inquirer means by "best."

With the rapid strides that are being made in radio it is possible that new classifications for circuits will be found, although at present there are but five channels into which one can place the thousands of receiving circuits and nothing in sight to suggest a sixth group.

CHICAGO ALLIED SHOW

The Allied Radio Congress and National Radio Exposition will be held at the Hotel Sherman, Chicago, September 27 to October 2. It is under the direction of the International Trade Exposition Co., Milo E. Westbrooke, manager, at the Hotel Sherman.

GETTING DX by Capt. P. V. O'Rourke, appeared in RADIO WORLD dated April 3. 15c per copy or start sub. with that issue. RADIO WORLD, 145 West 45th St., N. Y. C.

WHAT USERS OF THE BRETWOOD Variable Grid Leak *say:*

The Bretwood Grid Leak came with today's mail. It is now exactly 9:00 P.M. and the leak was installed about a half hour ago.
This note is not only an expression of appreciation but also an attestation of the truth of your advertising. During the past half hour I have tuned in stations "ALL OVER THE DIALS" at leisure, and can adjust reception with the leak almost equal to a variable condenser.
I feel constrained to add that while waiting for reply and then receipt of leak from you, there has been on the set a fixed leak and condenser of well known and thoroughly reliable make, and fairly good reception has been enjoyed, but during this half-hour-only test thus far the results are inexpressibly beyond expectation.
Have been a radio fan only about four years, but feel I have sufficient knowledge and experience to recognize a good thing upon fair trial. Your promptness and desire to satisfy your trade, in this case has won for you another "BRETWOOD BOOSTER." Thank you.
The Rev. WALTER G. BARLOW,
Bishopville, Ind.

Very many thanks for your kind letter of the 21st ult. and for the grid leak, which works perfectly. I have tried four different makes of grid leaks. The Bretwood "has 'em beat."
M. SAWYER,
Box 238, Los Gatos, Calif.

Received your grid leak and wish to say that none can compare with it when it comes to clearing up reception.
JOHN A. BLACKBURN,
5328 Warren Ave., Norwood, Ohio.

Enclosed find P. O. money-order for $3.00. Please send me two of your Variable Grid Leaks. I am using one and it works fine. Please mail them as soon as possible.
W. H. PERRY,
119 Congress St., Buffalo, N. Y.

Received your grid leak and many thanks. It is the best $1.50 that I have spent for radio equipment.
ED. JENKINS,
703 E. Main St., Louisville, Ky.

Enclosed herewith find check for $1.50 for one Bretwood Grid Leak. I am using your leak and find it far superior to any others. This is my third Bretwood.
J. C. WHITE,
422 W. Wooster St., Bowling Green, Ohio.

Will you please send me by return mail two Bretwood Variable Grid Leaks. I enclose herewith check for $3.25, the 25c. being for a special handling stamp, as these leaks are needed at once.
The leaks are the only satisfactory instrument on the market. I find them absolutely essential in the construction and operation of sensitive experimental receivers.
ED. J. WHITTIER,
The American Appraisal Co.,
Milwaukee, Wis.

I want to thank you for your leak, it makes the set 100% better. I was going to have a Diamond of the Air built, but since I have added your leak to my set I am now down in the dining room of the first floor and the set is on the second floor. I can hear the set just as plainly as if I were up there. I can hear every player in any band or music which is on air. The first night I gave the leak a very good test, and I got four stations in Chicago, one in Detroit, one in Canada, one in Atlanta, Ga., and several others without any noise. All were good and clear. It is going to make me spend more money, as I will have to get a good loud speaker. The horn I have now is a Manhattan Jr., and is good and clear, but as soon as your leak is installed the howling present when using three tubes is immediately stopped.
LEON E. COLE,
5816 Tilbert St., Philadelphia, Pa.

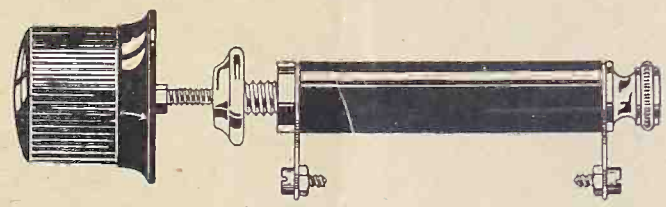
Grid Leak received and tested out, and find it is the only variable leak I ever used that is really variable. Enclosed find $1.50, for which please send me another one.
F. E. STAYTON,
Box 240, Ardmore, Okla.

Thank you for introducing me to the Bretwood Variable Grid Leak! I have installed one in my Three-Circuit Tuner, according to your instructions, and find that it does all you said it would—and more. I am now recommending the Bretwood to all my friends, and those who have used this wonder grid leak have nothing but high praise for it. The fact that it can be adapted for any hookup makes it invaluable to the experimenter.
Although I have only used the Bretwood leak for three weeks I have pulled in several of the weaker stations which were inaudible before, and the microphonic noises which were decidedly pronounced before have entirely disappeared.
Please accept my best wishes for your continued success and also for the Bretwood Grid Leak.
S. R. HUBBS,
180 Quincy St., Brooklyn, N. Y.

Let me say that the Bretwood Grid Leak improves the set 100%.
J. E. McGINNISS,
27 Lenox Rd., Brooklyn, N. Y.

I wish to take this occasion to thank you for your courtesy in furnishing me with your very excellent Grid Leaks. I have installed one with your Condenser on my own personal radio set, and am delighted with the results.
R. W. DeMOTT,
Experimenter Pub. Co.,
53 Park Place, N. Y. C.

I have received the Grid Leak you sent me and it is perfect. It is surely wonderful the way it works. Please send me another by return mail for a friend.
J. F. COOPER,
1029 Courtlandt St.,
Cincinnati, Ohio.



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S-Selectivity
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6-6 tubes

The BST-6. 2 Feet 4 Inches Long. 9 Inches Inside Depth. 8¾ Inches High.

THIS marvelous six-tube tuned radio frequency receiver is Self-Equalized and built of low-loss materials throughout. Its clear, rich tone of astonishing volume is a revelation. The circuit consists of two stages of tuned radio frequency, tube detector and three stages of balanced audio amplification. Air cooled rheostats and universal sockets are used.

Lubree modified straight line wave variable condensers are employed, insuring separation of the low wave length stations. PERFECT CALIBRATION—STATIONS ONCE TUNED IN CAN ALWAYS BE LOGGED AT THE SAME DIAL POINT.

The BST-6 works best with a 75 to 100 foot aerial, 6 volt "A" storage battery, two 45 volt "B" batteries, 4½ volt "C" battery, six 201-A tubes and any good loudspeaker.

LOG OF BST-6

Taken on a Fifteen-Foot Aerial in One-half Hour by Al. Kraus, 996 Aldus Street, New York City.

WSBC, Chicago, Ill.....10
WBBR, Rossville, N. Y..16
WEBH, Chicago, Ill....49
WHT, Deerfield, Ill.....55
WCCO, St. Paul, Minn..61
WSB, Atlanta, Ga.....66
WGY, Schenectady, N.Y..50
WMAK, Lockport, N.Y..14
WMSG, New York City.11
WOC, Davenport, Ia....85
WFAA, Dallas, Texas...78

SELECTIVITY

I live within four blocks of WLWL, and since the opening of this station have had great difficulty in choking them off my old set. Even after employing a wave trap I could still hear WLWL around the entire dial and was told by several friends that living so near this powerful station it would be impossible to entirely cut them out with anything less than a super-het. It was a very agreeable surprise, therefore, when I installed my new BST-6, to find that while WLWL came in on 25 I could tune in WRNY on 21 and entirely cut out WLWL. ***This is certainly real selectivity.***—F. S. Clark, 350 West 55th Street, New York City.

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