ULY 3 1926 15 CENTS

SET WITH
1-TURN PRIMARY

RADIO TESTS
ON HUMAN BODY

HOW TO MAKE
DRUM TYPE DIAL

RADIO WORLD

Reg. U. S. Pat. Off.

Vol. 9. No. 15 ILLUSTRATED Every Week

MAKE SPEAKER
EMIT YOUR VOICE

SUB-PANEL FOR
VICTOREEN PORTABLE

COMPLETE LIST
OF U. S. STATIONS

(Herbert Photos, Inc.)

POSSESSING a baby grand piano type of cabinet and soundboard, Violet Herbert has a distinctly novel home-constructed receiver.

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.

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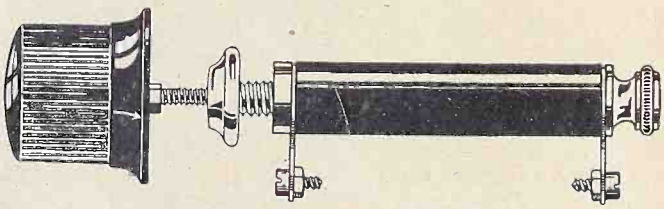

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Vol. 1X
No. 15
Whole No. 223
JULY 3, 1926
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REG. U.S. PAT. OFF.

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

Set With a 1-Turn Primary

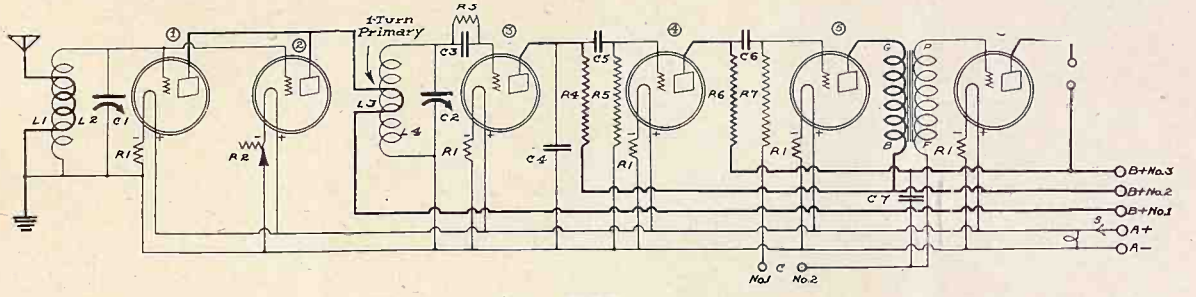

FIG 1.

The circuit design of a receiver using an extra tube for volume and sensitivity control, and featuring a novel primary, L3, which has only one turn. As the secondary, L4, has 60 turns, the ratio, secondary to primary, is 60-to-1. The tube accounts for an amplification of 6, thus giving a total of 360-to-1.

By Herman Bernard

Associate, Institute of Radio Engineers

VOLUME control in the radio frequency channel, rather than in the audio-circuit, being in high favor, it is thoroughly practical to use an extra tube for this. Not only does one get good volume on the set, using five tubes, but where stations otherwise would come in weakly, the volume is increased greatly by cutting in the sixth tube. This is done by turning the rheostat, R2. Aside from that resistance, the set has automatic filament control.

The extra tube idea is a good one, because no additional control is introduced. The volume is at least trebled. The strong output needed for dancing is thus available.

Cutting in the extra tube not only increases volume but adds to the range of the receiver. When the set is operated on a 5-tube basis it is not a distance-getting set, as a rule, but just cut in that sixth tube and you can bring in distant stations clearly and strongly.

LIST OF PARTS

Two radio-frequency transformers, as described (L1L2, L3L4).
Two .00035 mfd. variable condensers, (C1, C2).
Two dials.
Six sockets.
One 30-ohm rheostat (R2).
Five ballast resistors (R1).
One .00025 mfd. fixed grid condenser (C3).
One .001 mfd. fixed condenser (C4).
Two fixed condensers, .01 mfd. or larger (C5, C6).
One fixed condenser, 1.0 mfd.
Four 0.1 meg. resistors (R4, R5, R6, R7).
One 2.0 meg. resistor (grid leak R3).
One battery cable.
Two small hard rubber strips; two binding posts for one strip and two phone tip jacks for the other.
One audio-frequency transformer, PGBF.
One 7x24" panel.
One 8x23" baseboard.
One light switch, S.
One bulb for socket of light switch.

RF and AF Gain

The extra tube heightens the amplification, giving you in fact radio frequency power amplification. Thus the sensitivity increases greatly. The added voltage built up is passed along to the detector input, and as the detector output is the square of the input, the reason for the remarkable increase in volume, plus added sensitivity, is clear. Hence the general rule that radio frequency amplification also causes audio frequency amplification.

The coil novelty in this receiver is that only one turn is used on the primary, L3, of the interstage coupler. This primary must be located at the center of the secondary winding, on top of it, no separation being required.

The small primary at this point results in a receiver that is thoroughly self-balanced, so far as 5-tube operation goes, no trace of a squeal being present even when one tunes in an amateur station below 200 meters. Hence for normal reception of local programs there is ample ease of operation, not only on account of the absence of over-oscillation, but because there are only two tuning controls.

Use of Sixth Tube

When the sixth tube (No. 2 in Fig. 1) is used the set may have a slight tendency toward over-oscillation below 215 meters. This will be true only when the signal frequency input is rather strong from 215 meters down, hence the voltage is too great. Turn off the sixth tube, on such occasions, as the volume on the five tubes will be ample.

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The system is especially good when the signal wave arrives at the antenna in weak condition, for stations barely audible on most 5-tube receivers produce satisfactory speaker volume on the six tubes of this set.

The 1-turn primary, of course, cuts down the energy transfer from the radio-frequency tube, whether it be the single tube or the parallel-operated pair. However, the voltage stepup ratio, secondary to primary, is far greater, being 60-to-1, as compared with the otherwise 15-to-1 or less. Thus there is an adequate supply to the detector input.

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Following the detector, in this order, are two stages of resistance coupling and one stage of transformer coupling audio frequency amplification. This is an excellent hookup for this receiver in particular, as with the sixth tube going, and a moderately strong station being received, the volume is so great that the last tube might have more to handle than is safe for it. Where terrific volume is encountered, a final resistance stage has greater limitations than a final transformer stage. The last stage in any form

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L1L2 consists of a radio-frequency transformer suitable for tuning with the capacity of condenser used for C1. In the laboratory set this condenser was .00035 mfd. A commercial coil may be used here, either with adjustable primary, placed permanently in the position most favorable to loudest signals, or with fixed and non-adjustable primary. The fixed primary method would necessitate fewer turns on L2 than on L4, the corresponding secondary. The coil L1L2 as used in the author's set had a 53-turn secondary, on a 3" diameter, the primary consisting of five turns, wound over the secondary, at the center of the secondary.

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The wire used was No. 20 double cotton covered.

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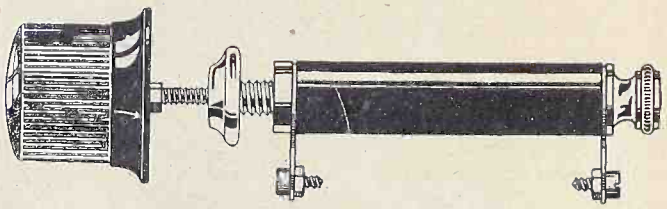

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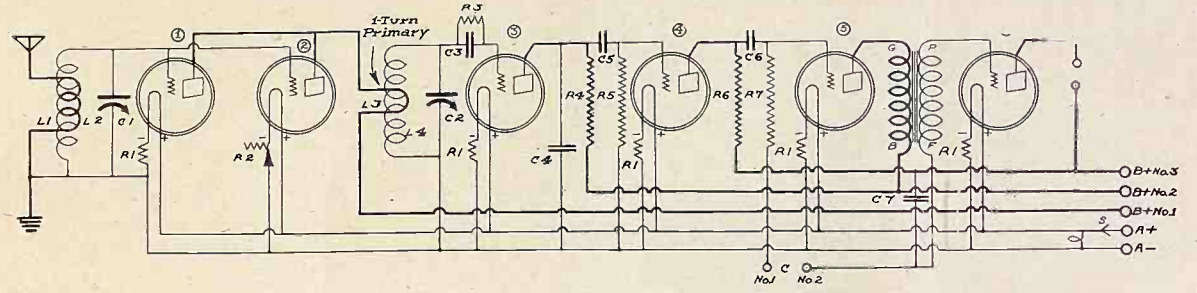

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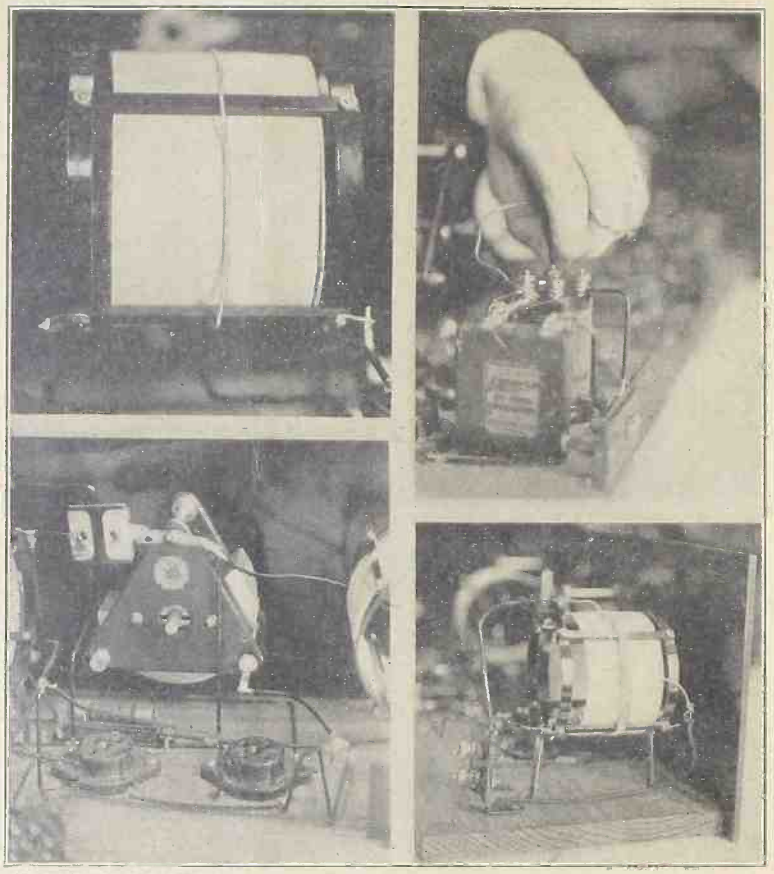
Extra Tube Controls Volume



(Radio World Staff Photos)

FIGS 2, 3, 4 AND 5

The 1-turn primary, L3, of the interstage coupler is shown in its central position atop the secondary. The flexible connection of C plus, from the last audio transformer, the common C minus lead to one side of the 1 mfd. bypass condenser, is illustrated at top, right. Below are depicted the aerial coil and binding posts and the parallel-connected radio frequency tubes. Note how the variable condenser is mounted, also the .001 mfd. bypass condenser, joined to rotor plates and to B plus post of the interstage coil.

of audio must always be a stage of power amplification, never, as with preceding resistance coupling, a voltage amplification stage.

A medium or low ratio transformer should be used. The one in the laboratory set was a Meloformer.

It is a good plan to use a power tube in the last stage, although this is not absolutely necessary. Folk who like tremendous volume will put in a power tube, because it will stand the great load better, while those who desire to increase the volume only on weak signals will use —01A tubes throughout.

The system, however, is equally applicable to other types of tubes, e.g., the 199, 11 etc., except in the audio channel, where the tubes other than —01A or high mu will give only fair results for the resistance stages. Power tubes can not be used to advantage at those points.

This receiver is capable of most delightful quality and has points of undoubted attraction. It is not experimental by any means. It has been giving highly appreciated service for several weeks and its use as a family receiver is most valuable.

In the construction of the receiver it is absolutely necessary to ground the negative filament. Those using battery eliminators therefore will take special pains to connect the ground lead (coming from the cold water pipe) to the ground post of the eliminator, and establish the ground connection to the set from the marked post of the eliminator. A fixed condenser is present in the eliminator, if any danger exists, so that no conductive contact is made between the ground itself and the filaments of the tubes. This is for the well-appreciated reason that in certain types of eliminators, if this precaution is not taken, the lighting main circuit may be closed upon the tube filaments in the receiver through opposite potentials at ground, with consequent disaster to the tubes.

The by-pass condenser, C7, which is 1.0 mfd., also is necessary, as it has a filtering effect upon hissing or muttering interference due to high resistance of batteries when the B block is of lower voltage than it should be. C4 is likewise essential.

On the subject of voltage it is well to emphasize the need of using a high voltage on the plate resistor R4, which is in the detector circuit. This is due to the big voltage drop in the resistor. At 90 volts at one end of the resistor the applied voltage at the plate is about half that, hence it is a good plan to use 90 volts. On strong signals little difference will be noted between 90 and 45 volts, but on weak signals the difference is considerable.

A high B battery voltage on radio frequency amplifying tubes in a tuned radio frequency set is advisable, if the circuit design will permit this without causing over-oscillation troubles. The 1-turn primary enables you to go the limit with the RF plate voltage. One may use 90 with safety, the only reason for not using more being the danger of introducing over-oscillation when the six tubes are used. But at 90 volts you will find a margin of safety whether you use the five tubes or the six. Try more than 90. For B plus No. 3 use 135 volts, with 6 volts or less negative bias.

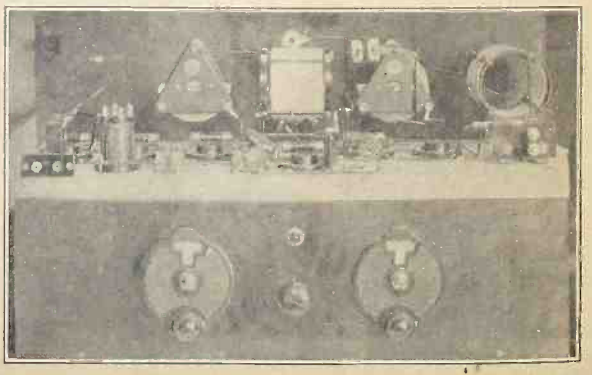
The circuit is good enough to warrant the use of good parts, and only good ones were used in the laboratory model. The variable condensers, C1 and C2, were General Radio Type 247-F. The counterweight was removed, but if it is intended to retain it, be sure to mount the sockets with centers 4¼" back from the edge of the baseboard that will be mounted to the panel. This gives you enough room for motion of the counterweights when the tubes are in the sockets.

The coils used were the Aero coils. The antenna coupler type may be used for L1L2, this being the coil with the adjustable primary. Also, the 1-turn primary on the other coil may be put on with an extra piece of wire, say No. 20 DCC, and the existing primary inside the Aero coupling coil left there.

The coupling condensers and mountings in the audio circuit were Aerovox and the resistors were Arthur H. Lynch's. Klosner sockets were used and a Bruno light switch.

The battery cable was that furnished with the Jones Multi-Plug, this plug system being a very convenient one, especially if one uses metal tags on the battery ends of the cables.

The photographs show the small pieces of hard rubber, mounted to the baseboard for speaker, aerial and ground posts.



(Radio World Staff Photos)

FIGS 6 AND 7

The rear and the panel of the receiver. The output to speaker is through the phone tip jacks at left, hence no panel provision is necessary. The position of the multi-plug and other parts is revealed. The panel shows only the two National dual range variable velvet vernier dials, the rheostat and the Bruno light switch.

Make Your Voice Run Horn

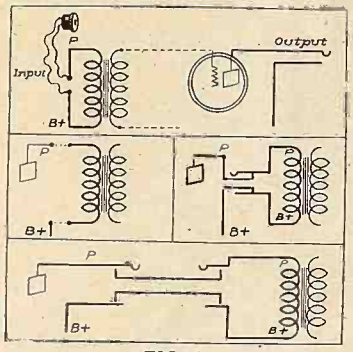
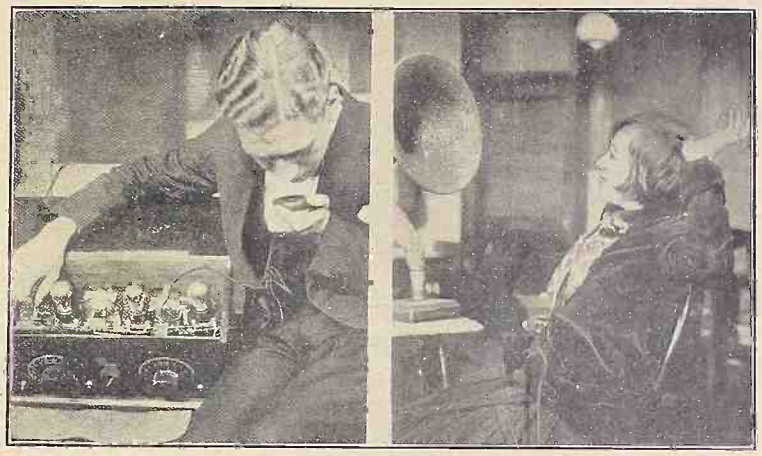


FIG. 1

Diagrams for cutting into the audio channel disconnecting the radio part of the receiver. The bottom hookup affords double utility.



(Radio World Staff Photos) FIGS 2 AND 3

With the earphones plugged into the audio input, hold your mouth close to the phones and speak or sing. If the output is connected to a speaker, preferably in another room, great surprise will be registered if some one in the family hears your voice presumably being broadcast and received by radio.

Various Methods Shown That Enable You to Plug Into the Audio Channel Input, So That, With Only a Pair of Phones as Your Aid, It Is Possible to Surprise Your Family in Another Room—They Will Think Your Voice is Being Broadcast.

IT is extremely handy to be able to plug into your audio frequency amplifier circuit, in any receiver, so that that channel may be used independent of the tuner.

This idea was embodied last September in the Diamond of the Air, in the manner shown in the second strip, at left, in Fig. 1. There are other ways of doing this and they have several interesting uses.

One of the adaptable purposes is the employment of the audio channel in conjunction with some experimental tuner you have constructed. You want to hear how it sounds on the speaker, yet your experimental set has no audio amplifier. Hence you utilize the audio part of your family receiver.

Amplify Your Voice

Another highly interesting purpose is the amplification of your own voice, so that if you put the speaker, say, in some other room, you may surprise members of your family by having your voice come out of the speaker with greatly amplified volume. All you need do is to connect a speaker unit or an earphone to the input of your audio channel, normally the P and B posts of the first audio transformers, or, if resistance or impedance coupled amplification is used, to the corresponding posts thereof. Then speak or sing into the phones, holding them close to your mouth.

The general aim of all hookups for affording individual access to the audio channel is shown in the top strip in Fig. 1. There an earphone is shown connected to the primary of an audio frequency transformer. The dotted lines represent the intermediate stages of audio amplification. The tube depicted is the last one in the audio chain, and from its plate is obtained the output which is fed into the speaker. This is usually done through a single circuit jack, which in the diagram is marked "output."

The Diamond Strips

In the central strip, at left, is the Diamond method, where the plate and B plus detector points are binding posts, next to which are corresponding binding posts that are joined to the P and B posts of the first audio transformer. The under sides of the binding posts are connected to plate, B plus and the transformer primary posts, thus leaving room for joining the pairs of binding posts on top of the sub-panel by means of bus bar, called straps. Each of the two pieces of bus bar is fastened to the binding post simply by turning down the nut. This method is simple and very inexpensive. It requires removal of the straps so that the phones or external tuner output may be connected to the audio channel input. This is quite satisfactory, since the option will not be exercised often, and the few moments' work amounts to next to nothing.

The Reversed Jack

A single circuit jack may be connected in just the opposite to the usual fashion, thus enabling you to use a plug, to which phones or external tuner are connected, to make immediate connection. By carefully studying the diagram at right in the central strip (Fig. 1) you will see that you can not plug in earphones at the detector output by this system of reversely connected double circuit jack, for when the top and bottom leaves of the jack are lifted from the inside contact prongs the connection is to the audio input, not to the detector output.

But both advantages may be enjoyed to fullest extent by using two double circuit jacks, one to plug in the detector output, for normal earphone reception on your family receiver, the other to plug into the audio input, to get your own voice amplified, or that of somebody else whom you want to delight with this novel experience. The correct way to do this is shown in the bottom strip in Fig. 1. Note that the output of the detector tube, which is represented by the symbols at left, is made in the usual way to the outside terminals of the double circuit jack, while the inside springs are connected to the inside springs of the next double circuit jack.

Two Double Circuit Jacks Will Afford Opportunity To Plug Into Detector For Normal Earphone Reception, and to Cut in On the Audio Channel Alone, For a Variety of Purposes—Combination For Input and Output Connections Easily Panel Mounted.

Let us examine the options thus afforded and the method by which this system works.

The Inside Springs

The connection for listening to the family set on earphones is familiar to all, but the connection of the inside springs to another pair of the same kind, in another jack, constitutes the novelty. It is the second jack, the one at right, that is reversely connected. Hence as one jack is obverse, that is, orthodox in its connection, we get output when we plug in, whereas the other jack being the reverse we tap the input.

Look at the outside terminals of the second jack, the one at right. As these are lifted, because of the insertion of the plug, everything preceding is disconnected from the circuit. Likewise, whatever is connected to the plug is fed to the primary of the first audio transformer. Hence we plug in at left to take out and at right to put in. The interconnection of the inside springs simply retains the connection from tuner to amplifier when neither of these two jacks is used. The system is very convenient and flexible and affords panel mounting opportunities that will prove attractive to many.

As for the employment of the audio channel to amplify an already audible de-

(Concluded on page 6)

Tests on the Human Body

(*Radio World Staff Photos*) FIGS. 1 AND 2

The test that determines which ear serves you better. The forefinger of each hand is used alternately to plug up and open up the ears. A marked difference usually is noticeable. One should stand about 20 feet from the speaker and preferably should listen to an orchestra from a strong local.

Easy to Determine Which Ear Affords Better Hearing—Difference Is Very Marked in Majority of Cases — Potentials Simply Distinguished in a Working Receiver Merely by Touching Coils.

AT many points does radio figuratively touch the human body. A long list of experiments, wherein the human body is the principal agency under test, will afford experimenters many hours of happy research work. The results are fascinating and some of them will shed light on phases that have received meagre publicity, if any.

As a starter let us consider just a few of these experiments, with the promise that in days to come there will be more of them.

Do you hear equally well with both ears? You may accept it as foregone that equality of audibility does not exist in your favorite pair of ears, for it is the common experience of mankind to have one anvil that works better than the other.

While the scientific precision of laboratory tests is not your pursuit in this instance, at least you would like to identify the ear that is rendering the better service. This is easy enough.

How to Make Test

Put a forefinger in each of your ears while the loudspeaker is emitting a dance program. Then take away one of the fingers from its bed in your ear. After listening, suddenly restore the withdrawn finger to its former position, at the same time removing the other forefinger from the other ear. Thus you are switching your main hearing of the music from one ear to the other. You are not cutting off the introduction of all sound even to the plugged-up ear, because sound travels through your hands and fingers and through the lobes as well, not to mention its courses right through your body, even from your toes.

The admission to the isolated member, however, may be discounted, as it is less than 10 per cent. and it will not affect the comparative result for which you are striving. Therefore listen carefully to determine by which ear you hear the music better. The test may be made solely on the basis of volume, as the ear that gives you the louder sounds is the one that is better in other respects as well.

The difference between the sensitivity of the ears of any given individual is sufficiently marked to enable him to identify the better performer.

Stand 20 Feet Away

It is not advisable to be so close to the speaker as the photographs would seem to suggest, for these were taken merely to show the procedure, not the relative distance. A good plan is to be about 20 feet, or even more, from the speaker. In practice, if the speaker is at the end of one room, you will stand at the other end.

Another test that concerns anatomical considerations is that pictured in Figs. 3 and 4, where a coil is shown in an operating radio receiver. At left the finger is placed against the top of the secondary, while at right the same finger is moved down to the bottom of the winding.

It will be noticed, when the receiver is in operation, that placing the finger at one extreme point greatly reduces volume, besides detuning the set. And the volume drop can not be overcome by returning. Hence it is obvious that the human body is absorbing radio energy from the coil.

Tell Which Is Which

The secondary is connected with one terminal to grid post of a tube, the other terminal to a battery post, and, if you are unable to trace the connections to distinguish one from the other, due to obscuring by other parts or other reasons, use the finger test, for the terminal that causes the volume drop is connected to grid. The finger when put at the battery terminal of the winding does not reduce the audibility to any noticeable degree.

In the photographs the secondary is the winding with the larger number of turns. The entire coil is a 3-circuit tuner.

The same test for identification of connections may be made on the primary, to discover which goes to aerial and which to ground, and to the tickler coil, to distinguish B plus detector from the plate connection. Always the volume is considerably diminished, sometimes the signal wholly tuned out, when the finger or other part of the human body is contacted with the high potential. This will be grid, plate or aerial terminal. The low potential in these instances would be, in the respective cases, A battery, B battery and ground.

Introduces Losses

The human body is at ground potential. So are the batteries and, of course, the ground lead of the antenna system. Therefore the potential difference set up when the finger is placed at a high potential point is that between extreme high and extreme low potential of the tuning or regenerating system. Such potential clashes always involve losses, and it is well to keep this in mind in wiring up coils in a receiver. The high potentials should be kept as far from each other as possible, while the low potentials may be left to take care of themselves.

Somewhat in line with these tests that affect the human body is the determina-

How to Use Six Stages of Audio Amplification

(*Concluded from page 5*)

livery, as when you or your friends speak into an earphone, or when a phonograph output is put close to the earphone, you can get a lot of real enjoyment that way, even after you have finished the big surprise to which you will treat your family.

Useful For Loud DX

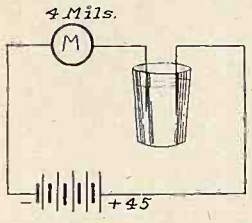
Other uses suggest themselves. If you have another set in the house that has an audio amplifier, and you get a far distant station, but not with sufficient audibility to operate a speaker to your satisfaction, again you can startle your family by hooking up the output of the final audio tube of the receiver that is bringing in the station, and feeding the impulses to the audio channel of the other set, thus making certain that the volume will be great. In that way you will be using at least four stages, and in some instances five or six stages of audio amplification. The advantage of being able to combine all this audio amplification is great indeed when you are anxious to render a very faint signal enjoyably audible.

So much audio amplification is not practical in a standard receiver, because the second or third tube will begin to overload on strong local signals, even if it is a power tube, and it is folly to incorporate more audio when you are stopped by overloading at a previous stage.

However, when a faint impulse is received and the audibility is naturally very low, the same condition of overloading would not begin to set in until, say, the fourth or fifth audio tube is reached, for it is a question of how much voltage is developed, not how many stages are used. A tube will stand only so much voltage without overloading. Hence this peak load may not be reached on DX signals until the fourth, fifth or sixth audio amplification stage.

The voltage referred to is not the A or B battery voltage but the alternating voltage that is supplied to the grid of the tube by the amplifying system ahead of that tube, through the coupling medium, be it transformer, resistor or choke coil. —H. B.

Finger Solves Problems



$\frac{45}{.004} = \frac{45,000}{4} = 11,250$ ohms
(Resistance of tumbler of water)

FIG. 5

The test circuit for determining the resistance of a glass of water at 45 volts. The voltage supply source was a B battery. The meter in the negative leg of the circuit was a milliammeter of 0—20 full scale deflection. The meter registered 4 mils., hence the resistance at 45 volts was 11,250 ohms.

Water You Drink Has High Resistance—Fluid May be Used in Emergency Cases Where Odd Values of Resistance Are Desired—Interesting Field for Experimenters.

tion of the resistance of a tumbler of water, if only for the reason that the human body imbibes so much water, or should, if excellent health is the goal. Who would ever suppose that when he drinks a glass of water he takes into his system 11,250 ohms of resistance at 45 volts? So if you have 45 volts knocking about within your stomach, that is the resistance of the water. As the voltage goes down the resistance goes down, so in point of actual fact the water you drink must be considered in the light of its resistance under electrical load.

If there is voltage in your body, and sometimes there is, although it is relatively small, the resistance of the water will change with the voltage. In the tests pictured in Figs. 5, 6 and 7 a 45-volt B battery was connected with one terminal so that an insulated wire from the maximum voltage terminal was placed in the water in the glass, the other or minus battery terminal being joined to one side of the milliammeter M. By connecting the free terminal of the meter to the water with another lead the circuit was completed.

Effect of Position

Now, the resistance was 11,250 ohms when the leads from meter and positive terminal of the battery were farthest apart. When they were held nearer together the resistance was less, although the voltage input was the same. This decrease was due to the smaller amount of water intervening between wire terminals. It was interesting to watch the milliameter readings change as the wires were placed farthest apart, then drawn nearer to each other. The less current flowing, the lower the reading, the greater the resistance. This is calculable by Ohm's law. The resistance equals the voltage divided by the amperage. The voltage at the source is 45, the drain at a given position of the leads in the water was 4/1,000 of an ampere, known technically as 4 milliamperes, which is commonly abbreviated to 4 mils. The reading often is given in figure form as .004 ampere. Hence 45 volts divided by .004 ampere equals 45,000 divided by 4, hence 11,250. The answer is in ohms, because the problem was in volts and amperes.

The resistance of the meter itself may be ignored.

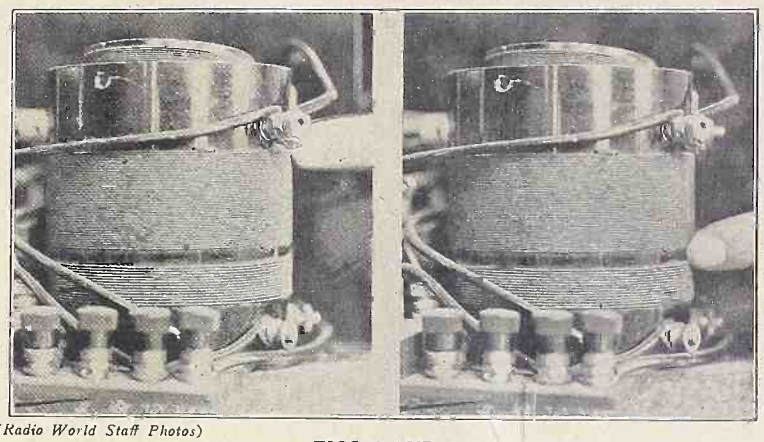
Has Practical Use

The practical value of such determinations is that different values of resistance, if suddenly needed, may be improvised by using sufficient quantity of water and by placing the leads properly. It is advisable to use the milliammeter method of determining the resistance.

You may put your finger in the glass of water, in addition to leaving the leads as shown, and see what effect is obtained. Likewise the resistance of your own body at given voltages may be determined.

Whenever resistance is spoken of it is well to give the voltage at which this resistance exists. The same practice, indeed, might well be used by manufacturers of resistors of any sort.

When resistance alone is stated, in many electrical instances, the voltage is known, though not stated, because a certain voltage is customarily taken for granted. With resistors in radio circuits, however, this can not hold true, because the voltages will differ vastly.—H. B.

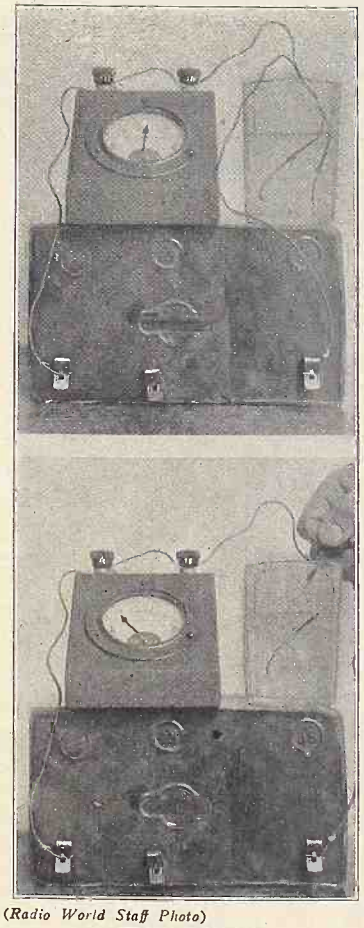


(Radio World Staff Photos)

FIGS. 3 AND 4

At left the finger is against the top terminal of the secondary, while at right it is pressed against the bottom terminal. In this way you can tell which is the grid and which is the battery connection of the secondary. The same test may be applied to the primary and to the tickler. When no volume is lost your finger is at battery lead or ground.

Resistance Varies According to the Voltage, Hence Both Values Should Be Given Where Extreme Accuracy Is Necessary.



(Radio World Staff Photo)

FIGS. 6 AND 7

By moving the leads farther apart the resistance between them, i. e., the amount of water separating them, is increased. Note how the meter shows lesser drain, hence greater resistance.

W. J. GRIMES JOINS WALBERT

W. J. Grimes, for many years manager of the Duluth branch of the Northwestern Electric Equipment Co., of St. Paul, has resigned his position to take over the distribution of Walbert products in Wisconsin, Minnesota, North and South Dakota. Mr. Grimes has sold a lot of radio merchandise in his time. He is confident of great success with the Walbert Isofarad receiver.

CRYSTAL OR TUBE EASILY SWITCHED IN

Fidelity of tone on local stations and volume on DX stations are much wanted by radio fans. To satisfy the desires of these fans, the following wiring description, with data on coils, etc., is given.

The receiver consists of a 1-tube 3-circuit tuner and a crystal detector unit. With the aid of a simple switching arrangement, either one can be placed into the circuit.

The primary of the tuner consists of 10 turns, wound on a tubing 3¼" in diameter, No. 22 double cotton covered wire being used. The secondary, which is wound on the same tubing, with a ¼" separation, consists of 45 turns. The variable condenser which shunts this secondary is of the .0005 mfd. type. If the .00025 mfd. variable type is used, then the number of turns on the secondary should be increased to 65. If a .00035 mfd. variable condenser is to be employed, then the secondary should consist of 55 turns. In all cases the same type of wire is used.

The Tickler Coil

The tickler consists of 36 turns of No. 26 single silk covered wire wound on a tubing 2¾" in diameter. When this is placed inside of the larger 3¼" tubing, the entire secondary winding should be in inductive relation to the tickler. Either the tickler winding may be wound on both sides of a shaft or entirely on one side of the shaft. If wound on both sides, it is better that the windings are equally divided, e.g., 36 turns on complete tickler, 18 on each half. This 36-turn tickler is employed only when the .0005 mfd. variable condenser is used to shunt the secondary. When the .00035 mfd. variable condenser is employed the number of turns on the tickler is increased to 40. The 40 turns may be employed when the .00025 mfd. variable condenser is employed.

As to the method of hooking up the unit. The beginning and the end of the primary are brought to the antenna and the ground posts respectively, while the beginning and the end of the secondary winding are brought to the filament plus and grid condenser-leak combination, respectively. The end of the secondary winding is also brought to the high potential terminal of a fixed or variable crystal detector.

Switch Wiring

The other terminal of this detector is brought to a switch point. Another switch point is brought to the minus post of the B battery. The switch arm is brought to one terminal of the phone tips. The other tip goes to A plus. Across these phone tips shunt a .001 mfd. fixed condenser.

The B connection is a bit different than with most sets, although fundamental. That is, the minus post of the B battery is connected through the phones to the plus of the A battery.

When the crystal is to be used, simply place the arm on the switch point connected with the low potential side of the crystal. When the tube is to be used, place the arm on the switch point connected with the minus post of the B battery.

A rheostat having a resistance of about 10 ohms should be used to control the filament of the tube. It should be connected in series with the negative A battery leg. When the crystal is used diminish the filament. Also turn the tickler at minimum coupling.

Lucky Fans Can Restore Their Burnt-Out Tubes

With a little patience, time, a 4½-volt battery, a couple of lengths of wire and a quiet room, it is possible to repair your burned out tubes.

Connect the battery to the socket so that the current travels to the filament lugs on the socket or in such a way that a good tube would light. Now select a burnt-out tube and put it in the socket. Before doing this, disconnect one of the battery wires from the post. Tap the tube so as to bring the filament terminals together. If you have luck, or a lot of patience, you may succeed in getting the two ends of the burnt-out filament to knit together due to the generated heat welding them. It must be understood that this stunt won't always work. But there is nothing to lose, except a little time, and if you win, you win big!

RESULTS LETTERS

RESULTS EDITOR:

I have built a 4-tube Diamond of the Air, using —99 type tubes, with a —120 type tube in the last audio stage. The results are wonderful. I can tune in station WIL, operating on 273 meters, while station KMOX, using 5,000 watts and operating on 280 meters, is on the air, without the least bit of interference. Other distant stations, such as WBBM, WHO, KDKA, KTHS, KOA, WSMB, KYW, etc., are all tuned in with ease, while the powerful locals are broadcasting. I have built several 5- and 6-tube sets, but none has equaled the Diamond.

LOUIS HOFFMAN, JR.,
5229 Robert Ave.,
St. Louis, Mo.

* * *

RESULTS EDITOR:

Some time ago I made a Diamond of the Air receiver. I shipped it to my mother at Bay City, Tex. Upon hooking it up there, she received an innumerable quantity of stations. It sure is a DX getter. Some of the stations received were: WOK, WGNB, WZBC, WRR, WMBB, KFLF, WDAF, WTAM, KFCZ, WWL, WSM, WLIB, KWKU, KDKA, KFDM, WSAI, KSAI, etc. The dial settings, in each and every case, were the same. In one week, 38 DX stations were received.

H. A. ARCHER,
4055 Ellis Ave.,
Chicago, Ill.

* * *

RESULTS EDITOR:

I have rewired the Diamond of the Air, according to the trouble shooting hints given in the various issues of RADIO WORLD, and the results are gratifying. The selectivity, volume and tone are great. May the RADIO WORLD long live to broadcast the information that all radio fans desire.

W. HIMBLETT,
227 West 135th St.,
New York City.

* * *

RESULTS EDITOR:

I have had wonderful results with the Diamond of the Air. I used —99 type tubes and a power tube in the last audio stage. I have logged stations from all over the country. I wish to take this opportunity to thank Herman Bernard for this hookup. It sure is a credit to him and to RADIO WORLD.

C. A. SCHRUERS,
616 East 5th St.,
Muscatine, Ia.

* * *

RESULTS EDITOR:

I have built the Diamond of the Air and wish to say that wonderful results have been obtained. I have built practically every set described by Herman Bernard and have not failed to obtain maximum results with every one. This Diamond sure is a wonder.

CHARLES H. MOORE,
1538 West Clark St.,
Springfield, O.

RESULTS EDITOR:

Just a word to say that we enjoy reading RADIO WORLD every week. My husband finds that RADIO WORLD meets his needs in every respect to radio building. He has been building sets for the past four years and he is always eager to hear the latest, which is always published in RADIO WORLD. I have built the Superdyne and find it a charm.

MRS. L. W. WARRELL,
1218 East 3rd St.,
Tulsa, Okla.

* * *

RESULTS EDITOR:

I have built Wright's 2-tube reflex as described in the Jan. 31, 1925, issue of RADIO WORLD and have obtained wonderful results. In order to obtain louder signals I have added a stage of transformer coupled audio frequency amplification. The results are remarkable. A C battery, 4.5 volt type, was installed in series with the F minus posts of the added AFT. 90 volts of B battery were placed on the plate of the new audio tube.

C. H. BINGHAM,
Care Sanford & Day Iron Works,
Knoxville, Tenn.

PATENTS GRANTED

1,587-880—Method and Apparatus for radio signaling. Roy Alexander Weagant, New York, assignor, by mesne arrangements, to Radio Corporation of America. Filed Feb. 7, 1919.

1,587,924—Wireless Signaling System. Henry J. Round, London, and Archibald McLellan, Swansea, England, assignors to Radio Corporation of America. Original application filed March 30, 1921.

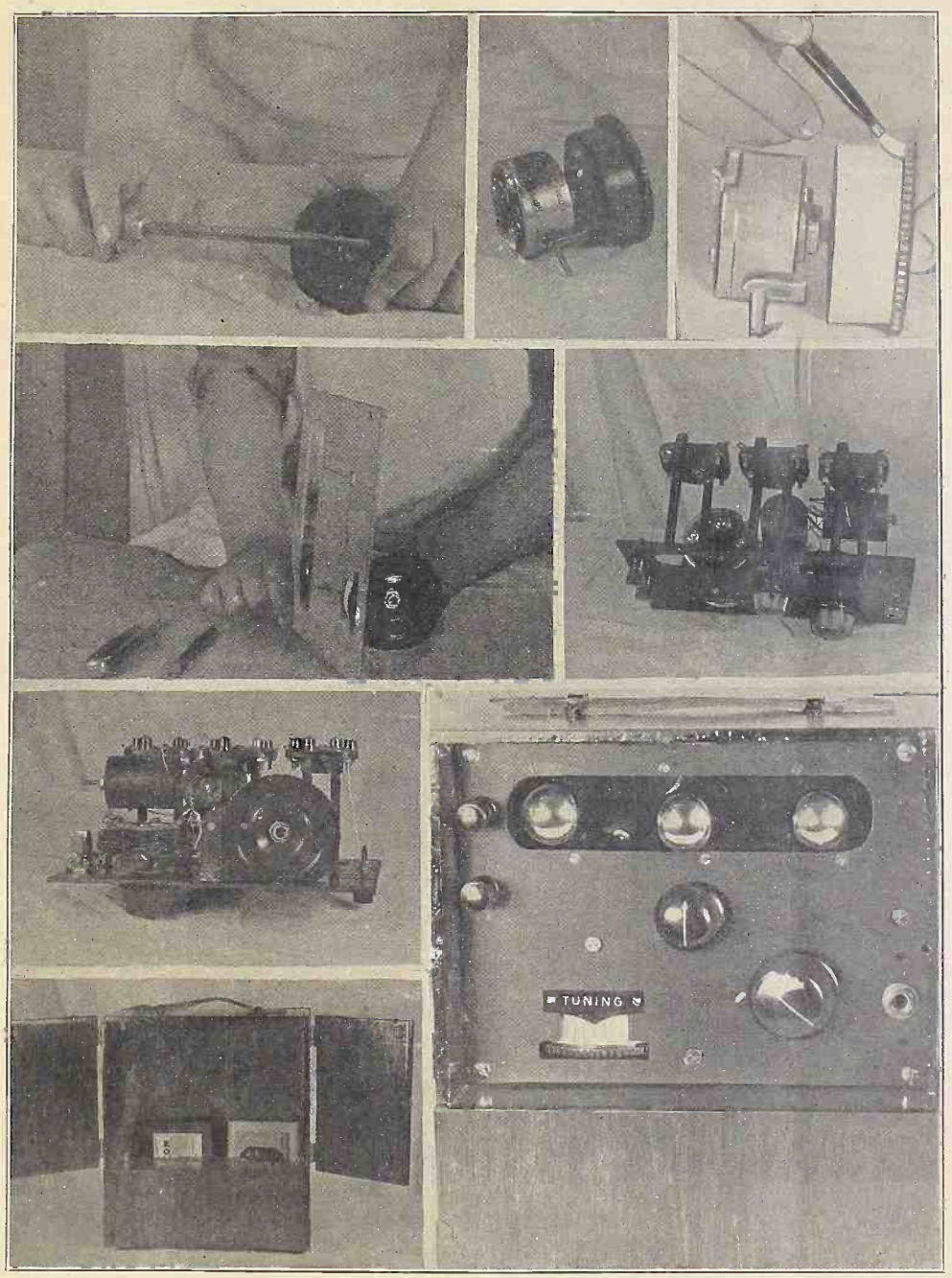
1,587,942—Condenser Structure. William Dubulier, New York, assignor to Dubilier Condenser and Radio Corp. Filed March 7, 1919.

Finkelstein Joins Freshman Sales Force

Sidney E. Finkelstein, who for the past three years directed the sales and advertising departments of the Bruno Radio Corp., has joined the ranks of the Chas. Freshman Co. in the capacity of sales engineer. Immediately after this appointment he left for a tour of the New England States to survey conditions and distribute additional Freshman franchises.

Mr. Finkelstein is well known in the radio field, having traveled throughout the United States, and is well known among radio fans for his valuable technical articles in newspapers and magazines here and abroad.

A Simple Drum-Type Dial



(*Hayden*)

DRUM TYPE dials are due for a great vogue. Using a discarded rheostat, a home-constructor can make such a dial. Take the knob and the resistance wire off. Notch the outer circumference, closely. Attach the center of the variable condenser to the center hole of the rheostat form. A holding nut is used. Paint the complete rheostat form white, so as to make it outstanding on the panel. These operations are shown in the photos on top, from left to right. Now with the aid of a bracket on the side of the condenser, (second photo from top, left) mount the dial on the panel. The dial protrudes through a small cutout on the panel, resembling a straw hat (lower right-hand photo). The condenser is mounted at right angles to the usual fashion. A rear view of the 3-tube set, using such a dial, is shown in the center photo, to the right. The bottom of the set and the cabinet rear and front are shown in the other pictures.

A 7x24" Cabinet Portable

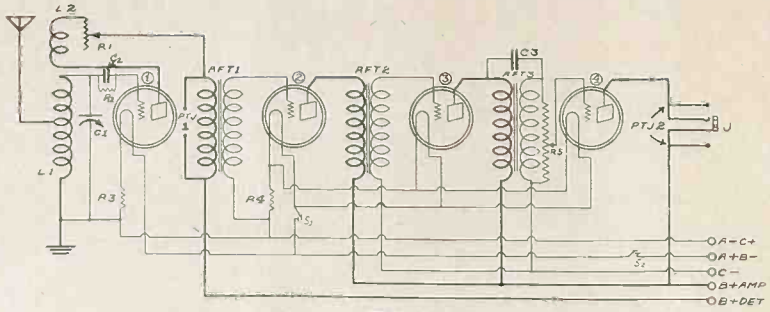


FIG. 1

The circuit diagram of the special 4-tube portable.

By Charles Fels

MANY subscribers have written to the Technical Department of RADIO WORLD, asking for a one major control 4-tube portable receiver, employing a regenerative detector and three stages of transformer coupled AF, so designed that it may be used as a portable. The circuit diagram is shown in Fig. 1.

There are quite a few novelties in the circuit, as well as in the mechanical construction. The resistance method of controlling regeneration is used. This it was found, gave ease and simplicity of control over the tickler. Although the rotary coil method is very satisfactory, it requires a bit more attention than the resistance manner. The receiver, it will be noted, is specifically a 1-major control type, the resistance playing a very small part as actual control, except to vary the strength of the signals. Another thing to be noted is the special tuning coil, there being a primary and secondary coil wound as a continuous winding, the plate winding being on the same tubing.

May Use Old Coil

An old 3-circuit tuning coil may be used also, if desired. Of course, the number of turns will have to be changed according to specifications to be found later in the text.

Three stages of audio frequency amplification have always been known to cause trouble, except when very low ratio AFT were used. However, with proper by-passing, etc., and a resistance shunted across the secondary winding of the last AFT, the howls and noises are killed. The main cause of this successful amplification is due to the use of the -99 tubes. The volume, when using the trouble eliminators, will not be decreased to an appreciable extent. That is, the extra stage of AF coupling will increase the volume and not vice versa, even though the noises are eliminated.

Two filament switches are used, one being in series with the A plus lead of the AF tubes and the other in series with the A plus lead of the detector tube.

With the aid of phone tip jacks shunted across the primary winding of the AFT, it is possible to listen to the signals at the output of the detector circuit, the filaments of the AF tubes being turned off with the switches, etc. In this way DX can be tuned in on the phones and then placed on the speaker.

Tapping the Coil

L1, the continuous winding, consists of 50 turns of No. 22 double cotton covered wire, wound on a tubing 3¼" in diameter. It is tapped at the 8th turn. L2, the plate winding, is as said before, wound on the same tubing, ¼" away from the end of the winding which is brought to the grid post. This winding consists of 30 turns of No. 26 single silk covered wire. This plate winding may also be wound on a tubing 2¾" in diameter and placed parallel inside of the larger tubing to the grid portion of the winding. When this size tubing is used, 36 turns will have to be wound, the same size wire being used.

The grid winding contains that many turns, that when shunted by a .0005 mfd. variable condenser, C1, the entire wave-band will be covered, provided a 100-foot antenna, lead in and 10-foot ground lead in are employed.

Other Data

C2 and R2, the grid condenser and leak, are of the .00025 and 2 megohm type. The filament of the detector tube is controlled by a 4-V199 Amperite. The filaments of the AF tubes are controlled by a 6-ohm resistance, this being the resistance wire of an old rheostat fixed at a certain position, determined by experimentation. C3 is a .001 mfd. fixed condenser. R5 is a 500,000-ohm potentiometer. R1 is a 2,-000-ohm potentiometer.

A 7x24" panel and cabinet are used to house the receiver. The set itself is built on a 7x12" panel, the extra 12" of space being used for the housing of the batteries and phones. An 8" portion is left at one side for the batteries and a 4" portion is left at the other side for the mounting of the midget speaker.

Mounting Directions

The condenser is placed at the left hand side about 2" from this edge and 3½" from the top and the bottom, with the plate resistance control in the same line and 2" from the right hand side. The two switches are mounted on the left and right hand sides respectively, with the jack in the center. The phone tip jacks are mounted at the right side, they being equally spaced and extending down the whole side of the panel or two close together, much space left and two more tips placed, etc. The portion left for the speaker and batteries is not cut out of the panel, it being placed as if the complete panel were being used. Where the throat of the speaker will appear, a hole is drilled with a scroll saw. This may be covered with some silkaleen or thin muslin.

Internally, however, the partitions for the set, speaker and the batteries are made. These can be made either with pieces of hard rubber, or thin wood, angle brackets being the means of support. A carrying case strap may be used instead of a handle, permanently installed on top of the cabinet.

The coil is not placed directly in back of the condenser but in back of the plate resistance. In back of this material the four sockets and transformers are mounted.

The set is very simple to wire. The only special precaution necessary is in the wiring of the coil. The beginning of the winding, L1, is brought to the ground post. The tapped portion is brought to the antenna post. The end of this winding is brought to the grid post of the first socket. It will be noted that 42 turns of the winding are in the grid circuit, this being the same as a secondary winding. Be sure that the antenna and the grid are kept together.

Three 4.5 volt C batteries are used to light the filaments of the tubes. Another 4.5 volt battery is used as a C battery. The detector plate voltage is 45, while the amplifier plate voltage is 67.5.

Two New York Stations Bought By a Clothier

George & Granadi, formerly clothiers at 11 West Thirty-fourth Street, New York City, have entered the commercial broadcasting field by purchasing station WFBH atop the Hotel Majestic, and station WRW, Tarrytown. It was announced that they would enable WFBH to operate throughout the day, instead of on a part-time basis, with the Tarrytown transmitter. In the past these two stations, both operating on the 273-meter wavelength, have divided the time on the air.

George Sulzbach, under whose direction WFBH will be operated, said that the station would solicit advertising accounts and would endeavor to be on the air from morning until late at night. He announced that Lewis Reid, formerly announcer at WJZ, would be in charge of the programs and Walter Neff, formerly of WMSG, would be studio manager.

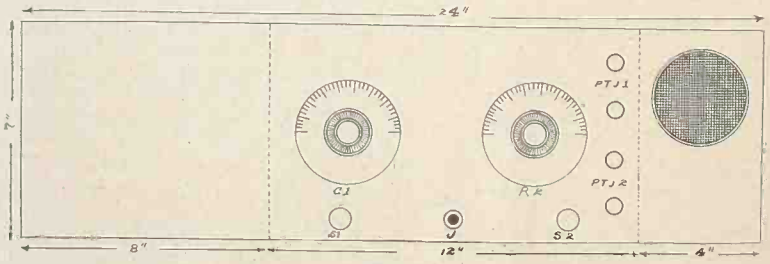
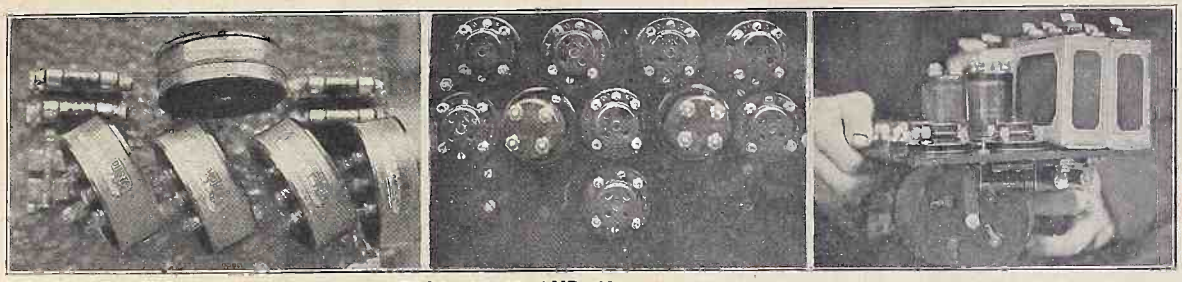


FIG. 2

The panel arrangement. The dotted lines indicate the positions of the partitions. The dials on the shafts of the variable condenser and resistance control are of the 3½" type. R2 indicates the regeneration control, not the grid leak. The screen is of silk and is at the speaker bell.

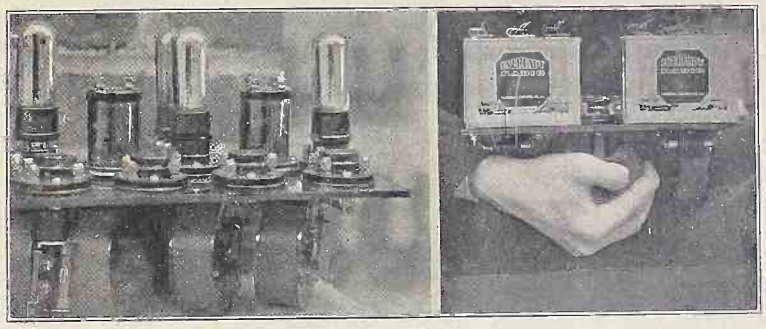
The Victoreen Portable



(Radio World Staff Photos) FIGS. 11, 12 AND 13.

The bottom view depicts the mounting of the four No. 171 Victoreen transformers and, at top, the No. 150 coupling coil (oscillator). The other photographs show the top view of the sub-panel and an angular side view.

How to Construct the Sub-Panel on a 7x9 3-4 Inch Space, Including the Mounting of the Five Victoreen Coils, the Two Audio Transformers, the Four No. 4V-199 Amperites, the Two Grid Condensers and the Two Lynch Leaks.



(Radio World Staff Photos) FIGS. 14 AND 15.

The front view of the sub-panel is shown with the four No. 171 transformers at bottom and the sockets and audio transformers on top. At back the four A batteries are placed as shown at right. They are banked in pairs.

AFTER the 1½x⅜" hinges are put on, and the catches to keep the door closed, the handle is placed on in center of the top. This handle is purchasable in a hardware store, as are the hinges and hook catches. The hooks require two screws each, one as pivot, the other as anchor.

The Pegs for the Loop

On the door are placed four pegs, one at each of the inside corners, but not so near the extreme corners as to prevent the door from closing. These pegs consist each of 1¼" 6/32 bolts, a ¾" wooden bushing ½" diameter with an open center or core, just big enough to pass the bolt, a 1" diameter fiber washer, and a 6/32 small nut. Get enough for four such units and mount the pegs so that a loop may be wound around them. Use No. 22 double cotton covered wire for winding the loop. You can conveniently wind about ¼ lb. of this wire on the 8½x10½" frame. If you are handicapped, repeat the pegging process about 2" in from the original pegs and continue the winding there. The loop question will be discussed in detail in a subsequent installment.

The burden of endeavor falls mostly upon the sub-panel in the construction of the Victoreen Portable. This sub-panel is 7x9¾", which is conveniently made by shaving down a 7x10" stock size hard rubber or other panel. In some instances the 7x10" size may be used as is, because the case may afford room for inserting a sub-panel of that size, but in the case I used the ¾" had to be taken off. This may be done with a file or with a jack knife or with both. The work takes only a few minutes.

The top of the sub-panel houses the eight Na-ald sockets and the two audio transformers. Four sockets are lined up at front, with centers 1¼" back, and are spaced with centers 2½" apart.

The next row has five objects, these consisting of three sockets and the two audio transformers. All sockets so far discussed are mounted with their F posts to the rear. The two audio transformers have their primaries to the rear. The only other thing to mount on the sub-panel is the eighth socket. This is for the oscillator and it is located at center, 5" back, with F posts toward the front.

A view of the resulting layout is shown in one of the accompanying photographs.

Bolts and Nuts Used

The sockets and audio transformers are mounted by means of 1" bolts of the 6/32 size, with nuts to match, the screw heads being on top and the tails and nuts below the sub-panel. The excess length of the bolt may be broken off by bending with pliers, or may be cut off with a strong pair of wire-cutting shears or nippers.

All the four Amperites are mounted in the same fashion, with bolts and nuts run through the central hole of the mounting. The Amperites are placed lengthwise on the bottom of the sub-panel.

The 45° angle is used for mounting the four intermediate transformers, in respect to the front edge of the sub-panel. Again nuts and bolts of the same variety as heretofore are used. Hence it is advisable to purchase a couple of dozen of each of these nuts and bolts.

The Intermediate Coils

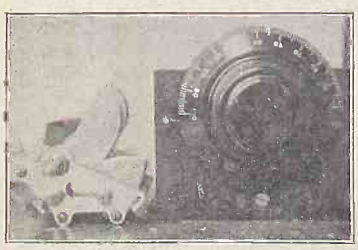
In the case of the intermediate frequency transformers the mounting holes are located in front of where the inductances will be placed, although a little to one side. The four holes are in alignment, 1⅞" back and respectively 1½, 3¾, 6⅛ and 8⅛" from the right-hand side of the sub-panel. If you hold the sub-panel upside down, that is, looking at the bottom, with the uninterrupted row of sockets at the back, the dimensions still are measured from right, for what was the front when you had the sub-panel in its natural position, with sockets, etc., on top, is now the back. The photographs illuminate this layout.

A different angular position is used for the oscillator coil. This is mounted with the coil toward the other coils, and with the four coil binding posts on the opposite side to the binding posts on the intermediate transformers. The mounting hole for the brass angle that supports the oscillator coil is 1¼" back and centrally located.

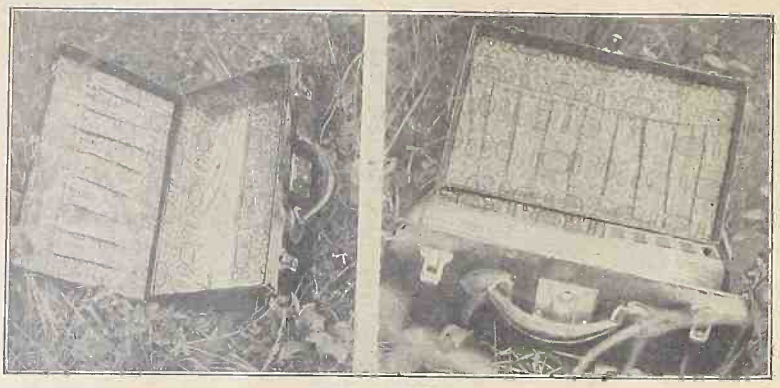
The Amperites are mounted to left and to right of the oscillator coil, which is parallel with the sub-panel back edge. A pair of Amperites is on each side.

The grid leak-condenser combination for the modulator is mounted on the bottom of the sub-panel, in the open space between the right-hand coil and the sub-panel side, with the sub-panel held with Amperites nearer you. The other grid leak condenser combination is mounted on the last intermediate frequency coil, extreme left, being fastened onto the G post thereof. The condenser is mounted first and the 5 meg. Arthur H. Lynch resistor is pressed between the clips with which the grid condenser is provided.—H. B.

WHAT'S WRONG WITH THIS?



Trouble-Shooting for The Light 5 Portable



FIGS. 8 AND 9.

AT LEFT is shown the battery supporting board in the week-end carrying case. The photograph at right shows an upright auxiliary support, helpful, but not necessary. In the case described by the author there is no room for this lateral support. The sub-panel takes its place.

[*The construction of this receiver was described in the June 12, 19 and 26 issues of* RADIO WORLD.]

IF trouble is encountered in oscillation control, an extra resistance, say of 10 ohms, may be placed between the filament side of the rheostat and the lead that goes to the filament posts. This heightens the control by affecting the filament emission.

Should the over-oscillatory action be due to magnetic coupling, the defect would not be curable by the filament method, and it would be advisable to shift the position of L2L3, the coil mounted on the back of the middle condenser. This position should be one approximately at right angles to the third coil, L4L5, with the axis of the central coil passing through the central diameter of the other one, the idea being carried out on the basis of an imaginary line.

If these suggestions do not prove sufficiently effective, pay strict attention to the wavelength at which over-oscillation begins. If it is around 315 meters or below that, one may remove a turn from the primary L2, and if some improvement is noted, but not enough, the same removal remedy may be applied to the primary L4.

May Remove Two Turns

In fact, due to the location of the primary at the center of the secondary winding, it is safe to take off even two turns from each of the specified primaries, but the removal of the second turn should not be made until after an adequate test upon removal of the first turn. Hence, suppose one turn is taken off L2 and the over-oscillation point is shifted from 315 to 310 meters. Here is evidence that you are on the right track, but it is a good time to readjust the relative position of the central transformer, L2L3, in respect to L4L5. Without altering the primary of either any more, the cure may be effected. If not, you have your choice of taking another turn off L2, which is advisable under the specified conditions of improvement, and later, if necessary, taking a turn off L4, making a total of three turns removed, two from L2 and one from L4.

If it is possible to identify the tube that is over-oscillating, then take turns off the primary that is connected to the plate of that tube.

In conjunction with these tests lower the filament voltage, as on the shorter waves the set may work better with less than the required 3½ filament volts.

Tuning Hints

As for synchronized tuning, while this is not exactly within the scope of trouble, it may be assumed that C1 will not tune like C2 and C3. The aerial circuit tuning condenser should not be tampered with in an attempt to make its readings correspond with those of C2 and C3, which will read alike, anyway. In few circuits, no matter what hookup is used, does the aerial circuit tune exactly like the others, due to the antenna-ground capacity and the additional capacity effect of coupling between primary and secondary. In the present set the antenna coil is of the impedance variety, however, and it is tapped only so that the broadcast range may be covered, that is, the wavelengths from 200 to 550 meters.

Needs Only One Tap

The coil using all of L1, without the tap, will enable you to tune from the highest wavelength down to about 350 meters, hence the tap is to be located at that point which will enable you to tune from somewhere above 350 meters to around 200 meters. If you find that with the tap switch S1 "on," which means the short-circuiting of the lower part of the coil, at the ground end, you do not get down low enough with the tap at the 18th turn, then put the tap at the 20th or 22nd turn of this coil, counting from the ground end. Actually, either end may be selected, but the relative position of the coil terminal is determined by the method of connection, hence join the ground to the switch and to the terminal of the winding that is nearer the tap. If you discover that under your special conditions the 18th turn does not start you off on your new dial readings above 350 meters, then use a tap at the 15th turn, instead. In any event, only one tap is needed, and while the 18th turn is sound advice for general conditions, special cases may require the location of the tap at some other point.

If you get signals with poor volume, be specially careful to see whether the C battery is properly connected. Sometimes an experimenter will connect C minus to A minus, instead of joining C plus to A minus. Then next to no volume results and the distortion is excessive, both due to the positive bias on the grid. This robs the audio channel of all its amplifying power and gives you volume equal only to the detector, if that, and a most wretched kind of reception, too.

For scratching noises, rasping sounds, sudden rising and falling of signal intensity, total but temporary disappearance of signals and static-like sputters, look over your set for loose, infirm or absent connections. Sometimes in soldering one is deceived into thinking he has made a good joint, but in fact he has simply united one wire to another by means of flux, while the solder is innocent of any interconnection between the two units. It is wise to put some physical tension on a supposedly well-soldered joint to see whether the joint is easily rent. If it is, you have located one source of trouble.

Mushiness in voice and music may be due to incorrect polarity of the speaker connections, hence reverse these, by putting to the plate the cord tip that formerly connected to B plus, and putting the erstwhile plate tip to B plus.

Be sure that the tube terminals contact securely with the socket prongs.—H. B.

Radio Connects Windfall to Man Missing 15 Years

MONTREAL.

A locomotive fireman in the employ of the Baltimore & Ohio, left the service after withdrawing his savings account, but leaving some dividends earned but not then due. Endeavors were made by the bank to find him. The search continued from June, 1911, until this year, when it was learned that he had at some time or another gone to Western Canada in connection with some land enterprise. It was then that the Radio Department of the Canadian National Railways was asked to aid in the search and, accordingly, a message was broadcast from the five western stations. Afterwards, word was received regarding the former fireman and eventually he was located in Montibello, California, as a result of information given by a friend who had listened in when the message was being broadcast.

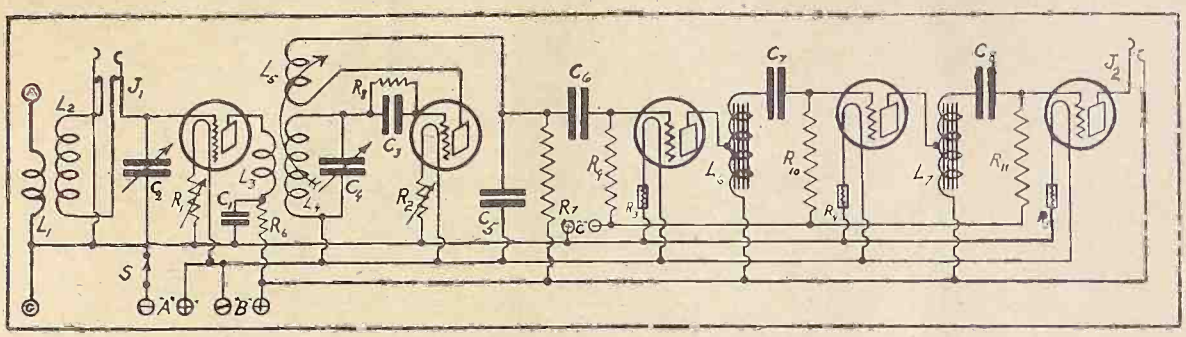
The amount to the credit for the fireman had practically doubled itself in the fifteen years.

Cardboard Diaphragm Helps Dispel Rattling

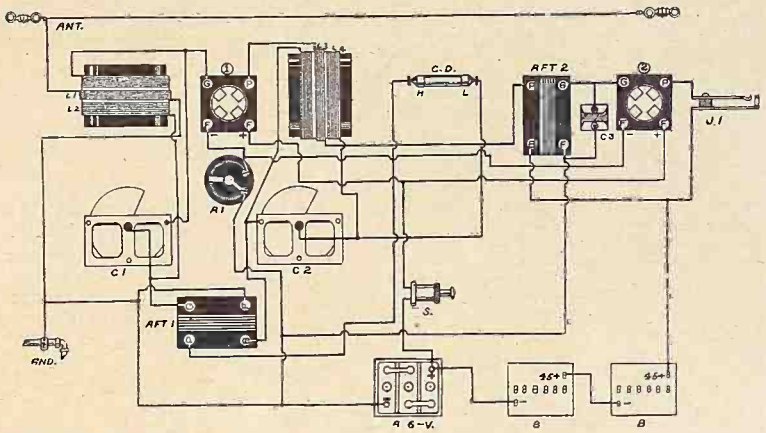
When units which employ a mica diaphragm are connected to the output of a set, which is delivering a tremendous amount of volume causing raspiness, etc., a thin piece of cardboard may be substituted for the mica, with gratifying results.

Remove the mica, by unsoldering the washer which usually holds the diaphragm in place. Place the cardboard in its proper position the cardboard having a pin hole in the center. Solder the washer back again. In this way the harshness previously present will disappear. Adjust the cardboard diaphragm so that the tension between the diaphragm and the tongue between the magnets is strong. Cardboard with a thickness of 1/32" to 1/16" has proven satisfactory.

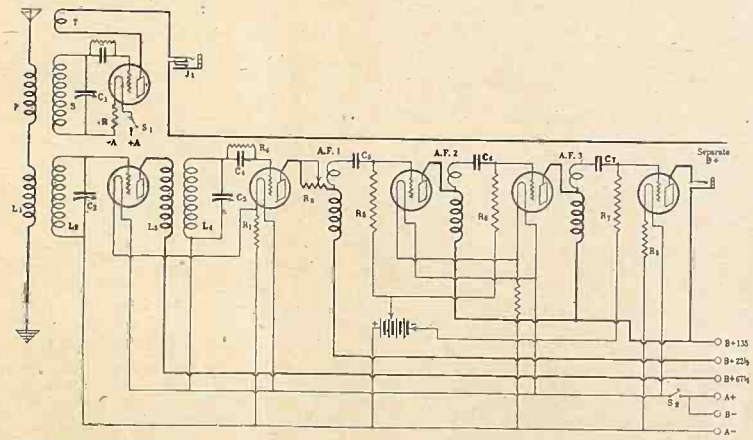
Six Substantial Circuits



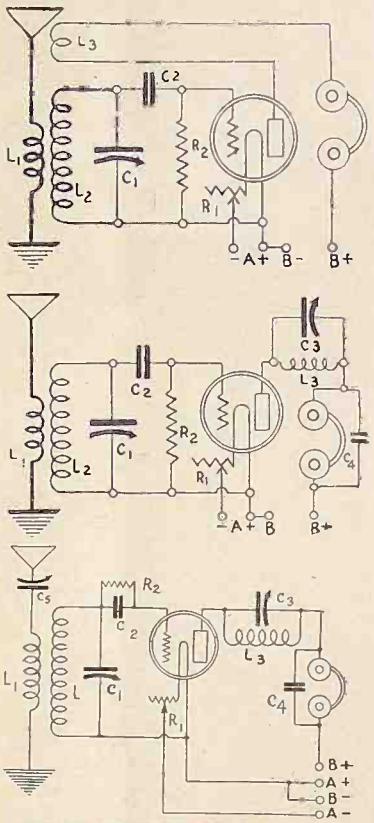
ABOVE IS the electrical wiring diagram of the Quality Receiver, described by J. E. Anderson in the Jan. 16, 1925, issue of RADIO WORLD. A tuned stage of radio frequency amplification followed by a regenerative detector, a stage of resistance coupled and two stages of autotransformer coupled AF amplification are employed. One B voltage is used, the different voltages for the RF and the detector tubes being obtained through the use of the resistances, R6 and R7. A loop can be used with great success. The filaments of the RF and the detector tubes are controlled by rheostats, while the filaments of the AF tubes are controlled by ballasts. With the special system of bypassing in the RF and detector circuits, excellent control of the oscillatory action of the tubes is obtainable.



THE PICTURE diagram of the old-type Harkeness reflex receiver. Complete data on this set were given in the Radio University columns of the May 15, 1926, issue of RADIO WORLD. The signals obtainable with this set are very loud, although not distorted, the crystal detector accounting for that action. Although a 6-volt storage battery is shown, indicating the use of the —01A type tubes, good results may be obtained, if the —99 type is used, the B voltage being kept the same.



THE ELECTRICAL diagram of a 5-tube receiver, employing a stage of tuned radio frequency amplification, a regenerative detector and three stages of auto-transformer AF coupling and the Rider trap circuit. The set was described in detail by Capt. P. V. O'Rourke in the Jan. 30 issue of RADIO WORLD. The data on this receiver should prove of great interest to fans located close to stations employing high power. A very novel feature of this set is that the trap unit can be employed as an individual 1-tube set.



THE CIRCUIT DIAGRAMS of three very popular regenerative hookups. The one at the top is similar to the trap unit employed in the receiver to the lower left, except that the grid leak is connected in shunt to the grid circuit, instead of to the condenser. The next two diagrams are fundamentally similar also, the grid and the antenna connections being different. In the bottom diagram we have a variable condenser in series with the antena, which acts as a tuner of the antenna, resulting in great signal strength. Rheostats control the filaments, in each of these circuits. L3, in the lower diagrams, consists of 35 turns of No. 22 DCC wire on a 3" diameter, C3 being .00035.

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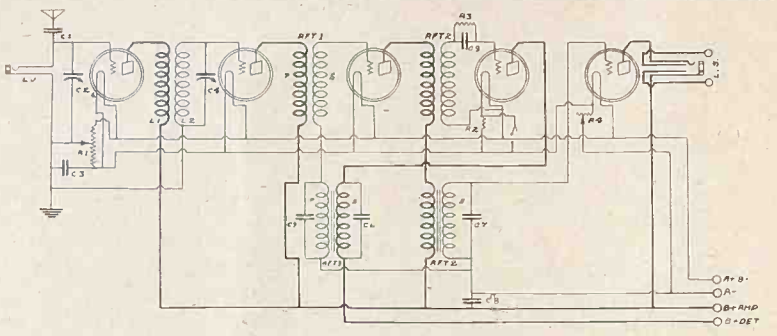


FIG. 356
The electrical diagram of the D-17, using a tube as a detector.

PLEASE GIVE the electrical diagram of the De Forest D-17 Reflex Loop Set, with constants. I wish to use a tube as a detector, instead of a crystal.—Charles Marles, College Point, Staten Island, N. Y.

The complete diagram is shown in Fig. 356. C1 is a .0001 mfd. fixed condenser. LJ is the loop jack of the single circuit type. Although the antenna and the ground appear as if they are connected when the loop is in the circuit, it is not a permanent feature of the set, at this stage. However, for louder signals, the antenna and the ground may be employed. C2 and C4 are .0005 mfd. variable condensers. C3 is a .0004 mfd. fixed condenser. C5, C6 and C7 are .0001 mfd. fixed condensers. C9 is a .00025 mfd. fixed condenser. C8 is a .002 mfd. fixed condenser. R1 is a 400 ohm potentiometer. R3 is a 2-megohm grid leak. R4 is a 15-ohm rheostat. R2 is a 10-ohm ballast resistance. L1, the primary of the tuned radio frequency transformer, consists of 10 turns wound on a tubing 3" in diameter with No. 22 double cotton wire. L2, the secondary, is wound on this same tubing, next to the primary, with a ¼" separation between the windings. This winding consists of 50 turns. No. 24 double cotton covered wire, may also be employed, the number of turns remaining the same. The first audio frequency transformer, marked AFT1, is of the low ratio variety, while AFT2 is of a higher ratio variety, or both may be low ratio. The fixed radio frequency transformers, RFT1 and 2, are such that cover the entire wavelength. An iron core, placed in the center of the primary and the secondary windings, allows the broadness of wavelength range. A novel arrangement is that of the speaker and phones. The headphones and the speaker terminals may both be connected to their respective posts, which are marked. That is, the plug containing the terminals of the phones is inserted in the jack, while the terminals from the speaker are attached to the tips. When the plug is inserted, the speaker is automatically disconnected. When the plug is taken out, the speaker is connected in the circuit. In this way, a distant station can be tuned in on the phones and then placed on the speaker, without changing any plugs, etc. When different plugs are inserted, etc., the capacity of these are usually different. This changes the dial settings of the station already tuned in and causes it to be lost, by the time the speaker is plugged in. Most times the DX station is obtained by very fine tuning, the least jarring of the set causing the dial to move, with resultant loss of the station. This is also prevented, as the plug has only to be removed just enough to break the connection, allowing the speaker to be connected. That is, its removal from the set is unnecessary. If storage tubes are to be used, throughout, then the ballast resistance, R2, is shorted out of the circuit, with the aid of the switch. If a dry cell tube is used as a detector, this short is broken. This decreases the amount of filament voltage applied to the filament. However, if dry cell tubes are employed throughout the set, this same resistance is again shorted or put out of the circuit. In this case only the number of cells necessary to light the filaments of the tubes is necessary. If more cells are employed, it will be found necessary to again employ the resistance. Otherwise the tube will blow. The radio frequency transformers should be absolutely shielded from the rest of the receiver. The cores of this audio frequency transformers should be grounded. The shield of the RFT should be brought to this terminal also. From 22½ to 45 volts will suffice as the B voltage for the detector tube, while for the amplifier tubes, as much as 90 volts may be found to be necessary. The potentiometer has a great deal to do with the volume control of the receiver. Great pains, therefore, should be taken to see that this is installed properly.

* * *

I WOULD like to have the electrical diagram of a regenerative single tube receiver, employing a condenser to tune the plate. I wish to use this set for the regular broadcast waves from 200 to 550 meters and for amateur waves from 140 to 200 meters. A complete wiring description, including the coil data, etc., is desired.—Maxwell James, Burlington, Pa.

Fig. 357 gives the wiring diagram of such a receiver. A tapped secondary and a tapped plate winding are employed to obtain long and short wave flexibility. The primary, L1, of the antenna coil, consists of 10 turns wound on a tubing 3" in diameter. The secondary is wound on this same tubing and separated ¼" therefrom. It consists of 60 turns, tapped at the 25th turn. A .00035 mfd. variable condenser is used to tune this secondary winding. No. 20 double cotton covered wire is employed. The plate coil consists of 40 turns of No. 26 enameled or single silk covered wire, wound on a tubing 2¾" in diameter. This is tapped at the 20th turn. A .00025 mfd. variable condenser is used to shunt this winding. The standard grid leak-condenser combination is used, e.g., .00025 mfd. grid condenser and 2 megohm grid leak. At the low wave lengths it may prove advisable to increase the value of the grid leak to about 6 or probably 9 megohms. A variable grid leak therefore would suit the bill. A 10-ohm rheostat should be used

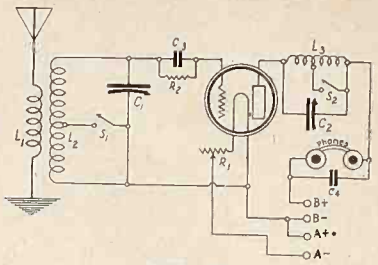


FIG. 357
The electrical diagram of the 1-tube short and long wave set.

to control the filament action of the tube, which is fairly critical. A .001 mfd. fixed condenser is used to shunt the phones, for by-pass action. As to the actual wiring of this set, the beginning of the primary winding of the antenna coil is brought to the antenna post. The end of this winding is brought to the ground post. The beginning of the secondary winding is brought to an arm of a tap switch and to the rotary plate connection of the .00035 mfd. variable condenser. The tapped portion of this coil is brought to a tap point of the switch. The end of this winding is brought to the stationary plate connection of the condsenser and to one terminal of the grid leak-condenser combination. The other terminal of this combination is brought to the grid post of the socket. The plate post of this socket is brought to the beginning of the plate coil winding and to the stationary plate connection of the smaller capacity variable condenser. The rotary plate connection is brought to the end of this plate winding and to one phone tip or binding post. It also is brought to one terminal of the .001 mfd. fixed condenser. The other tip or binding post of the phones is brought to the other terminal of the fixed condenser just employed and to the B plus terminal on the strip. The tap on the plate coil is brought to a tap point, while the switch arm is brought to the rotary plate connection of the .00025 mfd. variable condenser. The rotary plate connection of the .00035 mfd. variable condenser is brought to the F plus post on the socket. This same terminal is also brought to the A plus B minus terminal on the strip. The resistance wire of the rheostat is brought to the F minus post of the socket. The movable arm of this rheostat is brought to the A minus post on the strip. When tuning in on the broadcast wavelengths it is necessary to leave the switches opened. For short wave work the switches are closed. If it is found that on the short waves the tube does not oscillate freely enough, a radio frequency choke coil, consisting of 100 turns of No. 30 enameled wire, wound on a tubing 1" in diameter, should be inserted in series with the end of the plate winding and the rotary plate connection of the .00025 mfd. variable condenser. No difficulty should be encountered in getting the tube to oscillate at the broadcast frequencies. A few turns addition to the plate coil will cure any such trouble. When this is done, then the position of the tapped portion should be shifted accordingly. That is if two turns are added, then the tap should be shifted down another turn, etc. For best results it is advisable to use —01A type tubes, although the smaller type will work satisfactorily. About 45 volts are all that should be placed on the plate of this tube. This voltage is variable and is dependent upon the oscillatory action of the tube, a higher or lower voltage being probably necessary.

* * *

I HAVE a high and a low ratio audio frequency transformer, which I would like to use in a receiver, employing two stages of tuned radio frequency amplification, a detector and two stages of audio frequency amplification, wherein no more than three tubes are used. I understand

the necessary reflexing is difficult, but I like to experiment. The complete circuit diagram, coil, condenser data, etc., and wiring description are desired.—Joseph Atlass, 1022 Faile St., New York City.

A diagram of this receiver is shown in Fig. 358. This receiver is tricky, requiring the utmost care in construction. The primaries of the RFT consist of 10 turns each, wound on a spider weave form, having a 1½" hub. Nine slabs, 1" wide at the widest point and ½" wide at the narrowest point, 2" long, are employed. The secondaries consist of 50 turns. No. 24 single silk covered wire is used. The primary wire is wound near the hub. Three RFT are employed. The variable condensers that shunt the secondaries are of the .00035 mfd. type, and known as C1, C2 and C3. The primaries of the RFT are respectively L1, L3 and L5, while the secondaries are L2, L4 and L6. C5 is a .001 mfd. fixed condenser. C6 is also a .001 mfd. fixed condenser. A .00025 mfd. grid condenser and 2-megohm grid leak are used. A ½ ampere ballast resistor is employed to control the filaments of the two RF and AF tubes, while a single 10-ohm rheostat is used to control the filament of the detector tube. A single circuit jack is used on the output of the second AF and RF stage. The coils are not mounted on the end plates of the condensers, as is usually done, but about 3" back, with the exception of the second RFT coil, which is mounted at right angles to the condenser. This is placed directly in back of the condenser, although not touching. When the coils are mounted the center of the second RFT should be in line with the center with that of the third RFT. This is a very important feature. Otherwise uncontrollable oscillations will take place. The placing of the AFT is not important, except that they should not be in the fields of the RFT. As to the wiring, the beginning of L1 is brought to the antenna. The end of this coil is brought to the ground. The beginning of L2 is brought to the rotary plate connection of C1 and to one terminal of C5. The end of this winding is brought to the stationary plate connection of C1 and to the grid post of the first socket. The rotary plate connection of C1 is also brought to the G post on the high ratio AFT. The F post on this AFT is brought to the other terminal of C5, to one terminal of the ballast resistor and to the A minus post. The B post on this AFT is brought to the B plus 45 volt post. The P post on this AFT is brought to the plate post of the last socket, holding the detector tube. The other terminal of the ballast resistor is connected to the F minus posts of both RF sockets. The beginning of L3 is brought to the plate post of the first socket. The end of this winding is brought to the P post of the low ratio AFT. The B post of this AFT is brought to the B plus 67.5 volt post. The G post on this AFT is brought to the beginning of L4 and to one terminal of a .001 mfd. fixed condenser. The F post on this AFT is brought to the rotary plate connection of C2 and to the A minus post. The stationary plate connection of this condenser is brought to the grid post of the second socket and to the end of L4. The plate post of this socket is brought to the beginning of L5. The end of this winding is brought to the top terminal of the single circuit jack. The bottom terminal of this jack is brought to the B plus 67.5 volt post. The beginning of L6 is brought to the rotary plate connection of C3 and to the F plus post on the socket. It does not go to the rheostat as shown in the diagram. It was found that with the diagram method the tube became unstable. The rheostat is connected in series with the negative leg of the filament. All the F plus posts are connected together and then to the A plus post on strip. A switch may be inserted if so desired, in this lead.

* * *

IN THE Dec. 26, 1925, issue of RADIO WORLD there appeared on page 12 a circuit diagram of a voluminous and sensitive 3-tube regenerative reflexed Neutrodyne. Please give the constants and wiring directions.—James Philip Longwood, Perrin, Va.

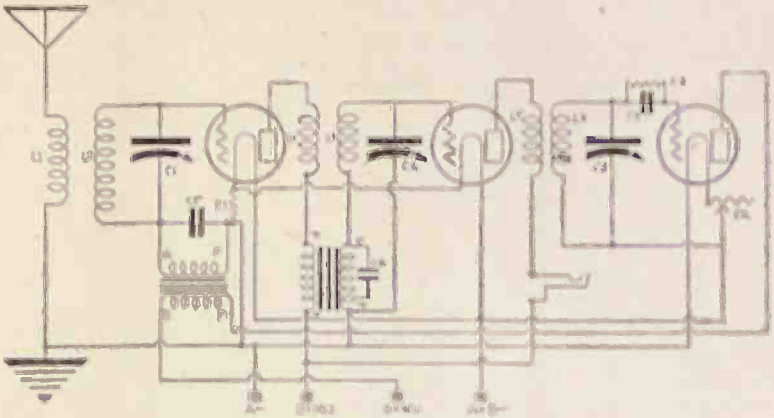


FIG. 358
The electrical diagram of the 3-tube reflex set requested by Joseph Atlass.

The primaries, L1 and L3, consist of 10 turns. Although the primary of the antenna coil is not marked, let us consider it L1. The secondaries, L2 and L4, consist of 50 turns. These are wound on a tubing 3" in diameter, No. 22 double cotton covered wire being used. No space need be left between the primary and the secondary windings. The tickler, L5 consists of 30 turns wound on a tubing 2½" in diameter, using No. 26 single silk covered wire. Although the secondary winding of the tuner is not tapped, for experimental purposes, it is best to tap it at the 10th turn from the beginning of the winding. The secondaries are shunted by .00035 mfd. variable condensers, C1 and C2, respectively. The first audio frequency transformer should be of a high ratio value, while the second one, which is in the regular audio stage should be of the low ratio type. N, the neutralizing condenser, should have a variable capacity range of from .00001 to .00004 mfd. C3 is a .001 mfd. by-pass fixed condenser. R1 and R2 are 10 ohm rheostats, each being able to pass ½ amperes. R3 is a ½ ampere ballast resister. C4 is a .00025 mfd. fixed grid condenser. R4 is a 2-megohm grid leak. The beginning of the primary winding, L1, is brought to the antenna post on a terminal strip. The end of this winding is brought to the ground post. The beginning of the secondary winding, L2, is brought to the rotary plate connection of C1 and to the minus post of a 4.5 volt C battery. The end of this winding is brought to the stationary plate connection of C1 and to the grid post of the first socket. This same connection is extended to the stationary plate connection of the neutralizing condenser, N. The plus post of the C battery is brought to the G post on the high ratio AFT. The F post on this same AFT is brought to the terminal of R1, connected with the arm and thence to the A minus. The resistance wire terminal of R1 is brought to the F minus post. The A minus lead is brought to the arm of the rheostat, R2, to the plus post of another 4.5 volt C battery and to a terminal of a ballast resister, R3. The resistance terminal of R2 is connected to the F minus post of the second socket. The other terminal of the ballast resister, R3, is brought to the F minus post on the third and last socket. The beginning of the plate winding, L3, is brought to the plate post on the first socket. The end of this winding is brought to the P post of the low ratio AFT. It is also brought to one terminal of the fixed condenser, C3. The other terminal of this condenser is brought to the F minus post on the first socket. This same terminal is connected to the F plus posts of the other three sockets. This common lead is then brought to the A plus B minus post on the strip. The beginning of the secondary, L4, is brought to the rotary plate connection of C2 and to the F plus post. The beginning of this winding is brought to the stationary plate connection of C2 and to one terminal of the fixed condenser, C4. The other terminal of this condenser is brought to one terminal of the fixed resistance, R4. The other terminal of this resistance is brought to the F plus post on the socket. The rotary plate connection of N, either may be brought to the end of the secondary winding, L4.

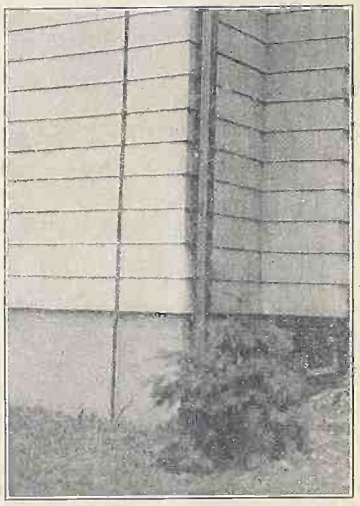
(Concluded on page 26)

Test For Aerial Leadin

(*Hayden*)

A GOOD antenna is always an aid to DX. The position of the antenna, as well as the direction, is important in obtaining the best antenna characteristics. When putting up a house test various leadin points and have the electrician wire your aerial and input accordingly.

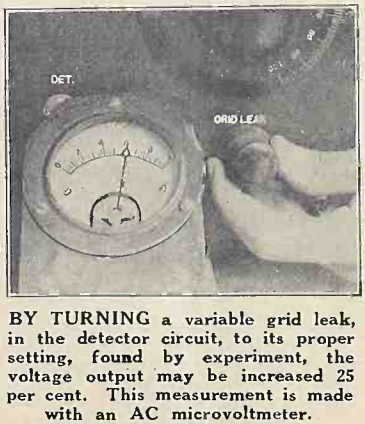
A Secure Ground



(*Hayden*)

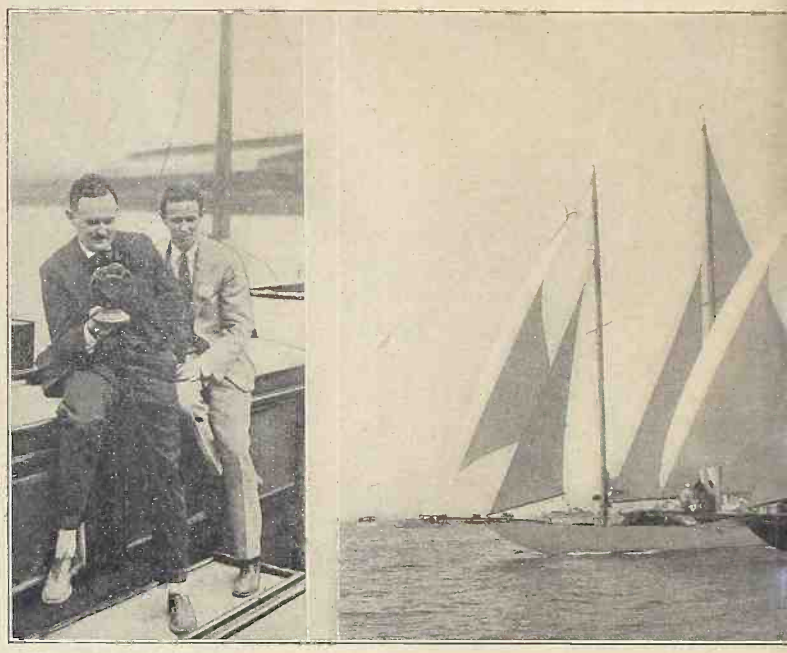
THE FAN who lives in this house drove an iron pipe deep into moist ground and made the ground connection to the pipe at the first story window.

Variable Leak Effect



BY TURNING a variable grid leak, in the detector circuit, to its proper setting, found by experiment, the voltage output may be increased 25 per cent. This measurement is made with an AC microvoltmeter.

Great Yacht Race From New London to Be



(*Underwood & Underwood*)

THE FIRST big yacht race to be broadcast was the one held recently over a 66 Bermuda. Douglas Rigney, himself a yacht racing fan, described the race befor own yacht, the MU1. A yawl, a ketch, a cutter and thirteen yac

Televisor's Impulses Photographed Under In

(*International Newsreel*)

THE transmitted image of the Televisor, invented by J. L. Baird, a Scot now photos Mr. Baird is shown in a plaid suit. Transmission and reception are d the scenes at the studio as well.

Loop with Other Aerial

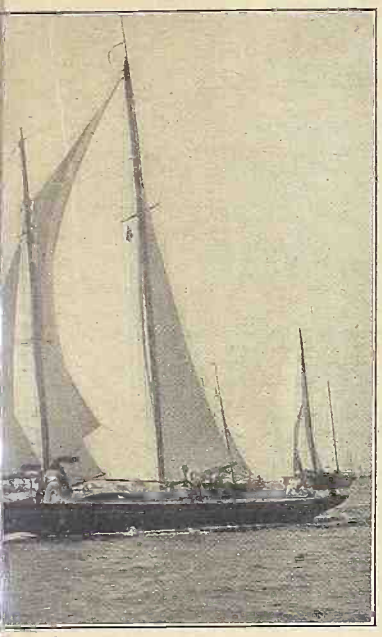
The only practical method thus far discovered of reducing atmospheric disturbances or static in radiotelegraphy or telephony in any marked degree, at a given frequency, is that of unidirectional reception; that is, by using some form of antenna or antenna system which receives more strongly from one direction than from another, says Dr. L. W. Austin, Bureau of Standards, Department of Commerce. Well-known forms of such systems are the Beverage or wave antenna used extensively by the Radio Corporation of America for transoceanic reception, and the older but more convenient, though somewhat less effective, combination of aerial and coil antenna (loop).

Unidirectional reception is useful whe ever the static does not come from t nearly the same direction as the static being received. By such means the rat of signal can often be made from ten twenty times better than on a simple a tenna.

In choosing the site of a receiving st tion it is of great importance therefore discover the prevailing static direction a its changes during different seasons the year.

In a paper presented by Dr. Austin b fore the American Institute of Radio E gineers, measurements made at Colon a Balboa, at the opposite ends of the Pa ama Canal, on the changes in static dire

uda Is Broadcast



le course from New London, Conn., to e microphone of WRMU, aboard his left the starting point.

ntor's Supervision

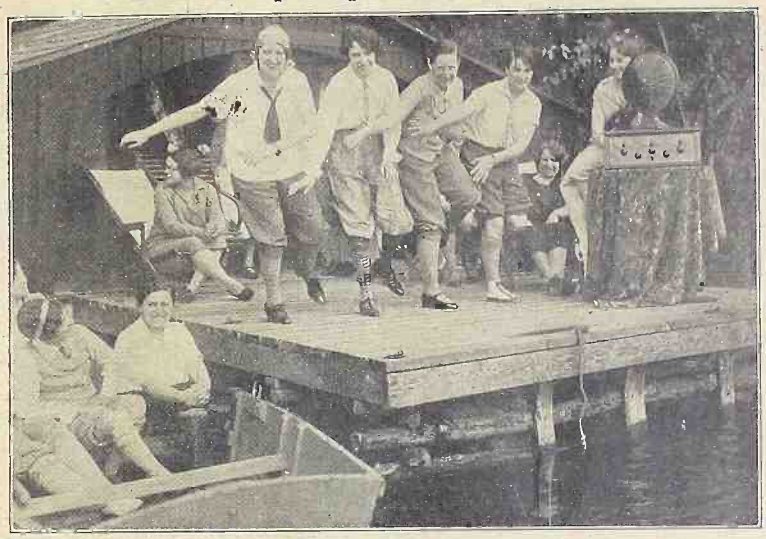
ondon, is shown at left. In the other ed. The machine sends out programs and

Cuts Static

tion from February to November, 1925, are described. The results indicate that during the dry season (January, February and March) while the sun is in the south, the static comes from the southeast at both stations. During the rest of the year, the local static from the low mountain chain running along the isthmus seems to produce most of the radio disturbance. This causes prevailing southerly or southeasterly static at Colon, and northerly or northwesterly static at Balboa. For reception from the United States this should give Colon quite an advantage over Balboa as a receiving site during most of the year.

Other sites are being studied.

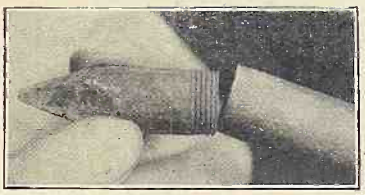
Radio at Camp Inspires Charleston Experts



(Foto Topics)

THE MEMBERS of the Kittredge Foundation for Girls at their Bear Mountain summer camp have become proficient in dancing the Charleston by utilizing the dance music broadcast by New York City radio stations for practicing on every possible occasion.

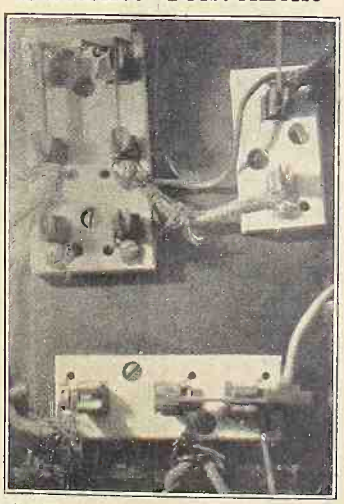
A Hot Tip On Irons



(Radio World Staff Photo)

WHEN YOU find it difficult to get the tip of the soldering iron hot possibly the copper on the iron has become so ionized or burnt that it will not conduct the heat and may burn out the resistance inside the device. Unscrew the tip and purchase a new one. A larger tip may be inserted, so that more heat can be safely carried.

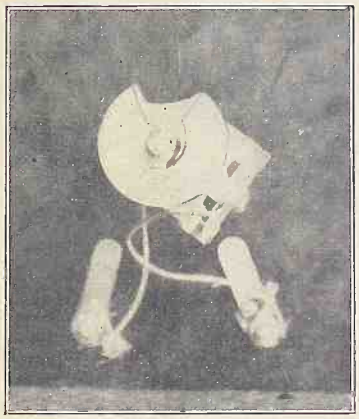
Switches Convenient



(Radio World Staff Photo)

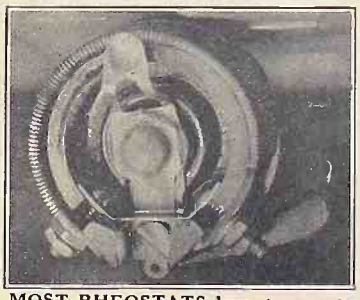
A DPDT switch connects charger or set to A battery. SPST switches govend filaments and aerial and ground.

Test of Small Capacities



A MIDGET condenser, if calibrated, may be used to measure small capacities.

Rheostat Precaution



MOST RHEOSTATS have two posts for connecting purposes. The rheostat shown above has three, the center post going to the A minus and either of the end posts going to the F minus post on the socket. In the two-post rheostats one may connect so that the minimum resistance will be in the circuit, when the arm is first turned up, unless one is careful.

The Official List of Stations

Corrected and Revised Up to June 23

Station	Owner and Locotion	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	Southwestern Baptist Theo. Seminary, Ft. 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	F. M. Henry, 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	United Churches, 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	Coburn Radio Laboratories, 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 I. 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	I. 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.	336
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.	[illegible]
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

Station	Owner and Location	Meters
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
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	A. T. & T. Co., 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)	229
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, Clear water, 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	F. 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.	248
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.	229
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	246
WRNY	Experimenter Publishing Co., (Radio News) N. Y. City	258

(Concluded on page 30)

A THOUGHT FOR THE WEEK

THE dramatists have lain fallow since "Brewster's Millions" stirred our theatregoers several years ago—and in the meantime radio has taken its place among the amazing wonders and marvelous utilities of the age. Isn't it about time for another big drama of the air?

RADIO WORLD

REG. U.S. PAT. OFF.

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

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JULY 3, 1926

Letters to the Editor

EDITOR RADIO WORLD:

I feel constrained to "get in my oar" in defensive response to an editorial appearing in your issue of May 29 relative to "The Appetite For DX".

I feel I am voicing the sentiments of a good many fans who regard fishing in the air as alluring.

This operation is analogous to fishing in the water, in my opinion, for in either instance we like to make catches—yes, real catches.

They are surely a lure and a test of receiver efficiency and tuning skill in reaching out for distance and the further effort to get in these signals as perfectly as all the conditions will permit. Anyone can "play with radio" and get in high-powered or most any other powered locals on multi-tube sets, which stations should readily come in almost on a hair pin. Most of the time we have very much more of them than we care for, so who wouldn't really rather try to learn a little something about the seeming mysteries of the wonderful science of radio?

RADIO WORLD is to be complimented for its class of articles and authors. Commendation is directed in particular to the issue of May 29, on all of the highly instructive detailed articles therein, which offer much food for thought and experiment. It is my belief that many fans in their present expectations have overlooked the wonderful strides accomplished in radio transmission and reception in the few short years. Phonographs for instance, had reached no such proportions when four years, and more, old and even now we are on the threshold of a combination of radio telephony and radio moving pictures.

W. W. MESSEY,
1743 F. St., N. W.,
Washington, D. C.

Well Enough

HOWEVER inviting the short waves may be in regard to the sheer number of broadcasting stations that could be accommodated in that belt, it is too much to assume that mere numbers will force the stations down to that region. Conditions exist at the ultra-frequencies that do not make for best broadcast transmission and reception.

It can not be said with much truth that we have too few stations now, or that all who clamor for a place on the air should have their cries heeded. Operating a broadcasting station entails much responsibility, chiefly the duty of furnishing excellent programs. How difficult it is to keep up a high plane of entertainment and instruction is obvious every day and every night, when a great deal of the indifferent variety of program is put on the air by small stations. Hence, as Secretary Hoover has pointed out, it is advisable to have fewer and better stations, and the public probably is coming around to that view, if not sharing it already.

Besides, the electrical troubles on the higher frequencies are enough to make existing broadcasters satisfied to stay in the channels they now occupy. The operating stations, of course, will carry an important voice to any session that will decide upon the weighty matter of what belt should be assigned to stations as a whole. The present range, roughly from 200 to 550 meters, suits the stations now on the air, excepting only those forced far down on the wavelength scale, and who would just as soon be down around 100 meters as barely above 200, for then the other stations, more fortunate under existing conditions, would be in the same boat as they.

The Station Policeman

ONE of the perplexities attending the dispute over music fees, waged between stations and the American Society of Composers, Authors and Publishers, concerns the playing of unauthorized pieces by orchestras at points outside the studio. For instance, a hotel may be party to a quarrel with the society, and certain pieces may be forbidden, so far as the hotel is concerned. The station that is sending out the hotel orchestra's music by remote control may be fully authorized to broadcast the very pieces forbidden to the hotel. It would seem only fair that the station should be permitted to send out the music, nevertheless, and not have to keep listeners unoccupied while the orchestra goes ahead with its defiance in melody. Otherwise the station would become a policeman for the society and listeners would be subjected to occasional annoyance.

Commercialized Science

DR. J. H. DELLINGER, chief of the Bureau of Standards radio laboratory, upon retiring recently from the presidency of the Institute of Radio Engineers, in a brief speech warned that the editorial pages of the Proceedings, the official publication of the Institute, was in danger of being utilized for commercial purposes. For instance, radio engineers would make successful attempts to get themselves invited to address the Institute, and the speech would be published in the Proceedings. These engineers would be in the employ of some manufacturer, and the speech (and subsequent article) would deal with the particular product or line the company was manufacturing. In the case of the publication there would be suitable photographs revealing the trade name of the manufactured line, even if no mention thereof appeared in the speech.

That the warning was an excellent prophesy, too, assuming that it was not a criticism of previous lapses, is proved by what has appeared in the Proceedings since Dr. Dellinger spoke on the subject.

The Proceedings should be devoted to science, rather than to commerce. Although in radio it is hard to keep the two apart, the solution is one of the burdens of publishing the Proceedings. The Institute has tackled harder tasks and succeeded. It can solve this one, too, as no doubt it will.

Room for Both

THE B battery eliminator is getting a great deal of attention these days. It serves the purpose of convenience, rather than of economy, and on that score it has attracted attention. Just what will be the ultimate or preponderatingly popular form of B eliminator no one can tell yet, for the experiment is very young.

It is certain, however, that batteries will continue to have a great attraction so long as the present type of radio tube continues in use. Take dry cell B batteries as an example. If of proper capacity, that is, suited to the current drain of the set, they will last six months, and indeed if the largest capacity types are used, their period of life will run to about a full year.

Therefore, like so many other things in business, batteries and eliminators will find adequate room for themselves, without either crowding the other out of the picture.

A Humane Service

THE location of missing persons, especially when there are grieving relatives to soothe, is a work to which broadcasting is well adapted. Several stations make special endeavors to locate such persons, sending out, in some instances, what are known as "alarms," although there is less of the alarming and more of the assuring in this branch of service.

Here and there a listener may object to the interruption of a musical program so that some one may call attention to the height, weight, color and clothes as these existed when the missing person disappeared, maybe fifteen years ago. But the occasional instances of the location of long-lost persons and the reunion of blighted families are a wonderful benefaction to keep in mind. What a world of solace in the announcement that the "alarm" broadcast a few days previous resulted in the finding of the lost brother, sister, father or mother. A little sacrifice in jazz music to bring about such happiness is well within the teachings of every form of religion.

Why This Summer Is Best In the History of Radio

By Dr. A. N. Goldsmith

Chief Broadcast Engineer, Radio Corporation of America.

THIS, the fourth Summer of broadcasting at last finds conditions much suited to a genuine radio summer. Indeed, it is not stretching the notoriously abused radio truth to say that broadcasting has finally evolved from a seasonal amusement to an all-year-round service that brings entertainment, enlightment and education day in and day out to the American public at large.

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There will be news bulletins, too. In fact some broadcasters plan more news and more frequent news bulletins, bearing in mind that radio, in many instances, may supplement and extend the usefulness of the newspaper for those vacationists buried deep in the remote camp or the rural farm.

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(*Hayden*)

ATTACH one end of a ball of cord to a bottle and throw the bottle. Then as the boat or canoe you are in, skims along the water, cut the cord and attach it to aerial. Let your aerial almost float atop the water. The motor frame may be used as ground.

A THOUGHT FOR THE WEEK

THE dramatists have lain fallow since "Brewster's Millions" stirred our theatregoers several years ago—and in the meantime radio has taken its place among the amazing wonders and marvelous utilities of the age. Isn't it about time for another big drama of the air?

RADIO WORLD

REG. U.S. PAT. OFF.

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

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PUBLISHED EVERY WEDNESDAY
(Dated Saturday of same week)
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SUBSCRIPTION RATES

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

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

ADVERTISING RATES

General Advertising

1 Page, 7¼"x11"	462 lines	$300.00
½ Page, 7¼"x5½"	231 lines	150.00
½ Page, 8¼" D. C.	231 lines	150.00
¼ Page, 4⅛" D. C.	115 lines	75.00
1 Column, 2¼"x11"	154 lines	100.00
1 Inch		10.00
Per Agate Line		.75

Time Discount

52 consecutive issues	20%
26 times consecctively or E. O. W. one year	15%
4 consecutive issues	10%

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

CLASSIFIED ADVERTISEMENTS

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Entered as second-class matter March 23, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879.

JULY 3, 1926

Letters to the Editor

EDITOR RADIO WORLD:

I feel constrained to "get in my oar" in defensive response to an editorial appearing in your issue of May 29 relative to "The Appetite For DX".

I feel I am voicing the sentiments of a good many fans who regard fishing in the air as alluring.

This operation is analogous to fishing in the water, in my opinion, for in either instance we like to make catches—yes, real catches.

They are surely a lure and a test of receiver efficiency and tuning skill in reaching out for distance and the further effort to get in these signals as perfectly as all the conditions will permit. Anyone can "play with radio" and get in high-powered or most any other powered locals on multi-tube sets, which stations should readily come in almost on a hair pin. Most of the time we have very much more of them than we care for, so who wouldn't really rather try to learn a little something about the seeming mysteries of the wonderful science of radio?

RADIO WORLD is to be complimented for its class of articles and authors. Commendation is directed in particular to the issue of May 29, on all of the highly instructive detailed articles therein, which offer much food for thought and experiment. It is my belief that many fans in their present expectations have overlooked the wonderful strides accomplished in radio transmission and reception in the few short years. Phonographs for instance, had reached no such proportions when four years, and more, old and even now we are on the threshold of a combination of radio telephony and radio moving pictures.

W. W. MESSEY,
1743 F. St., N. W.,
Washington, D. C.

Well Enough

HOWEVER inviting the short waves may be in regard to the sheer number of broadcasting stations that could be accommodated in that belt, it is too much to assume that mere numbers will force the stations down to that region. Conditions exist at the ultra-frequencies that do not make for best broadcast transmission and reception.

It can not be said with much truth that we have too few stations now, or that all who clamor for a place on the air should have their cries heeded. Operating a broadcasting station entails much responsibility, chiefly the duty of furnishing excellent programs. How difficult it is to keep up a high plane of entertainment and instruction is obvious every day and every night, when a great deal of the indifferent variety of program is put on the air by small stations. Hence, as Secretary Hoover has pointed out, it is advisable to have fewer and better stations, and the public probably is coming around to that view, if not sharing it already.

Besides, the electrical troubles on the higher frequencies are enough to make existing broadcasters satisfied to stay in the channels they now occupy. The operating stations, of course, will carry an important voice to any session that will decide upon the weighty matter of what belt should be assigned to stations as a whole. The present range, roughly from 200 to 550 meters, suits the stations now on the air, excepting only those forced far down on the wavelength scale, and who would just as soon be down around 100 meters as barely above 200, for then the other stations, more fortunate under existing conditions, would be in the same boat as they.

The Station Policeman

ONE of the perplexities attending the dispute over music fees, waged between stations and the American Society of Composers, Authors and Publishers, concerns the playing of unauthorized pieces by orchestras at points outside the studio. For instance, a hotel may be party to a quarrel with the society, and certain pieces may be forbidden, so far as the hotel is concerned. The station that is sending out the hotel orchestra's music by remote control may be fully authorized to broadcast the very pieces forbidden to the hotel. It would seem only fair that the station should be permitted to send out the music, nevertheless, and not have to keep listeners unoccupied while the orchestra goes ahead with its defiance in melody. Otherwise the station would become a policeman for the society and listeners would be subjected to occasional annoyance.

Commercialized Science

DR. J. H. DELLINGER, chief of the Bureau of Standards radio laboratory, upon retiring recently from the presidency of the Institute of Radio Engineers, in a brief speech warned that the editorial pages of the Proceedings, the official publication of the Institute, was in danger of being utilized for commercial purposes. For instance, radio engineers would make successful attempts to get themselves invited to address the Institute, and the speech would be published in the Proceedings. These engineers would be in the employ of some manufacturer, and the speech (and subsequent article) would deal with the particular product or line the company was manufacturing. In the case of the publication there would be suitable photographs revealing the trade name of the manufactured line, even if no mention thereof appeared in the speech.

That the warning was an excellent prophesy, too, assuming that it was not a criticism of previous lapses, is proved by what has appeared in the Proceedings since Dr. Dellinger spoke on the subject.

The Proceedings should be devoted to science, rather than to commerce. Although in radio it is hard to keep the two apart, the solution is one of the burdens of publishing the Proceedings. The Institute has tackled harder tasks and succeeded. It can solve this one, too, as no doubt it will.

Room for Both

THE B battery eliminator is getting a great deal of attention these days. It serves the purpose of convenience, rather than of economy, and on that score it has attracted attention. Just what will be the ultimate or preponderatingly popular form of B eliminator no one can tell yet, for the experiment is very young.

It is certain, however, that batteries will continue to have a great attraction so long as the present type of radio tube continues in use. Take dry cell B batteries as an example. If of proper capacity, that is, suited to the current drain of the set, they will last six months, and indeed if the largest capacity types are used, their period of life will run to about a full year.

Therefore, like so many other things in business, batteries and eliminators will find adequate room for themselves, without either crowding the other out of the picture.

A Humane Service

THE location of missing persons, especially when there are grieving relatives to soothe, is a work to which broadcasting is well adapted. Several stations make special endeavors to locate such persons, sending out, in some instances, what are known as "alarms," although there is less of the alarming and more of the assuring in this branch of service.

Here and there a listener may object to the interruption of a musical program so that some one may call attention to the height, weight, color and clothes as these existed when the missing person disappeared, maybe fifteen years ago. But the occasional instances of the location of long-lost persons and the reunion of blighted families are a wonderful benefaction to keep in mind. What a world of solace in the announcement that the "alarm" broadcast a few days previous resulted in the finding of the lost brother, sister, father or mother. A little sacrifice in jazz music to bring about such happiness is well within the teachings of every form of religion.

Why This Summer Is Best In the History of Radio

By Dr. A. N. Goldsmith

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Radio Is Supplementary As Advertising Medium

PHILADELPHIA.

Martin P. Rice, manager of advertising, publicity, and broadcasting, General Electric Company, addressing the Public Utilities Advertising Association at the Twenty-second Annual Convention of the Associated Advertising Clubs of the World, said:

"Heretofore the printing press has furnished the only method of reaching great masses of people. With its aid the structure of modern advertising has been built up, and it has been employed effectively by public utilities.

"Science has recently contributed a new agency, and radio broadcasting is today one of the important factors in forming public opinion. It is an example of one of the few ideas that did not have to be sold to the public. Its use in advertising has been widely discussed, but the art is really too new to warrant definite or final conclusions.

"Broadcasting will probably not be employed in direct selling until some plan is provided by which such advertising can be definitely segregated from all other programs. However, broadcasting supplies us with a new medium which permits us to speak to vast audiences simultaneously. It has already been widely used for entertainment, education, the dissemination of news, the presentation of political opinions, the extension of church services, financial, market and stock reports and detailed accounts of athletic events. It has been successfully employed in institutional or good-will advertising, and many of the applications for broadcasting stations now pending in Washington are undoubtedly inspired by the desire to employ broadcasting in this capacity.

"The extent to which broadcasting may be employed in advertising will depend ultimately upon the facilities available and upon the adaptability and ingenuity of advertisers to make use of an entirely new medium. In the field of public utility advertising it has the peculiar advantage of expressing personality and of reaching customers in their homes when they are at leisure and their minds receptive. The experience of several large public utility companies in broadcasting is quoted to support the views presented in the paper.

"Broadcasting is not suggested as a substitute for older forms of advertising and publicity, but as a supplementary agency. The public has not been educated to believe that it should pay the cost of broadcast programs any more than it expects to pay the cost of a newspaper or popular magazine—the advertiser pays, and there seem to be many advertisers interested in educational or institutional programs who are willing to pay the cost of broadcasting."

Stoner and Heath Get Union Battery Line

Stoner & Heath, Inc., have been so successful in handling such lines as Centralab products, the new Perlesz One-Dial Control sets, the Bodine line of twin-eight coils, loops and radio appliances and Cellometer, the authoritative, scientific A battery meter tester, that they have been selected by the Union Battery Co. of Chicago as sole Eastern representatives for their long-life heavy duty storage A battery.

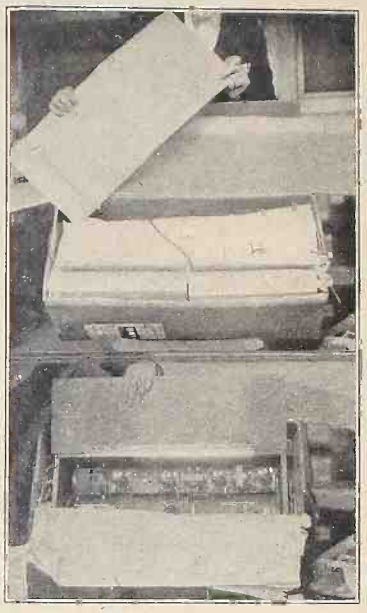
This battery is well known in the West, where it has been a heavy seller for some time.

The Union batteries are made for auto and radio purposes in capacities from 60 to 150 amperes and for quality and capacity are hard to equal at their reasonable list price.

Another addition to the lines carried by Stoner & Heath, Inc., is that of the General Instrument Co. of New York City. It includes their full line of parts including the new Metralign condenser. Information regarding any of these lines may be had from Stoner & Heath, Inc., 122 Greenwich Street, New York City.

Mention RADIO WORLD.

Pack Your Sets Well



(Radio World Staff Photos)

THE ABOVE SET was received by RADIO WORLD'S laboratories for testing. The efficient manner in which it was packed deserves mention. Heavy corrugated cardboard surrounded both sides of the cabinet while a large quantity of tissue paper tubes were shipped in the set and withstood the jarring of transit.

Los Angeles Beacon Aids Coast Safeguard

Better protection for vessels on the Southern California coast is assured by the radio beacon just established at Los Angeles Harbor Light Station. It sounds every 120 seconds, single dashes for 60 seconds and silent 60 seconds. The signal will be sounded through thick or foggy weather on a 1,000 meter wavelength and will be available for vessels equipped with radio compasses.

Set Builders to Show Their Work in New York

NEW YORK.

Even far-off Australia will enter the international set-building test that is to be a feature of the Radio World's Fair.

This means that the radio fans of the metropolitan district, and thousands from other states, during the show at Madison Square Garden, Sept. 13-18, will see a great collection of efficient home-made wireless apparatus. Most of the exhibits, those which do not have to be sent back at a definite date, will be displayed at the Chicago Radio Show in the Coliseum, beginning October 11.

It is likely that provisions can be made also for sending some of the sets to other points and arrangements to that end should be made immediately by radio expositions, chambers of commerce, radio clubs and other organizations, through communication with G. Clayton Irwin, Jr., general manager of the Radio World's Fair, 1475 Broadway, New York City.

NEW CORPORATIONS

Rowin Florescent Lights, N. Y. City, radio, $20,000, O. A. and K. Roensch, W. A. Winter. (Atty., C. F. Brown, 2 Rector St., N. Y. City).

Kenwood Radio Co., N. Y. City, $20,000, H. M. Stein, M. Cohen. (Atty., I. Sack, 110 West 40th St., N. Y. City).

Saturation of Sales Is Expected In 1936

In "Radio News" Laboratories we have made 110-volt incandescent lamps speak and sing—and everybody has heard of the singing arc lamp. In neither of these are diaphragms used. Then there is also the Peukert Talking Dynamo principle. Here we have a wire wound upon a steel magnet which, when mounted upon a resonant base, becomes a wonderful loud speaker. The effect here is had through molecular action. No diaphragm is used. These are only a few principles. There may be many more which have as yet not been discovered. But you may rest assured that in 1936 you will not be able to tell the difference between the singer's voice when singing over the radio and actually hearing her on the stage. The chances are, in fact, that you will hear her better by radio than from the stage, because if the transmission is perfect, you will be only a few feet away from the loudspeaker, whereas in the theatre you may be 100 or more feet away from the singer.

It is altogether probable that in 1936 the saturation point of radio will have been approached. By that time anywhere from 25,000,000 to 35,000,000 radio receiving outfits will be in operation in the United States. In putting down this figure I have, of course, borne in mind that the population of the United States within 10 years will be greatly in excess of what it is now.

Rather than decreasing, the number of radio broadcast stations will probably keep on increasing during the next few years. At that time we shall also have moving broadcast stations, as, for instance, stations on board ships, stations on board airships and airplanes, for commercial and semi-commercial purposes. Every rich man's automobile will have its radio transmission and receiving station to enable him to keep in direct touch with his office.

All of the views expressed herein are very conservative. The chances are overwhelming that progress will be a great deal faster and a great deal more wonderful than the few predictions made here would indicate. —*Hugo Gernsback.*

Good Back Numbers of RADIO WORLD

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

1925:

Aug. 29—A Set a Baby Can Build, by Herbert E. Hayden. A Fine Meter Switchboard, by Lewis Winner.

Sept. 12—An Oscillating Wavemeter, by J. E. Anderson. A 25-to-110 Meter Receiver, by Sidney E. Finkelstein. Spreading Out the Lower Waves, by Capt. P. V. O'Rourke.

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. Fortington.

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

Dec. 26—The Regenerative 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. 23—The 4-Tube Diamond of the Air, by Herman Bernard. B Batteries Last Six Months, by S. E. Finkelstein.

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 Eliminater, 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 Foote.

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 Reilex 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 Sailor Rug, 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).

Any copy, 15c. Any 7 copies, $1.00. All these 33 copies for $4.50, or start subscription with any issue. RADIO WORLD, 145 W. 45th St., N. Y. C.

TRADE TO MEET AT BIG SHOW IN CLEVELAND

CLEVELAND.

This city's second annual radio exposition, to be held in the municipal auditorium here Sept. 20 to 26, promises to be one of the biggest, most important and most productive radio shows of the year. G. B. Bodenhoff is managing the show.

Cleveland is the heart of a territory in which live 3,000,000 people. And these people come to Cleveland for expositions of every kind. It also is the heart of a large radio consuming territory.

At the show, there is to be held here a convention of radio jobbers and dealers of Ohio and adjacent territory, so that manufacturers and dealers may get together at a central point to prepare for the coming season.

At this convention will be presented prepared papers affecting many branches of the trade which will be of value to all in the business.

A. T. Haugh, general manager of the King Mfg. Co. at Buffalo, who is president of the Radio Manufacturers' Association, has accepted the honorary chairmanship of the manufacturers' committee of the Cleveland show. L. G. Baldwin, radio sales manager for the Willard Storage Battery Co. of Cleveland, who is secretary of the R. M. A., is the show's general manager again.

Others well known in the trade who are members of the manufacturers' committee are: J. F. Bichl, sales manager for the Kodel Radio Corporation, Cincinnati; V. W. Collamore, sales manager for the Atwater-Kent Mfg. Co. of Philadelphia; W. W. Dowdell, sales manager for the Sterling Mfg. Co. of Cleveland; H. H. Eby, president of the H. H. Eby Mfg. Co., Philadelphia; E. S. Germain, Cleveland representative of the Brunswick-Balke-Collender Co.; V. H. Meyer, president of the Workrite Co., Cleveland; J. F. Quinn of Electrical Research Laboratories, Chicago; C. F. Saenger of Fansteel Products Co., Chicago; H. F. Sauer, Cleveland manager for the Electric Storage Battery Co.; F. J. Wisinger of the Twin Dry Cell Battery Co. of Cleveland, and R. H. Woodford of the Stewart-Warner Corporation of Chicago.

The publicity director is James H. Lanyon, 511 Guarantee Title Building, Cleveland, O.

Business Opportunities Radio and Electrical

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

SWITCHBOARD AND PANEL BUSINESS; opportunity for salesman with a following, thoroughly familiar with electric switchboard business, to become identified with manufacturers of high-grade products, etc.; capital not necessary, but will consider selling an interest to live man; write for interview, giving retails. Box A, Radio World.

RADIO MANUFACTURER, well established, wants responsible party to take over factory and production on contract basis; splendid opportunity for small established concern or energetic individual with small capital; kindly give brief history in letter. Box E, Radio World.

BATTERYLESS RADIO—Competent engineer is open for connection with concern desiring to manufacture radio working from light socket; no trickle charges or liquids; powerful natural reproduction; will demonstrate. Box C, Radio World.

MANUFACTURER OF ELECTRICAL equipment including complete line of battery eliminators, trickle charger and power amplifiers is looking for sales organization or executive with facilities for marketing. Box B, Radio World.

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 .....

J. B. Gasquet, St. Petersburg Times, St. Petersburg, Fla.

College Point Radio & Electrical Supplies, 612 Second Ave., College Point, N. Y. (Dealer).

James Williams, Warrensburg, Ill.

P. D. Boogkier, 1116 North Murray St., Springfield, O. (Dealer).

Ralph G. Bailey, 51 Morse Place, Portland, Vt.

F. T. Carrington, Garage, Agency, Mo. (Dealer).

Carl W. Sternfelt, 32 High St., Cambridge, Mass. (Dealer).

John Province, Orlando, Okla.

Committee Is Named For Los Angeles Show

The fourth radio show in Los Angeles will be held September 5 to 11. It will be known as the Fourth Annual National Radio Exposition, and the place will be the Ambassador Auditorium, adjacent the hotel.

Committeemen now lining up the show are J. A. Hartley, general chairman in charge of finance; L. E. Taufenback, in charge of advertising; A. H. Meyer, broadcasting; W. D. Scott, preview; L. J. Smith, floor; Carl A. Stone, booth sales; J. W. Boothe, publicity and banquet; C. H. Mansfield, host, and F. D. Hutchinson, ticket sales.

Exhibitors are joining in the show from all sections of the United States, Mr. Hartley said. With Los Angeles one of the most appreciative and enthusiastic radio sections in the country, it is predicted the show will prove exceedingly valuable from the dealer, jobber or manufacturer standpoint.

Waldo T. Tupper, Pacific Coast exposition expert, who managed the show successfully last year, again is managing director, and A. G. Farquharson, secretary of the trades association, is secretary of the show.

As a special feature, a preview of the show at which only the professional radio men will be admitted, is to be held on the opening day and evening. Jobbers, manufacturers' agents and retailers are equally represented on the committee of nine.

Second Trade Tour to Be Held in August

The Northwest Radio Trade Association has chosen the first week in August for its second annual radio tour.

The thirty-three pioneers who made up the delegation last year are going again and each man is pledged to get one or two others to go.

The itinerary follows:

Leave Minneapolis Sunday night, August 1.

Grand Forks, N. D., Monday, August 2.

Fargo, N. D., Tuesday, August 3.

Aberdeen, S. D., Wednesday, August 4.

Sioux Falls, S. D., Thursday, August 5.

Mankato, Minn., Friday, August 6.

Arrive at Minneapolis Friday night, August 6th.

"Mike" Privileges Sought By National Politicians

By T. Malcolm Stevenson

WASHINGTON.

PLACE: Floor of the United States Senate.

TIME: Between Dec. 1 and March 4 when Congress is in session.

Senator Hokum: Mr. President . . .

Vice President: The Senior Senator from New Dakota.

Senator Hokum: Mr. President, I would like to call the attention of the Senate to a serious state of affairs. The liberty of our country is endangered; the bulwarks of our Constitution and the principles of our cherished institutions are being insidiously undermined. Only quick and decisive action by the Senate can save us from this deadly peril.

Mr. President, I demand an immediate investigation of broadcasting station BING. The Senate and the people of the country should know who owns and operates this thing which has sprung up among us, what sinister influences are behind it.

Mr. President, my attention was called rather forcefully only yesterday to the character of station BING. Mr. President, you and the Senate are aware of the bill I have recently introduced—it is that Senators be permitted to have photographs of themselves printed and distributed to their constituents at the expense of the Government. You are all aware of the dire necessity for such legislation. But to accomplish such a purpose, we must carry the proposition to the people. Yesterday, I approached the management of Station BING and sought to be allowed to speak directly to the people of the country on this vital issue. Mr. President, they refused me. WHY? I think, Mr. President, they should be compelled to answer to the Senate and to the people of the country. Mr. President, they are . . . (and so on, far into the session).

* * *

It is not hard for anyone who has followed the proceedings of the U. S. Senate for any considerable length of time to imagine a scene such as that portrayed above. The fact, during recent months it has not only become a vivid possibility but has become almost an actuality.

During the coming Congressional election every effort will be made to utilize as many of the broadcasting stations as possible to disseminate political propaganda. Politicians are aroused to the influence of a broadcasting station in shaping public opinion and they are going to try to make it uncomfortable for the station which takes an unfriendly attitude toward their ambitions and policies.

Perhaps this condition will prevail until the status of broadcasting stations has been clearly defined in the minds of politicians. The generally accepted view of the public is that a broadcasting station has a status somewhat similar to a newspaper and the corresponding power to accept or reject material as it sees fit.

The writer recently approached a prominent Republican politician in an effort to learn which stations would be utilized in broadcasting political speeches. He found the politician deeply resentful toward a number of stations, claiming they were showing favoritism toward Democratic spokesmen in their programs. Strangely enough at the Democratic headquarters the same feeling prevailed against almost the same stations.

Last spring a request was made on the floor of the senate for the investigation of a broadcasting station. The station in question, according to the Senator, refused him the privilege of broadcasting a speech in favor of exclusion of the Japanese from this country. He charged the station was under Japanese influence and demanded a prompt and thorough inquiry into its operations.

An effort will be made within the near future to pass a law which would compel all broadcasting stations to allow any time desired to politicians for their speeches.

Standard Frequency Schedule Announced

WASHINGTON.

Announcement has been made by the Bureau of Standards that radio signals of definitely announced frequencies will be transmitted once a month for use by the public in standardizing frequency meters and transmitting and receiving apparatus. The signals will be transmitted by WWV (Bureau of Standards) Washington, D. C., and 6XBM, Leland Stanford Jr. University, Calif. The signals will be transmitted on July 20, August 20, September 20 and October 20.

Those who are interested in the frequency transmissions are invited to communicate with the Bureau of Standards for information and co-operation.

VICTORIA KEEN FOR SETS

WASHINGTON.

The number of licensed radio receiving sets in Victoria, Australia, has increased from 33,000 to 45,000 in three months, there being an average of one receiver to every seven families, according to a report to the Department of Commerce.

Call of All Lost Vessels To Be Buried With Them

WASHINGTON.

The radio call letters of ships lost at sea may never be reassigned to other vessels. Such a policy is under consideration by the Radio Bureau of the Department of Commerce.

Contrary to popular opinion, there is no great prejudice on the part of seamen toward the use of call signals of ships that have gone to "Davy Jones' Locker." Up to the present time the calls of the lost ships have been reassigned freely.

Chief Radio Supervisor W. D. Terrell thinks the call of a ship should be buried with it when it goes down at sea. Sometimes, Mr. Terrell says, a lost vessel either is raised and put into commission again or is reported lost and is not heard of again for several months. Mr. Terrell believes these calls should be reserved for the vessels in case they are recovered.

WGBS Omits Programs In Morning For Summer

Commencing July 1, WGBS discontinued its morning programs for the summer. Instead, many of the regular features which had been broadcast between 10 and 11 a.m., are heard in the afternoon.

For example, Cousin Eleanor's Kiddie Klub program, a usual Saturday morning feature, takes place at 3 p. m. every Friday afternoon. Likewise, Nestor Matson's radio gym class, in the past, scheduled at 10:15 a. m., now is on the air at 2:05 p. m.

Physicist's New Horn Has Multiple Resonance

BLOOMINGTON, IND.

A new type of phonograph and radio horn has been perfected by Dr. A. L. Foley, head of the department of physics of Indiana University and authority on acoustics.

A new series of bends and folds is used on scientific principles of sound reflection. These bends and folds divide the horn into several segments, each with its own natural period of vibration. By properly choosing the dimensions of the several segments, Dr. Foley has been able to increase greatly the number of tones to which the horn is resonant. He has also increased cross resonance by means of a sounding board between folds of the horn.

The low tones are said to be reproduced equally well and the high tones are clearer.

The largest of the four designs of the horn takes less than two cubic feet of space. The minimum requirements of a phonograph using the new horn, for instance, will be only one-fourth the space of the latest improved phonographs on the market today.

The Starr Piano Company, Richmond, Ind., and the Showers Bros. Company, Bloomington, Ind., have obtained the rights to manufacture of phonographs and radios using the Foley horn.

Station Concert Bureau Gets Work for Artists

BALTIMORE.

WBAL, Baltimore's super-power station, announced that a concert bureau will be established in connection with its radio broadcasting.

So far as it is known, WBAL is the first station in the country to establish a concert bureau in connection with its broadcasting artists and the fact that through this proposed concert bureau WBAL artists will be able to obtain personal concert engagements is expected to set a precedent in the world of radio broadcasting that will more than likely be followed by other broadcasters throughout the country.

"The fact that many of our artists are receiving requests and calls to appear in concert work prompted the idea of establishing a WBAL concert bureau in the fall so that various organizations and groups desiring talent for their musical entertainments, will be able to secure through this bureau the artists they have heard over WBAL," Frederick R. Huber, Director, stated. "In fact, the need for such a bureau has been very definitely felt as the popularity of the soloists appearing over WBAL has been so enthusiastically evident that some of our artists have even been asked to appear in concert out of town."

MUKDEN LIVENS UP

WASHINGTON.

Interest in radio at Mukden, China, is increasing despite difficulties imposed by lack of broadcasting and receiving apparatus, according to a report to the Department of Commerce.

Question and Answers On Builders' Problems

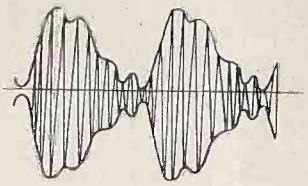


FIG. 359

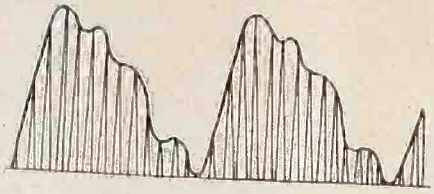


FIG. 360

The resultant modulated carrier waves as they appear before and after rectification.

(*Concluded from page* 15)

or to the tapped portion of the same winding. This is purely experimental, as stated heretofore. The beginning of the tickler winding, L5, is brought to the plate post on the second socket. The end of this winding is brought to the P post on the first AFT (high ratio). The B post on this AFT is brought to the B plus 22½ volt post, as marked in the diagram. The B post on the second AFT (low ratio), is brought to the B plus 90 volt post. The G post on this AFT is brought to the G post on the last socket. The F minus post on this AFT is brought to the minus post of the second 4.5 volt C battery. 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 90 volt post. This is the same post that the B post on the second AFT was connected to, making this a common lead and voltage for both the RF-AF and the AF tubes. The RF-AF tube is, of course, the first tube. This receiver is difficult to operate, but once mastered, is very simple. C1 and C2 carry the tuning burden, while the tickler is a volume control. Once the rheostats are set, it should not be found necessary to bother with them. Although the grid leak is brought to the F plus post on the socket, it may be found that by shunting it to the grid condenser, better results will be obtained. A .001 mfd. fixed condenser across the secondary winding of the first AFT, might improve results, as well as the exclusion of the C battery in this portion of the circuit. The antenna and the tuning coil should be fairly far apart, about 5". The neutralizing condenser, need not be bothered with, once set. Dampness, etc., will cause the change in the capacity of the neutralizing condenser, etc. The entire set may be built in a cabinet, 7x18". The —01A type of tubes are used throughout. If the detector tube becomes unstable, decrease the number of turns on the tickler, one by one.

* * *

I READ with interest the article in the June 26 issue in which a discussion of how both sides of the audio wave, when rectified, are still preserved. There are, however, a couple of points that I would like to see illustrated. The following points:—(1)—How the resultant modulated radio wave would appear, when the radio frequency carrier is modulated by an audio frequency signal before rectification; (2)—How the modulated carrier would appear after rectification.—D. Stephan, 250 Brook Ave., Bronx, N. Y. City.

(1)—The resultant modulated carrier wave, before rectification is shown in Fig. 359. (2)—The resultant modulated carrier wave after rectification is shown in Fig. 360.

* * *

ALTHOUGH I have seen many explanations as to the inclusion of a C battery in 2-stage transformer coupled audio frequency amplifiers, I am still foggy as to the exact method of insertion. This can, I think, be cleared up, by publishing a specific wiring diagram, showing how to place this C battery in the amplifier circuit. I wish to place the C battery in both AF circuits.—James De Grat, Louisville, Ky.

Fig. 361 shows the circuit diagram, illustrating the C battery inclusion. Both F minus posts of the audio frequency transformers are connected together and then run to the minus post of the C battery. The plus post of the C battery is then run to the minus post of the A battery on the strip.

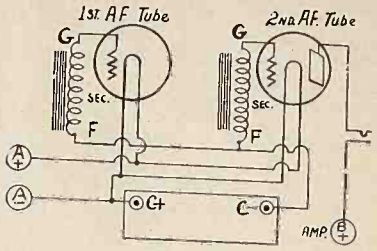


FIG. 361

How to connect a C battery in a transformer coupled AF amplifier.

STATION FOR HALIFAX

WASHINGTON.

Plans are being made for the installation of a broadcasting station in Halifax, Nova Scotia. Local associations and enterprises have agreed to subscribe toward the cost and it is believed local broadcasting will increase the market for radio equipment as reception of the American and Canadian stations in Halifax is weak and unreliable.

THE GREAT AID OF BY-PASS CONDENSERS, by John F. Rider, appeared in RADIO WORLD dated May 8. Sent on receipt of 15c, or start sub. with that number, RADIO WORLD, 145 W. 45th St., N. Y. C.

Mystic Powers Sought In Elusive Frequencies

By Leon L. Adelman

The Chas. Freshman Co., Inc.

Everything that exists, everything that we can see, hear, taste, feel or smell, consists of matter in motion. Nothing is at a standstill. Minute particles, protons, electrons, ions, atoms, molecules, nuclei —all are in a constant state of vibration. Whatever nature has been attributed to that which we recognize and call matter, that same is manifest as electricity. Matter and electricity are synonomous. That is the final conclusion of our scientists. All modern research has pointed that way. Just what is electricity, no one has as yet established, but it is conceded that electricity is the manifestation resulting from a flow of electrons from one point to another.

Imagine, if you can, two types of particles, each invisible, intangible and infinitesimal, in the ordinary sense of these words, and indeterminate in form and substance. For one type of particle, we have acknowledged the term "electron"; for the other, the word "proton." Electron and proton are complementary. The electron is a negative particle of electricity while the proton is positive. They are thus mutually attractive.

Electricity in Action

From this simple beginning arise the laws governing electric current flow. In this respect we understand the negative particles of electricity or electrons to travel in quantities towards the body containing a similar number of protons or positive electricity.

The speed with which electricity travels is 186,000 miles per second, which is equivalent to 300,000,000 meters per second.

Countless billions of electrons per second are required to produce even the feeblest flow of current.

Vibrations in the air produce sound waves. The motion of the molecules comprising the various gases which are constituents of air can be anywhere from 20 to 20,000 vibrations per second, to lie within the extremes of audibility. People with good hearing can detect very low notes of 16 vibrations per second and very high notes of more than 25,000 per second. The range of the voice, however, lies well within 200 to 2,000 vibrations.

A Baffling Situation

From sound waves, the frequency steadily increases, but no one has as yet discovered what these frequencies do or mean. In other words there is an unexplored region of nearly 10 octaves between the highest sound or audible frequency and the lowest electrical vibrations.

Electricity, however, is not a motion of molecules as is the case of sound, but a motion of electrons. Between the fastest electrical vibrations and the slowest heat waves lies a partly unexplored band of approximately five octaves. Recent experimentation with the production of short waves or high frequencies has narrowed the breach down somewhat, but there remains much more to be done. Radio waves differ from electrical vibrations in being vibrations in the ether, similar to light waves. However, the shortest radio wave produced is still some thousands of times longer than the longest light wave, such as the infra-red.

When with the disclosure of the fact that radio waves one meter long were created, many enthusiasts were fired with the inspiration to duplicate and even better the results. Some of them were successful, others were not. First one would attain the difficult results, then another would by far better them.

Fascinating Achievements

One experimenter succeeded in getting down to less than three-quarters of a meter wavelength and a short while later another, by the production of harmonics from an efficient oscillatory obtained one-fifth of a meter. However, the ultimate goal in mind was a duplication of Hertz's pioneer experiments in which that famous savant produced wavelengths of only a few centimeters and less in length!

By using a line of attack heretofore not followed, an arduous experimenter has succeeded in getting even lower than Hertz had done. He has succeeded in generating oscillations less than 100th of a meter in length, thus getting very close to the wavelength of the infra-red light rays.

The transition from heat waves into light is a gradual one and very well known. However, from the heat waves to radio waves there remains a gap which will be filled only through extensive research. As the Hertzian wave of one centimeter is practically still 1,500 times longer than the wavelength of visual light, and science has not as yet determined nor conjectured the effects of intermediate wavelengths between these, efforts are being pushed to the solution of the problems.

Bold Possibilities

Perhaps very valuable rays similar to x-rays and radio-active emanations will be discovered and one might even come to the discovery of a real death ray. Since everything is vibration of that which constitutes matter and electricity, who knows but that unknown rays may be discovered with power instantly to disintegrate materials; solidify gases, increase densities a thousand-fold, have the power of transmutation, of changing a baser metal into a more desirable one; of being the solution of the elusive problem of television; of enabling one to become invisible; of having the property in assisting astronomers to see conditions on other planets, and perhaps solve even the problem of the Fountain of Youth?

The subject is certainly a very fascinating one and has drawn many thousand of experimenters to its fold. Though progress is necessarily slow, the advances which are being made daily have more than repaid the research workers for their untiring efforts.

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.

How Ductile Tungsten Is Produced for Tubes

By F. C. Kelley

Research Laboratory of the General Electric Company.

[*The use of tungsten in radio tubes makes a discussion of this metal in ductile form especially interesting.*]

Although little use had been made of tungsten up until the time it was obtained in its ductile form, it was by no means rare. Deposits of its ores occur in many parts of the world, and especially in the United States, Portugal, British India and South America. The chief ones are wolframite, and iron and manganese tungstate, sheelite, a calcium tungstate, and stolzite, a lead tungstate.

The pure oxide of tungsten is obtained from the ore by chemical separation. It is canary yellow in color and in its finely divided state resembles flour. This yellow powder is loaded into porcelain tube, electric resistance furnaces, through which hydrogen is passed. The temperature and flow of hydrogen gas are carefully regulated for upon these conditions depend the character of the reduced metal. The furnace is heated gradually to a bright yellow heat, causing hydrogen to combine with the oxygen of tungstic oxide forming water which vaporizes leaving the pure uncrystalline metal behind.

Avoiding Breakage

The hydrogen-reduced metal powder is next pressed in a mold under hydraulic pressure in the form of bars. If a bar is handled at this stage, it will break under its own weight, so it is carefully transferred to a slab of molybdenum, tungsten, or some highly refractory material, and refired in hydrogen at nearly a white heat for half an hour. This high temperature sinters the metal so that the bar can be handled without breakage.

It is next clamped between two water-cooled clamps in a metal treating bottle, and a heavy current is passed through it. This heats the bar to a dazzling white heat, and causes it to sinter still more. It is now strong, but not ductile, and a sharp blow with a hammer will break it. The bar may now be rolled into sheets or hammered into rods or wire by means of swaging machines. The process depends upon the use to which the metal is to be put. The treatment is as follows: The bar is heated in a hydrogen electric resistance furnace to nearly a white heat. It is then pulled out of the furnace by means of tongs and inserted quickly into the swaging machine. It is immediately withdrawn and reheated.

Reduction in Size

This time the opposite end is inserted into the swager. A smaller set of dies is now put into the machine for the next operation. This heating, hammering, and gradual reduction in the size of the dies continues until the bar is worked down into wire. The bar is not allowed to become cold during the swaging operation, because it would break up. The temperature of working, however, is gradually decreased with its size. When the bar has been worked down into a long wire, it is fed automatically through the machine by rolls, being heated by a gas flame just before it goes into the swager. It is reduced in this way until the diameter becomes about one-half that of the lead in a pencil.

At this stage it is tough and ductile at room temperature, and can be bent cold without breaking. The process of reducion to still smaller diameters is accomplished by drawing through diamond dies. The wire is drawn at a dull red heat at first by heating in a gas furnace as before, but as it becomes smaller the heat is gradually reduced, so that it will not burn the fine wire. The amount of reduction for each pass through the die also becomes less as the size decreases. By this method, wire five ten thousandths of an inch in diameter, or smaller, can be drawn.

Sometimes It's Rolled

If the desired form of the metal should not be wire, the highly sintered bars are rolled hot, just as they were when swaged. Metal sheets rolled in this manner furnish the materials from which a variety of products are made.

The method of making ductile tungsten is very different from the processes used to produce other metal. It is never melted in any part of the process like iron, copper, nickel, etc., but is made by pressing finely divided powder and heating to a temperature several hundred degrees below the melting point. During sintering at such a high temperature the

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A DISCUSSION ON SELECTIVITY, by J. E. Anderson, appeared in RADIO WORLD, dated June 19. Sent on receipt of 15c, or start subscription with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

THE GREAT AID OF BY-PASS CONDENSERS, by John F. Rider, appeared in RADIO WORLD dated May 8. Sent on receipt of 15c, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

DETAILS OF WIRING THE DC B ELIMINATOR, Part II, by Lewis Winner, appeared in RADIO WORLD dated April 24. Sent on receipt of 15c, or start sub. with that issue. RADIO WORLD, 145 W. 45th St., N. Y. C.

HOW TO USE AERIALS IN GROUND AND WATER, by Lewis Winner, appeared in RADIO WORLD, dated May 29. Sent on receipt of 15c, or start subscription with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

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THE BERNARD PORTABLE SUPER-HETERODYNE appeared in RADIO WORLD dated April 3, 10, 17 and 24. Sent on receipt of 60c, or start your subscription with April 3 issue. RADIO WORLD, 145 West 45th St., N. Y. City.

WIRELESS IN THE HOME by Lee deForest, sent on receipt of 15c. The Columbia Print 145 W. 45th St., N. Y. C.

HERMAN BERNARD, managing editor of RADIO WORLD, broadcasts every Friday at 7 p. m., from WGBS, Gimbel Bros., N. Y. City. 315.6 meters. He discusses "What's Your Radio Problem?" Listen in!

A BUILT-IN SPEAKER SET, by Herbert E. Hayden, **POWERTONE IN OPERATION**, by Capt. P. V. O'Rourke, **THE NOVICE'S NOOK**, by James B. Scully, appeared in RADIO WORLD dated May 22. Sent on recipt of 15c, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

THE 5-TUBE SUPER HETERODYNE SET, by Jasper Jellicoe, appeared in RADIO WORLD dated April 17. Sent on receipt of 15c. RADIO WORLD, 145 W. 45th St., N. Y. C.

THE VACATION NUMBER OF RADIO WORLD DATED JUNE 12 contained many great features. The light 5-tube Portable, by Herman Bernard, The Freshman Masterpiece, by Albert W. Franklin, The Importance of C Batteries, by John F. Rider, etc. Sent on receipt of 15c, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

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THE NEW 1-DIAL POWERTONE SET, by Capt. P. V. O'Rourke, appeared in RADIO WORLD dated April 17. Sent on receipt of 15c, or start sub. with that number. RADIO WORLD 145 W. 45th St., N. Y. C.

CONFESSIONS OF A SUPER BUG, by James H. Carroll, appeared in RADIO WORLD dated May 22, 15c per copy, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

individual particles grow together forming grains. The bar then actually develops a crystalline structure which may be seen with the naked eye if it is broken. The size of the grains depend upon the temperature, time, etc., of heating. The grains of a sintered bar when worked hot into wire are elongated, giving it a fibrous structure. If the wire is then reheated to a high temperature the fibers undergo a change and form new equiaxed grains.

Can Not Be Machined

Ductile tungsten is too hard and tough to be machined with tools, so other methods are used to obtain it in the desired form. Discs are punched from hot sheets, and various other forms are made by forging the hot sintered bars. Heavy sheets may also be sheared while hot to get the required shape. This metal has some very unique properties. It is almost unattacked by the common acids, such as hydrochloric, nitric and sulphuric of any strength, either hot or cold, and is not attacked by alkali solutions. It is also unaffected by damp atmospheric conditions. The tensile strength of small wires runs as high as 650,000 lb. per sq. inch, or several times that of steel. It has the highest melting point of all metals, and a weight exceeding twice that of an equal volume of iron.

The high melting point, tensile strength, low vapor pressure, under the best vacuum conditions, and some other qualities, make it a very desirable metal for lamp filaments and cathodes for radio and x-ray tubes. These have proved to be its most important uses. It is also extensively used in the electrical industry as a contact material where electrical circuits have to be made and broken frequently, as in magnetos, distributors of automobiles, and voltage regulators.

Used As Phonograph Needles

A very valuable use has been made of it as a target in x-ray tubes. Phonograph needles are also produced with a tungsten point. Its use as a heating unit in tube form, and as a heater-winding, has been of very great value in electric furnaces, where the metal is protected from oxidation at high temperatures by a vacuum or an atmosphere of hydrogen.

A temperature of 2,500°C can be obtained in a few minutes in the tungsten tube furnace, while in the resistance type, the temperature is limited only by the melting point of the refractory material upon which it is wound.

Tungsten has also taken a prominent place in the field of metallurgy. Alloyed with iron and cobalt it is used as a permanent magnet material. Alloys of tungsten with iron, and iron-chromium-manganese, etc., are used in the production of "high speed" steels. Tools made from these alloys are capable of taking heavy cuts from steel at high rates of speed, thus saving much time and money for industries using them. Much heat is generated in such an operation, but still the tool maintains its cutting edge. Carbon tool steels would lose their cutting properties under such conditions in a very short time.

Compounds of tungsten are used as fire-proofing materials, for weighing silks and in the arts for producing bronze colors on glass and porcelain.

There is probably no other metal, after being obtained in a workable form, that has had such a rapid rise to industrial importance as tungsten.

Broadcast Jazz Aids Terrell in His Garden

WASHINGTON.

Chief Radio Supervisor W. D. Terrell has made the discovery that an application of jazz music helps his garden grow.

Mr. Terrell works in his garden every evening after he has completed his duties at the Radio Bureau. He has found it a good way of relaxing after the many and perplexing problems presented by the broadcasting tangle.

To help the cure along, Mr. Terrell put his radio set on the porch so that he might enjoy broadcasting while working. Mrs. Terrell does the tuning in while Mr. Terrell fights the weeds and potato bugs.

One evening after a steady diet of jazz Mr. Terrell discovered that his garden looked better than on previous occasions. He tried out the jazz experiment again with even better results. At the present time he is giving his garden two or three hours of jazz each week.

Mrs. Terrell thinks that the jazz music inspires Mr. Terrell to harder work and that the good results are obtained in that way rather than through direct appreciation of the music by the vegetables.

TABLE FOR CONVERSION OF FREQUENCIES AND METERS appeared in RADIO WORLD dated May 1, 1925. Sent on receipt of 15c. or start your sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

DESIGN DATA FOR RADIO TRANSMITTERS AND RECEIVERS by M. B. Sleeper, sent on receipt of 75c. The Columbia Print, 145 W. 45th St., N. Y. C.

Run-Down Ear Phones Greatly Reduce Volume

A poor headset can cut down the audibility of reception signals to such an extent that the average fan believes there must be something wrong with his receiver or the broadcasting station from which the concert is being received.

Many long-distance reception records are made or marred in the head phones and for this reason it might be well for fans who hope to carry phones with them on outings as well as for use in the home to be sure their head phones are the best obtainable.

Much thought and attention has been given to head phones by engineers. Tests have been made for reception with all types of receivers and under various conditions. The present head phones represent the very latest development in this branch of the accoustic art.

A head phone set consists of a metal diaphram rigidly mounted a fraction of an inch away from a pair of pole pieces, made of soft iron and magnetized by one or more permanent magnets. Around the pole pieces are wound many turns of very fine copper wire. The diaphram is normally under tension from the magnets in the poles, and when an electric current flows around the windings it changes the magnetic pull on the diaphram, causing it to vibrate and produce sounds.

COMING EVENTS

SHOWS

(Revised to date, corrections and additions solicited)

Aug. 21-28. Pacific Radio Exposition, Civic Auditorium, San Francisco. Pacific Radio Trade Association, 905 Mission Street, San Francisco, Cal.

Sept. 5-11. Los Angeles Radio Exposition, Ambassador Auditorium, Auspices Radio Trades Association of Southern California. A. G. Farquharson, Secretary, 515 Commercial Exchange Building, Los Angeles, Cal.

Sept. 10-17. National Radio Exposition, Grand Central Palace, New York City. Harold Bolster, Managing Director, Radio Exposition Corp., 1560 Broadway, New York City.

Sept. 13-18. Third Annual Radio World's Fair, New Madison Square Garden, New York City. Radio Manufacturers' Show Association, 611 Times Building, New York City.

Sept. 15-18. Akron Radio Show. Auspices Radio Dealers Association and "Times Press", George Missig, Secretary, "Times Press", Akron, O.

Sept. 20-25. Pacific Northwest Radio Exposition. Public Auditorium. George J. Thompson, Jr., Secretary, 411 Journal Building, Portland, Ore.

Sept. 20-26. Cleveland Radio Industries Exposition. Public Auditorium. George B. Bodenhoff, Manager, 511 Guarantee Title Building, Cleveland, O.

Sept. 25-29. Fourth Wisconsin Radio Exposition and Convention, Auditorium, Milwaukee, N. C. Beerend, Manager, P. O. Box 1005, Milwaukee, Wis.

Sept. 27-Oct. 2. Second Allied Radio Congress and National Radio Exposition, American Radio Exposition Palace, Chicago. Milo E. Westbrooke, Manager, 440 South Dearborn Street, Chicago, Ill.

Oct. 25-30. Second Annual Indianapolis Radio Exposition, State Fair Grounds. Auspices Broadcast Listeners' Association. A. J. Allen, Secretary, 1406 Merchants' Bank Building, Indianapolis, Ind.

Oct. 26-29. Sioux Falls Radio Show. Coliseum. Auspices Civic Club. Roger S. Brown, Secretary, Sioux Falls, South Dakota.

Oct. 30-Nov. 6. Third annual Brooklyn Radio Exposition, 23rd Regiment Armory. Stephen T. M. Edwards, Secretary, 4464 Cass Avenue, Detroit, Mich.

CONVENTIONS

Oct. 18-23. Jobbers and Dealers Convention. Southwestern states. Auspices St. Louis Radio Trades Association. William P. Mackle, Executive Secretary, 1207 Syndicate Trust Building, St. Louis, Mo.

Oct. 25-31. State Radio Dealer Convention. Auspices Radio Trade Association of Michigan, Convention Hall, Detroit. A. M. Edwards, Secretary, 4464 Cass Avenue, Detroit, Mich.

CANADIAN SHOWS

Sept. 13-18. Winnipeg Radio Show, Royal Alexandria Hotel. Auspices Canadian Exhibition Co., 204 King Street, East, Toronto, Canada.

Oct. 4-9. Montreal Radio Show, Windsor Hotel. Auspices Canadian Exhibition Co., 204 East King Street, Toronto, Canada.

Oct. 25-30. Toronto Radio Show, Coliseum, Canadian National Exhibition Grounds. Auspices Canadian Exhibition Co., 204 East King Street, Toronto, Canada.

Dellinger Visits Field to Safeguard 'Planes in Air

Marked efforts are being made by Government experts to perfect radio devices for guiding and further safeguarding airplanes in flight. To this end Dr. J. H. Dellinger and F. W. Dunmore, of the radio laboratory of the Bureau of Standards, recently visited the flying field at Dayton.

About five years ago the Bureau of Standards devised a system whereby aircraft were able to follow their course by the aid of radio signals. It requires no direction finder but only the use of regular receiving apparatus on aircraft and has since been used with considerable success by both the Army and mail air services, being in regular use at the McCook field air base at Dayton.

STATIONS

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WWL—Loyola University, New Orleans, La.. 275

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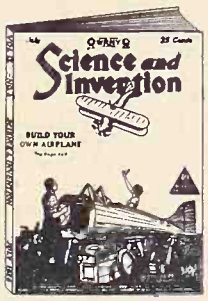

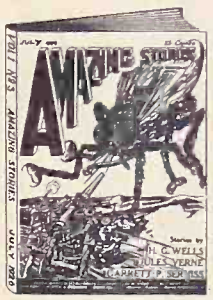

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B-Beauty S-Selectivity T-Tone purity 6-6 tubes

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

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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1926

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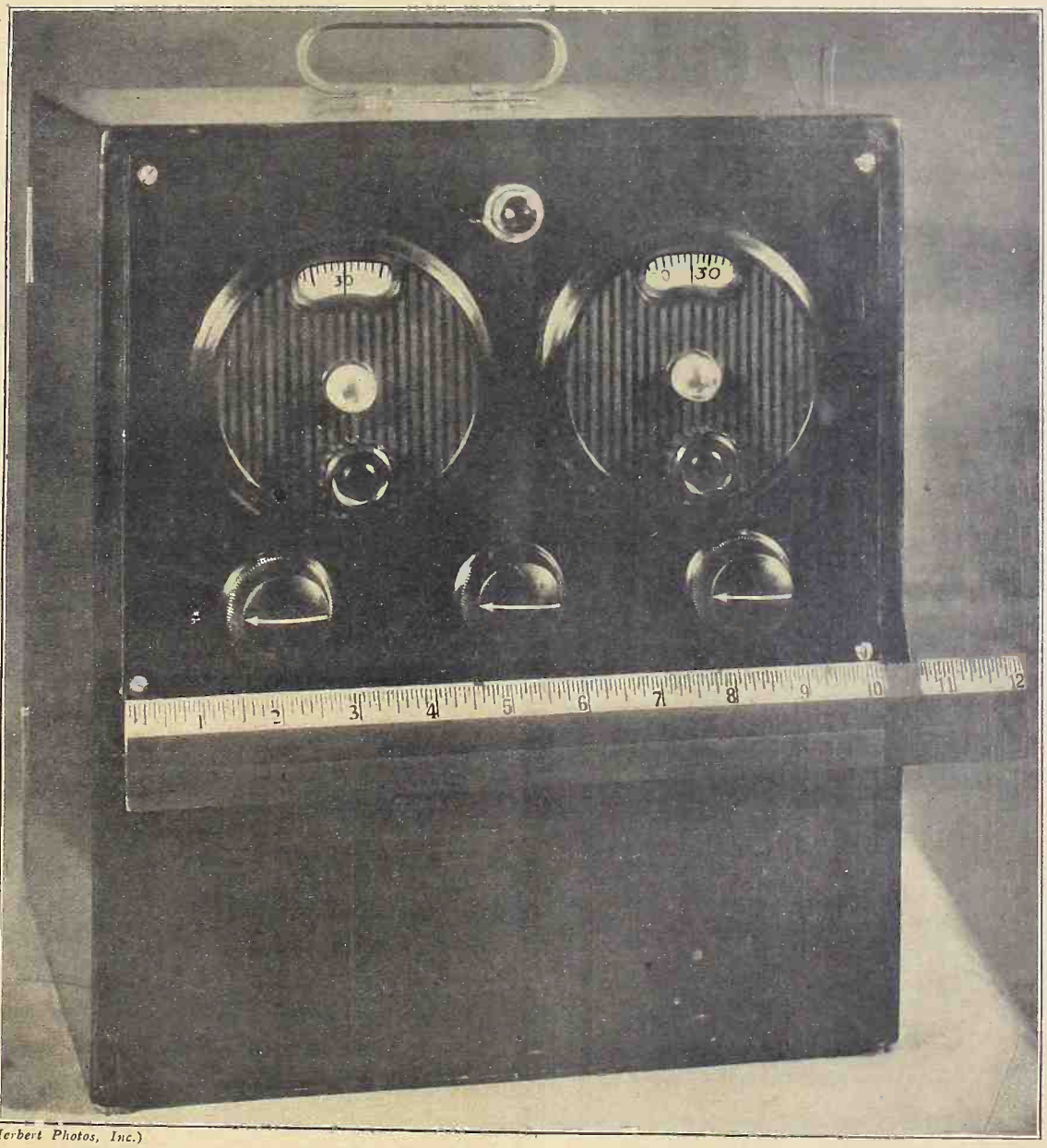

(Herbert Photos, Inc.)

THE VICTOREEN PORTABLE, in its carrying case, makes a handy self-contained set. The panel is 7x10". See page 3.

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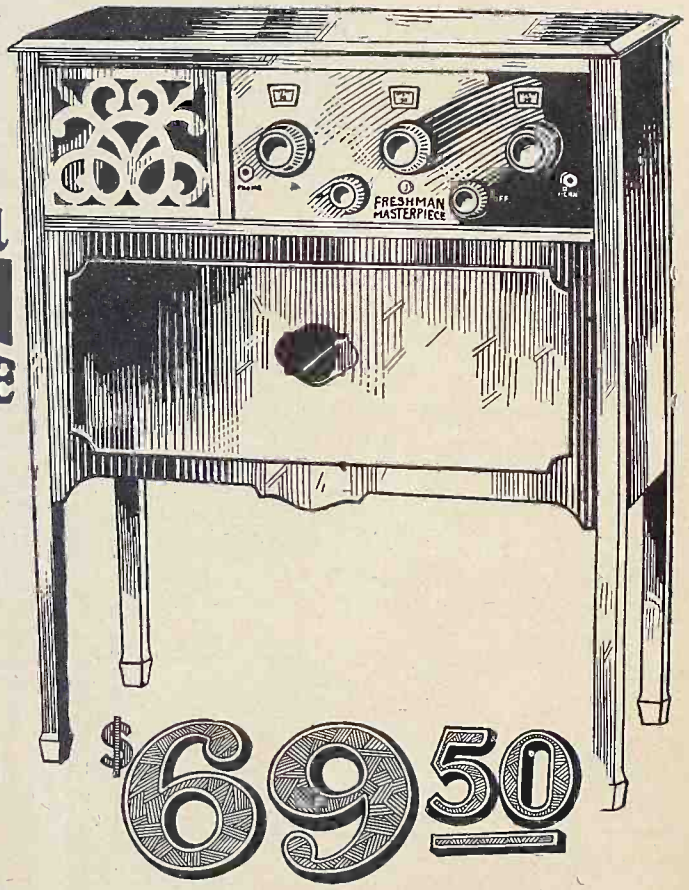
This BEAUTIFUL CONSOLE

This Wonder Set which is spreading entertainment, education and contentment in hundreds of thousands of homes in all parts of the world now has many additional points of superiority.



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The Victoreen Portable Set

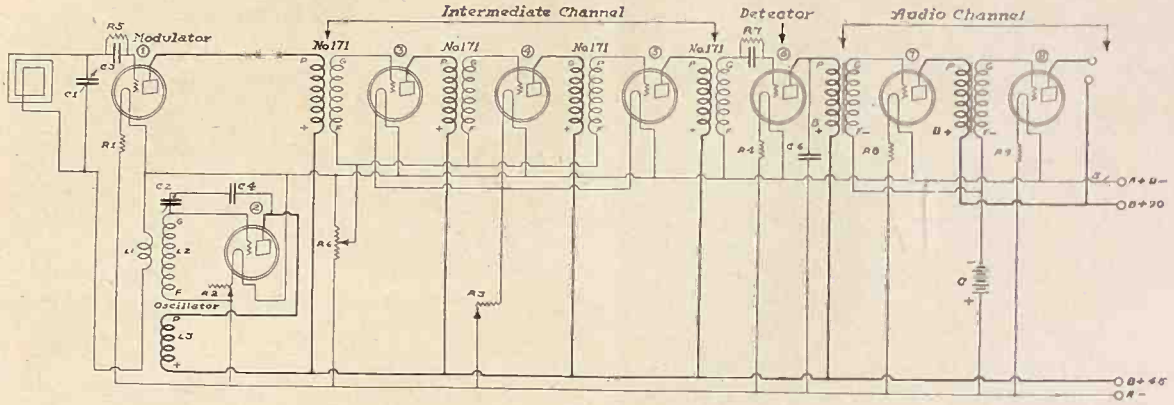


FIG. 1
The schematic diagram of the standard Victoreen Super-Heterodyne, one of the most efficient circuits so far developed, adapted to portable use. The fixed condenser C4 is a safety device, to protect tubes from blowout due to plates of C2 accidentally touching. Amperites replace rheostats at non-critical filament points of the circuit.

Extremely Sensitive Receiver Meets the Prime Requirement for Utility in Woodland, at Shore or on Lake—Set, Batteries and Speaker All Contained in 10x12¾x10¾" Wooden Cabinet — Has Only Two Tuning Controls — Good for Distance Work, Even in Summer.

By Herman Bernard
Associate, Institute of Radio Engineers

PART I

THE Victoreen Super-Heterodyne makes an admirable portable. Being extremely sensitive, it offers the very advantage which a portable set needs most. The Super-Heterodyne, as a circuit, independent of which particular one, best lends itself to portables, because it is the most sensitive hookup known. For those who want to lay out the extra money necessary to procure finest portable results, the Super-Heterodyne is the thing, and the Victoreen is the Super-Heterodyne. Results not as good may be obtained at less cost, using a tuned radio frequency portable.

The panel, strange as it may seem to say this, need be only 7x10" for the Victoreen Portable. The reason is that only few parts are located thereon, the other parts and the wiring being put on a sub-panel. In other words, the set is built deep, rather than wide. This offers an excellent opportunity for correct placement of all the parts, making for extreme compactness. Fortunately, too, it is possible to get a genuine mahogany cabinet, costing not more than $5, in which all the works may be placed, including the batteries and speaker. This cabinet has a swinging door, at the inside corners of which are pegs around which a loop may be wound. Only a loop is used as the pick-up medium, hence antenna problems are solved forever. The door may be swung through a 180° angle, and this of course is ample.

Good Reception Assured

Thus you may take this receiver anywhere and be assured of good reception, if reception is at all possible on any receiver. Just as it is, you take it out in your canoe, or in your automobile, and operate it simply by turning the switch and tuning in the desired station.

The distance range is adequate, since the Victoreen is noted as a DX-getter. The volume is good, too, because of the high degree of amplification obtained ahead of the so-called second detector. This tube, No. 6 in Fig 1, really should be called merely the detector. The first tube, No. 1 in the diagram, sometimes called the first detector, is really the modulator. The incoming frequency is modulated on the oscillator frequency (or the oscillator frequency is modulated on the incoming signel frequency, have it as you will) but the action is purely modulative, rather than detective, although the electrical operation of modulation and detector is much the same.

The diagram shows by indicating captions what are the component functions. The signal frequency is received on the loop by tuning the loop with C1 and turning the loop in the proper direction, and is introduced into the modulator tube. Hooked up with the modulator tube is an oscillator tube, No. 2 in the diagram. The coupling medium is L1, the two unmarked posts on the Victoreen oscillator coil. These posts occupy, by themselves, one side of the casing. Remember, later on, to reverse the connections of this coil to see which way gives the better results.

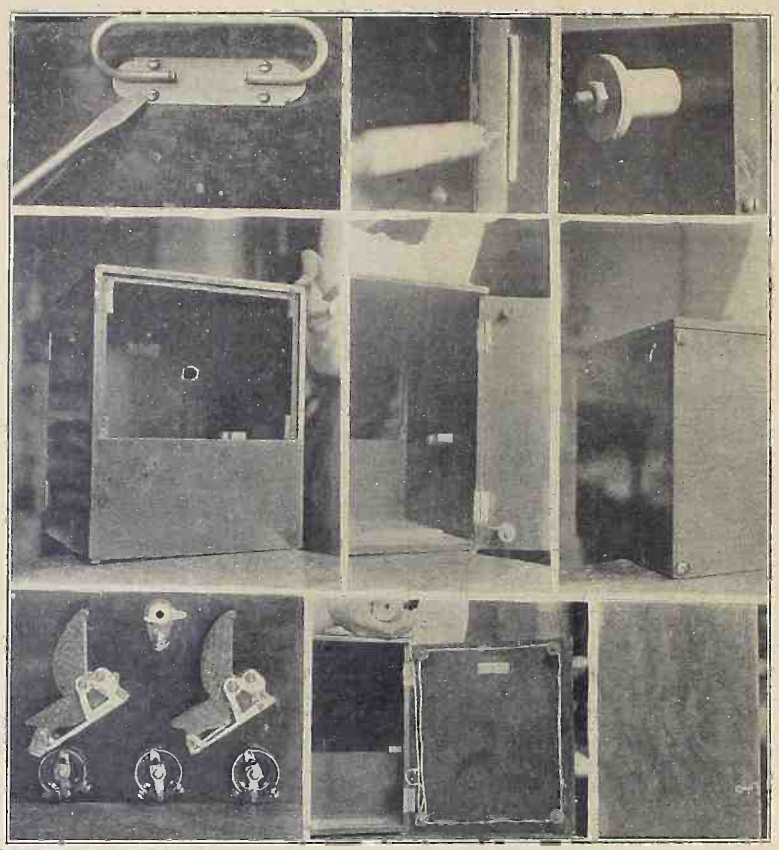
Fixed Condenser in Oscillator Hookup Provides Insurance Against Tube Blowout Due to Touching of the Plates of C2—Theory of Operation of the Set—99 Type Tubes and X Type Sockets Used Throughout — Standard Hookup Is Followed and Fine Results Are Assured.

The Intermediate Frequency

By turning C2 so as to make the oscillator circuit tune to a different frequency than the modulator circuit, the other frequency is obtained. This is known as the intermediate or medium frequency. Four No. 171 Victoreen transformers, specially suitable for the 99 type tubes used, are required in the intermediate channel. There are three intermediate stages. The reason why there are four transformers, although only three stages, is that one of the transformers is needed to couple the output of the intermediate channel to the detector input.

The signal received by the detector at

Panel Used is Only 7"x10"



(Radio World Staff Photos)

FIGS. 2 TO 10

The handle and how it is attached to the top of the case are shown at top. The Central strip, top to bottom, shows the hinge outside the box, next inside, and then again, where the loop winding method is depicted. The loop peg is at upper right. The other pictures show front cabinet view, rear panel, with parts mounted, and the manner in which the latches are attached. The cabinet bottom should have rubber feet.

Construction of the Cabinet Outlined — Small Panel Accommodates the Two Tuning Condensers, Two Rheostats, Potentiometer, Switch —Back of the Case Is a Door, Pegs Being Bolted Thereto and a Loop Wound on 8½x10½" Frame Thus Provided.

the intermediate frequency is chopped up in the detector, so that half the radio wave is eliminated, while the full audio wave is retained. The audio frequencies then are amplified in the audio channel and, for the first time, made audible.

The hookup is the standard Victoreen with two modifications which do not impair the efficiency in any way. The condenser C4, which is .006 mfd., is used as a safety device, so that if the rotor and stator plates of the variable condenser C2 should happen to touch, the tubes will not be affected, indeed nothing serious will happen, and all you need do is to straighten out the plates. If C4 were not included the touching of these plates, one set of which goes to A minus, the other to B plus, respectively through grid and plate oscillator coils, would put the 3½ filament volts and 45 plate volts, i.e., 48½ volts, across the filaments, thus burning out five of the tubes. The three Amperites would burn out, instead of the tubes they are connected to. The other modification is the inclusion of the three Amperites to eliminate rheostats there.

The Victoreen intermediate transformers and the Victoreen oscillator coil are marked for connections just as shown in Fig. 1. The audio transformers, which are Meloformers, selected because of their small size but high efficiency, are also marked on the instruments as in the diagram.

If Bruno straight line frequency condensers are used for C1 and C2, then the rotor plates should go to grid, and the stator plates should go to A positive, in the case of C1 (through the coupling coil L1), and to one side of C4 in the case of C2. All other makes of condensers should be connected the opposite manner, i.e., with stator plates to grid.

On the subject of variable condensers it is well to sound the valuable warning that physically small ones are necessary, especially if the straight line frequency type is used, as in the laboratory model. Otherwise you may have difficulty in properly mounting the variable condensers on the 7x10" panel, which must accommodate also the switch S, the 4" vernier dials, the two rheostats, R2 and R3, and the potentiometer, R6.

The cabinet used for housing the complete set, batteries and speaker, if not purchased in manufactured form, may be made by the home constructor, if he is inclined toward woodworking. He need not use genuine mahogany, but may select Southern pine, cedar, or some other suitable wood of at least ¼ or ⅜" thickness.

The cabinet outside dimensions are, at top, 10¾" wide and 10" deep. The cabinet is 12¾" high. Thus if ⅜" wood thickness is used, the panel is exactly 10" wide, and due allowance for any other wood thickness must be made, of course, so that the panel width is correct.

With the case turned around, so you are looking at the back, assuming the hinges are to be at right, make the door ⅜" shorter than the overall height of the case. As that height is 12¾", the door is 12⅜" high. Remember that the two sides, at rear, are shortened to a depth equal to the thickness of the door. The directions under (3) and (4) below take care of this. Likewise the bottom board is made ⅜" shorter than the top piece, or 10¾" by 9⅝".

When two hinges are put on the inside of the door, the one side piece is notched for these, and the rear will close flush with the overhanging top edge of the top board.

Hence there are six pieces of wood required:

(1) a top piece, 10¾x10".
(2) a bottom piece 10¾x9⅝".
(3) and (4), side pieces, 12¾x9⅝".
(5) the rear piece, or door, 12⅜x10¾".
(6) a front piece, 10¾x5½", the sides (3 and 4) being notched 5½" up from bottom to accommodate the front piece.

The use of ⅜" thick wood is taken for granted in these dimensions.

If the joints are made by 45° planes sawed to meet, the specified dimensions hold, otherwise (as if the top and bottom thickness is added) the case is 2x⅜" or ¾" higher.

[Part II of this article will be published next week, issue of July 3, and Part III, the conclusion, will be printed the following week.]

LIST OF PARTS

Four Victoreen RF transformers, No. 171.
One Victoreen No. 150 coupling unit.
Eight Na-ald X sockets.
Two .0005 mfd. Bruno SF condensers (C1, C2).
Two 4" Bruno vernier dials.
Two .00025 mfd. Electrodyne grid condensers, with mountings (C3, C5).
Two Arthur H. Lynch 5-megohm grid leaks (R7, R5).
One .006 mfd. fixed condenser (C4).
One .001 mfd. fixed condenser (C6).
One 400-ohm Victoreen potentiometer (R6).
Two Victoreen 30-ohm rheostats (R3, R2).
Three No. 4V-199 Amperites.
Two Meloformers.
One 7x10" panel.
Two sub-panels.
Two phone tip jacks.
One Bruno battery switch (S).