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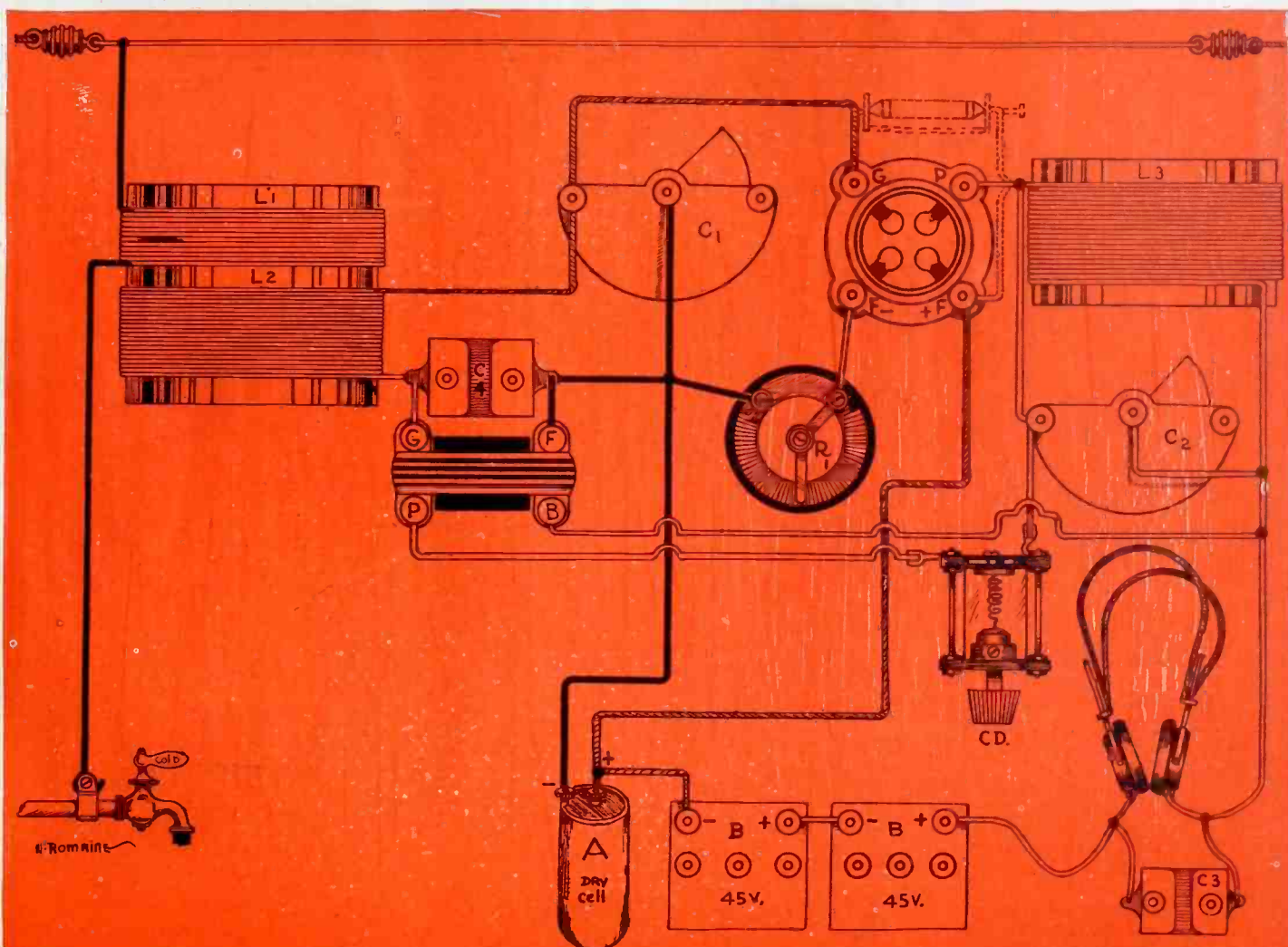
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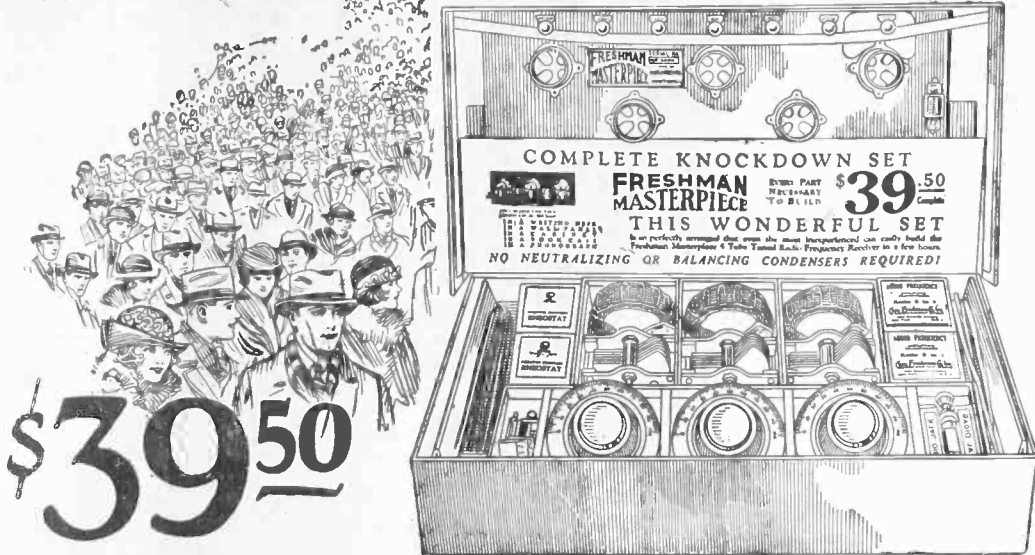
Picture Diagram of the Wiring of the Simplest Reflex Set



THE SIMPLEST 1-TUBE REFLEX (Fig. 2) shown in asymmetrical form. The dotted lines show a variable resistance to be used only if signals do not come in clearly. Few will find the resistance necessary. See article on page 4.

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A 1-Tube Reflex for the Novice

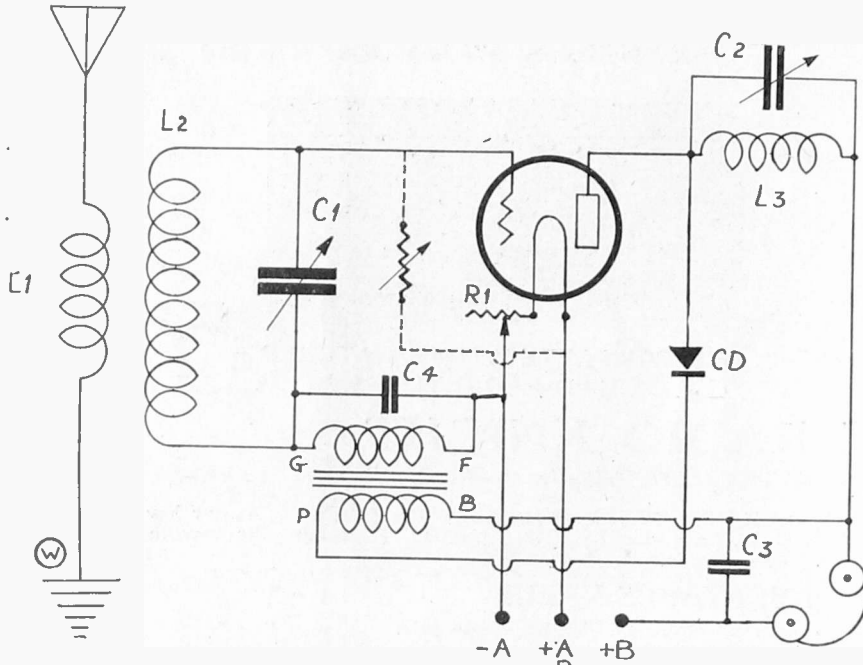


FIG. 1, circuit network of the simplest reflex, embodying a stage of tuned radio-frequency amplification, crystal detector and a reflexed audio stage. The tone quality is superb. Also, the set is capable of some good DX work. The novice usually finds it confusing to follow the reflex part of the hookup, where the crystal's audio output is delivered to the g of the tube. The grid return of the secondary coil L2 goes to the G or S1 post of the audio transformer, whose F or S2 post goes to A battery minus. The fixed condenser C4 is connected across this secondary of the audio transformer (G and F posts). The crystal is shown connected to the P post of the audio transformer, but in the assembly it may be easier to make this connection to the B post, the end of the coil L3 going to P. This reverses the direction of current and sometimes helps to stop undesirable audio feedback. If audio feedback is not cured by this method use a variable resistance, maximum 100,000 ohms. This is shown in dotted line, connected like a gridleak, from the G post to the F+ post of the socket. See picture diagram on front cover.

lel holes in the form, $\frac{1}{2}$ " from the top, to anchor the primary, wind twelve turns in either direction, terminate, and anchor as before. It is a good plan to leave about 6" of slack for later connections. This large excess may be cut down when you find just how much wire is needed to join to the aerial and ground leads. Now leave $\frac{1}{4}$ " space and wind the secondary, L2, which consists of 44 turns of the same kind of wire wound in the same direction as was the primary. With a .0005 mfd. variable condenser (normally 23 plates) this inductance will enable constructors in most instances to tune to the entire broadcast band of wavelengths, and perhaps 20 meters beyond. Aerial, local conditions, placement of parts in the sets and other considerations affect this point. Normally, with an aerial system 100 feet over all (including the outdoor aerial, its lead in and the length of the wire connecting to ground or cold water faucet) you are almost sure to hit it right.

For the plate coil, which is wound on the shorter tubing of the same diameter, it is well to wind 32 turns, in either direction, and then wind five more turns, making tap loops at each of those five turns. The object of this is to enable you to match up the two inductances L2 and L3 with whatever .0005 mfd. variable condensers you are using, so they tune in step. Thus not only may you log this set (which is true under almost any conditions) but each dial reading will be about the same over the whole band. The plate coil, therefore, consists of 37 turns, the last five turns with a small loop on each. The loop taps are regarded as the end of the coil. Try them all.

The terminals are anchored as was done in making the other coil (L1 L2) and the insulation is scraped off each tap loop.

Those are the only inductances used in the set and they are simple indeed to make. Some may prefer commercial products. The radio-frequency transformers and plate coils made by Wallace, Globe, Eastern Coil Co., ARC and other concerns, designed for operation with a .0005 mfd. variable condenser, may be used successfully in both cases.

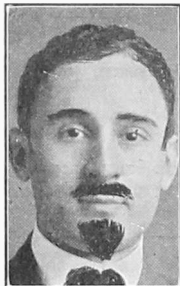
Panel and Assembly

The panel and assembly layouts are shown in combined form in Fig. 3. The crystal detector is mounted at right, lower. This has a rotatable knob on it and is of the semi-adjustable type. The rheostat is at lower left. The two dials, each 4", are shown. They need not be equipped with vernier. The only other object appearing on the panel front is the single-circuit jack.

The dimensions for drilling are given in the assembly panel layout, except the drill holes for the mounting-screws of the rheostat and variable condensers. These are furnished with the condensers. If you are using condensers you have around the house, and the templates are missing, you may safely drill the center-shaft holes in each instance, using $\frac{1}{4}$ " drill, then place the screws in the condenser front and hold the condenser as if it were already mounted.

By Feodor Rofpatkin

MANY experimenters rather new to radio have had in mind the building of a reflex. They have heard fearsome things about home-constructed reflexes, one common cause of complaint being inability to make the set reflex. This has been due mostly to audio feedback. That is, audible sounds, instead of going to the phones almost exclusively, have been running races with themselves through the circuit. That is indeed a trouble that may arise. But in this circuit the chances are about ten to one that such results will not ensue. Those who do experience the difficulty mentioned should reverse the connections to the primary of the audio-frequency transformer. Instead of one side of the crystal going to the P or P1 post of the audio transformer it would go to the B or P2 post. The end of the plate coil, L3, would then go to P or P1



FEODOR ROFPATKIN

(the posts are marked one way or the other on various types of transformers). These two connection posts are to the primary of the AFT.

As a further means of meeting this difficulty, should it arise, a system of blocking the audio feedback by means of a variable resistance, maximum value 100,000 ohms, is shown by dotted lines in Figs. 1 and 2. However, even the novice should not be halted by these frank statements of possible (but not probable) sources of trouble, but should begin to enjoy the fun of experimenting with reflexes. Even the tried experimenter, if he has not constructed this reflex, should sample it, for it is capable of a richness of tone that is truly delightful. Besides, it's very simple and inexpensive.

The Coils For the Set

The coils may be made at home very conveniently. Use cardboard tubing, 3" diameter, for both forms. One form is 4" high. The other preferably should be 3" high, to take up less room. If some forms other than cardboard are at hand you may use them. On the higher form the tuning coil is wound (L1 L2). It is a radio-frequency transformer of the tunable type. Using No. 22 double cotton covered wire, after puncturing two paral-

How to Make the Reflex Coils

Now with scribes draw circles, passing the scribe's point around the rim of the screwhead. In a pinch a sharp-pointed pencil will do. If this proves unhandy (due to the type of condenser used) you may scratch radiating lines, beginning at the rim of each screwhead and continuing outward for perhaps $\frac{1}{2}$ ". Be sure not to move the condenser during this operation. See that all marking is done on the back of the panel. Using the circles as your guide, determine the center of each, centerpunch this, and drill from back to front of panel until the drill just emerges, then complete the drilling from the other side to avoid chipping the panel. If hard rubber is used, such as radion, it will not chip. Bakelite may.

The assembly plan shows where to mount the audio-frequency transformer, which is sometimes a problem for the novice, who is tempted to place it much nearer the crystal than is shown.

Tubes

The best tubes to use in this reflex are UV201A or C301A, which have the same characteristics, being made in the same manner for two different concerns. But such tubes require a storage battery and very likely experimenters would prefer greater economy. This may be practiced at little sacrifice in results by using the WD11 or WD12 tube (these two tubes are identical except for the type of socket they require). A $1\frac{1}{2}$ -volt dry cell constitutes the A "battery." It is preferable to use the 11 or 12 tube if dry-cell operation is the goal, but those who have a 199 or 299 tube at hand may use that, with a $4\frac{1}{2}$ -volt dry-cell A battery. Good results will obtain. The Sodian tube can not be used in this circuit.

B Batteries

The B batteries should consist of two 45-volt units, connected in series, that is, the minus of one 45-volt B battery to the plus 45 of the other. That leaves two free extreme terminals, a minus post and a plus 45-volt post which (due to the series connection) is really 90 volts. Try various B battery voltages from $67\frac{1}{2}$ to 90.

The manner of making external connections (aerial, ground and batteries) is left to the experimenter. Leads may be brought direct from the aerial, ground and batteries to their respective points of introduction in the circuit, or a terminal block may be used, the external connections being made to binding posts on the block, the corresponding connections from the block to the set being made from the parts of the circuit to the lugs under the binding posts of the block. If a block is used it may be placed at right, rear, on the baseboard, which is $6\frac{1}{2}$ " wide by 13" long.

A fixed crystal is not advisable, although sometimes this type functions splendidly. There is trouble in getting a good crystal for a reflex and even a good adjustable type will not be just right in an occasional instance.

Wiring Directions

1. Connect the A battery minus to one side of the rheostat R1 and the other side of that rheostat to the F— post of the socket. Connect the A battery plus direct from battery to F+ on socket. If a $1\frac{1}{2}$ -volt dry cell is used the outside terminal or pole goes to the rheostat, the central pole to the F+. This completes the A battery wiring.

2. Connect the aerial to the beginning 2., or top of L1, the primary or small winding on the higher form, the end of that winding to the ground. The beginning or top of L2 or secondary on this form goes (a) to the stator or fixed plates of the variable condenser C2 and (b) to the grid or G post of the tube. The other terminal or end of L2 goes to the

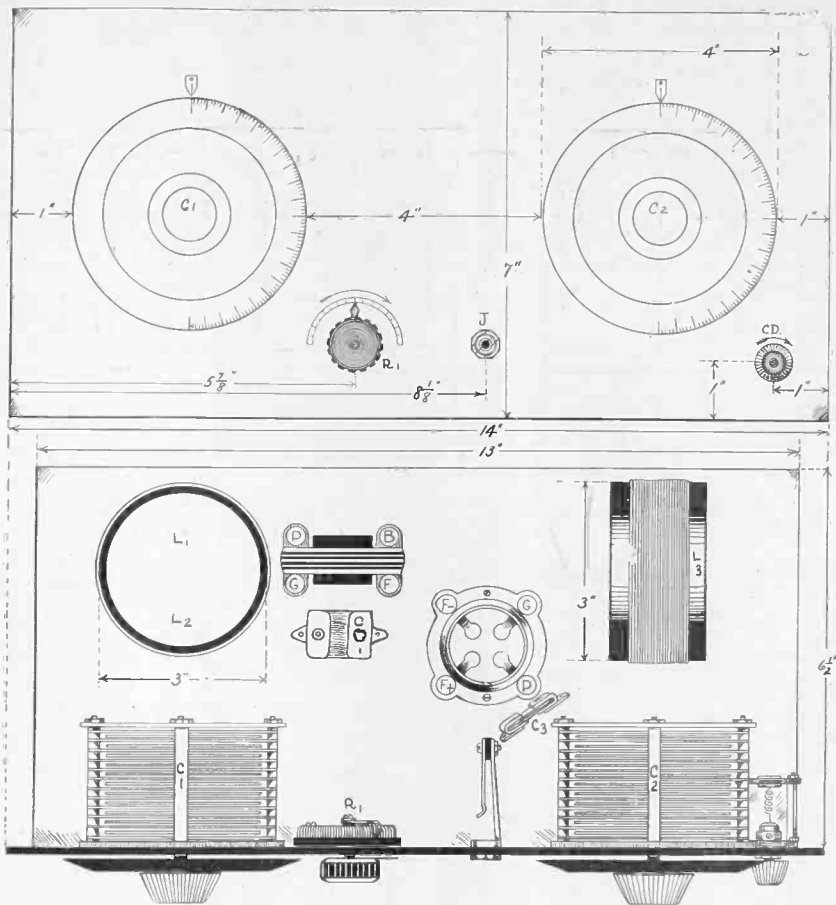


FIG. 3, combined panel layout and assembly plan of the simplest reflex, designed especially for novices. The crystal is panel-mounted, at right. A lead from one side of the crystal would more conveniently connect to the B post of the AFT than the P post, but try both options.

List of Parts

- One panel, 7x14".
- One baseboard, $6\frac{1}{2}$ x13".
- One cardboard tubing, 3" diameter, 4" high.
- One cardboard tubing, 3" diameter, 3" high.
- One-quarter 1-lb. No. 22 double cotton covered wire.
- One audio-frequency transformer (preferably not more than 5-to-1 ratio).
- Two .0005 mfd. variable condensers, normally 23 plates. (C1C2).
- Two fixed condensers, one .001 (C3), the other .002 (C4).
- Two 4" dials.
- Two dial pointers.
- One 6-ohm rheostat (R1).
- One WD 12 tube.
- One standard socket.
- One $1\frac{1}{2}$ -volt dry cell.
- Two 45-volt B batteries.
- One Freshman crystal detector (CD).
- One pair of earphones.
- 100 feet of aerial wire; 50 feet No. 14 insulated leadin wire; solder, lugs, hardware, lightning arrester, internal connecting wire, such as round tinned busbar or No. 18 double cotton covered wire.

the audio-frequency transformer. The F post (or S2) of this AFT goes to A BATTERY minus. C4, the .002 fixed condenser, connects across the AFT second-

ing to the G or S1 post, the other side of the fixed condenser to the F or S2 post.

3. The P or plate of the tube is connected (a) to one terminal of the plate coil L3, (b) to one side of the crystal and (c) to the stator plates of C2. Two lugs designate the crystal connecting points. Use either. The other terminal of L3, plate coil, goes (a) to the remaining unconnected rotor plates of C2 (b) to one of the connections on the single-circuit jack, preferably the spring, and (c) to the B post or P2 of the audio-frequency transformer primary. The P post or P1 of this primary connects to the other side of the crystal. These two leads, to P and B or to P1 P2, constituting the primary posts of the AFT, are the ones that are reversible.

4. A .001 mfd. fixed condenser (C3) is connected across the jack, that is, one side of the condenser to the spring already connected to L3, the other side of the condenser to the remaining unconnected side of the jack. To this side of the jack (the side opposite the one that connects the coil i.e., the right-angle of the jack), join the B+ 45-volt post of the battery opposite the one with the unconnected minus post. This is 90 volts.

Now turn up the rheostat. If the tube lights, connect B— to A+.

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A Set for Professional Folk

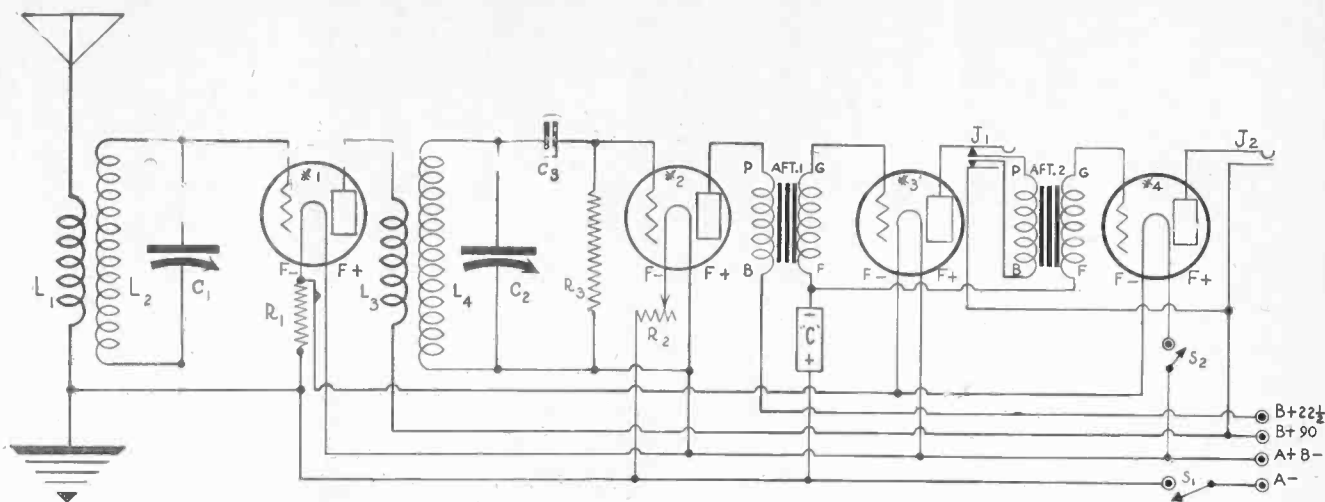


FIG. 1, schematic wiring diagram of a 4-tube circuit especially attractive to the professional man. It combines ease of tuning with quietness, no radiation taking place. The circuit comprises a stage of tuned radio-frequency amplification, tube detector and two transformer-coupled audio stages. The wiring of L2 and C1, while unconventional, is correct, and the reasons therefor are explained by Lieut. Peter V. O'Rourke in the accompanying text.

By Lt. Peter V. O'Rourke

A SET that appeals to the professional man, because of the simplicity and quietness of tuning and the dependability of operation, is one embodying a stage of tuned radio-frequency amplification, detector tube and two stages of transformer-coupled audio-frequency amplification. As no regeneration is used it is necessary to incorporate the radio-frequency stage to obtain sufficient selectivity to meet the needs of the day. The selectivity factor is daily becoming more important, although it does seem that the separation between any two stations on neighboring wavelengths is now as small as it can safely be. In some cases it is only ten kilocycles.

Normally a stage of tuned RF and a tuned detector stage will not give sufficient selectivity to meet the requirements in cities. In the large centers there are more broadcasting stations, hence there is greater danger of getting signals from two stations at once. This will happen even on some excellent sets, but the stations may be separated on such sets. It is no uncommon thing to tune a Neutrodyne, for instance, so that two or even three stations are heard at once, but by readjusting the dials to their correct setting for the desired wavelength the interfering stations may be eliminated. The Neutrodyne or the equivalent circuit (two stages of RF ahead of a detector tube) meets present needs, but it would hardly be safe to have a circuit much less selective than that type. The present one approximates the Neutrodyne in selectivity. The novel method of connecting the secondary of the aerial tuning inductance adds to the selectivity. If the conventional method were used, with a grid return to the negative A (or both to negative A and ground) there would be less selectivity and more volume. As the set gives all the volume that one desires, the gain in selectivity is made at little sacrifice. The absorption method is used in tuning the secondary of the aerial inductance. The gain in selectivity is about 19 per cent.

If it is found that all selectivity needs are satisfied, and the home constructor desires to connect the secondary L2 in standard fashion, he may do so experimentally, but I am free to say that he will probably change over to the original method shown in Fig. 1.

Another alternative is the connection of the ground lead to the filament instead of to the battery direct. Fig. 1 shows the

ground going direct to negative A battery. The home constructor should try this connection made instead to the socket (filament) side of this lead. Thus the ground lead would not be in series with the balanced resistance R1, shown in Fig. 1.

Characteristics of the Circuit

The tone quality produced by this circuit is excellent. Normally the absence of regeneration preserves the tone quality (although the opposite it is true in the Superdyne).

The circuit is not critical in any respect. Anybody in the family can tune it. There are only two controls. One rheostat is employed for the filament of the detector tube (No. 2), the three other tubes being controlled automatically by the balanced resistance R1. A double-circuit jack is provided for the first audio stage output, as sometimes local stations may come in with enough volume to operate a speaker from this stage, or, if such condition does not prevail, this jack may be plugged in for earphone operation. The other jack, J2, is a single-circuit one and is for speaker output. The two switches serve an exceptionally useful purpose, one cutting off the last audio tube when the plug is in the first jack, J1, the other turning off the entire set. As I said before, the circuit is not critical in any respect, hence once the detector rheostat knob is placed in its proper position, and S2 turned on (closed circuit), the speaker being plugged in the last stage, the set may be turned on and off simply by pulling out or pushing in the switch S1. If the last audio tube is to be turned off, the switch S2 is used, cutting off the A current from that tube completely (open circuit). The plug in that case is inserted in J1. Hence the switch S1 in any case turns on or off so much of the set as was in use or turns on so much of it as is desired. If S1 turns off one tube it always turns off all tubes. If it turns on one tube it turns on either three or four tubes, depending on how S2 is set.

The set is fairly good on distance, but is not essentially a DX set. Although greater distances are receivable, no more than 500 miles on speaker operation should be expected.

Parts Used in Set

The two coils used are duolateral or honeycomb coils, each 75 turns. Base-board mounts hold the coils secure. Fifteen turns are removed from each coil and rewound to constitute the respective primaries. They may be wound on a small vaseline bottle removed and

bound with thread. This kind of radio-frequency transformer was fully described by Herbert E. Hayden in the February 14 issue of RADIO WORLD. The variable condensers should be low-loss. The terminal block preferably should be severed, so that the aerial and ground leads will be at left (Fig. 3) and the battery leads at right. This sometimes helps to avoid capacitive coupling, harmful in radio-frequency circuits.

Any good grade of audio transformers may be used. The important factor is that they should be of good make. The turns ratio is a secondary consideration. Usually 5-to-1 is a high enough ratio for any purpose. If transformers of different ratios are used, put the higher ratio in the first stage (AFT. 1, Figs. 1 and 3). The dials should be 4". No vernier is necessary. A C battery is used for negatively biasing the grids of the two audio tubes. This saves B battery consumption, tends to minimize distortion and occasionally increases volume. The tubes should be UV201A, or C301A throughout. If dry-cell operation is desired (with a slight volume drop) use WD11 or WD12 tubes with four 1½-volt parallel-connected No. 6 dry cells. The WD11 requires a special socket. The other tubes fit in standard sockets.

Tuning in Step

The set may be logged, even tuned in step, and this is possible at the very beginning of tuning, if the same kind and make of variable condensers are used. They are .0005 mfd., normally 23 plates. If different makes of .0005 condensers are used there may be some difference in dial settings as between the two condensers for a given station. If the difference is only a few degrees the dials may be made to tune virtually in step by tuning in a station, preferably above 500 meters, and readjusting one dial so that it reads like the other. If you have found that the highest wavelength station that you can hear comes in at dial settings (left to right) of 80 and 82, loosen the setscrew that holds the dial to the shaft of the left-hand condenser and rest the dial so that it, too, reads 82. That will avoid any possibility of a reading of zero on the adjusted dial before the plates are completely unmeshed. The only possibility then would be that not only would the plates be completely out of mesh at or before reaching zero (say, at 4), but that a lesser reading would again include some greater capacity, if the rotor plates have no endstop. However, no condenser should require readings above 90 or below 5 for condensers

Visualized Wiring of Set for Professional Men

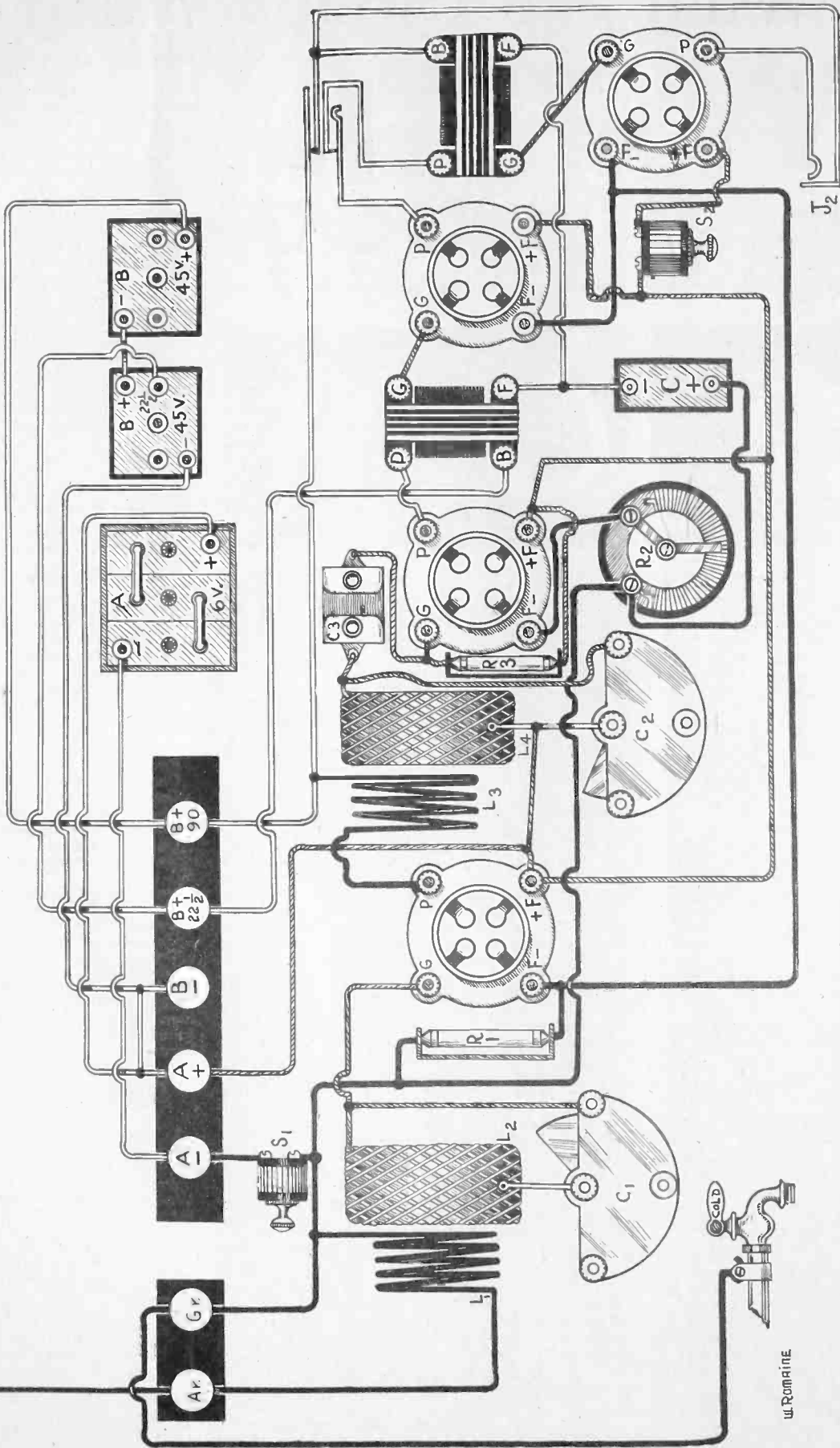


FIG. 2, picture diagram of the wiring of Lieut. O'Rourke's set, designed especially for professional men. The parts are designated to correspond with the lettering in the schematic diagram (Fig. 1).

W. R. MANNING

Visualized Wiring of Set for Professional Men

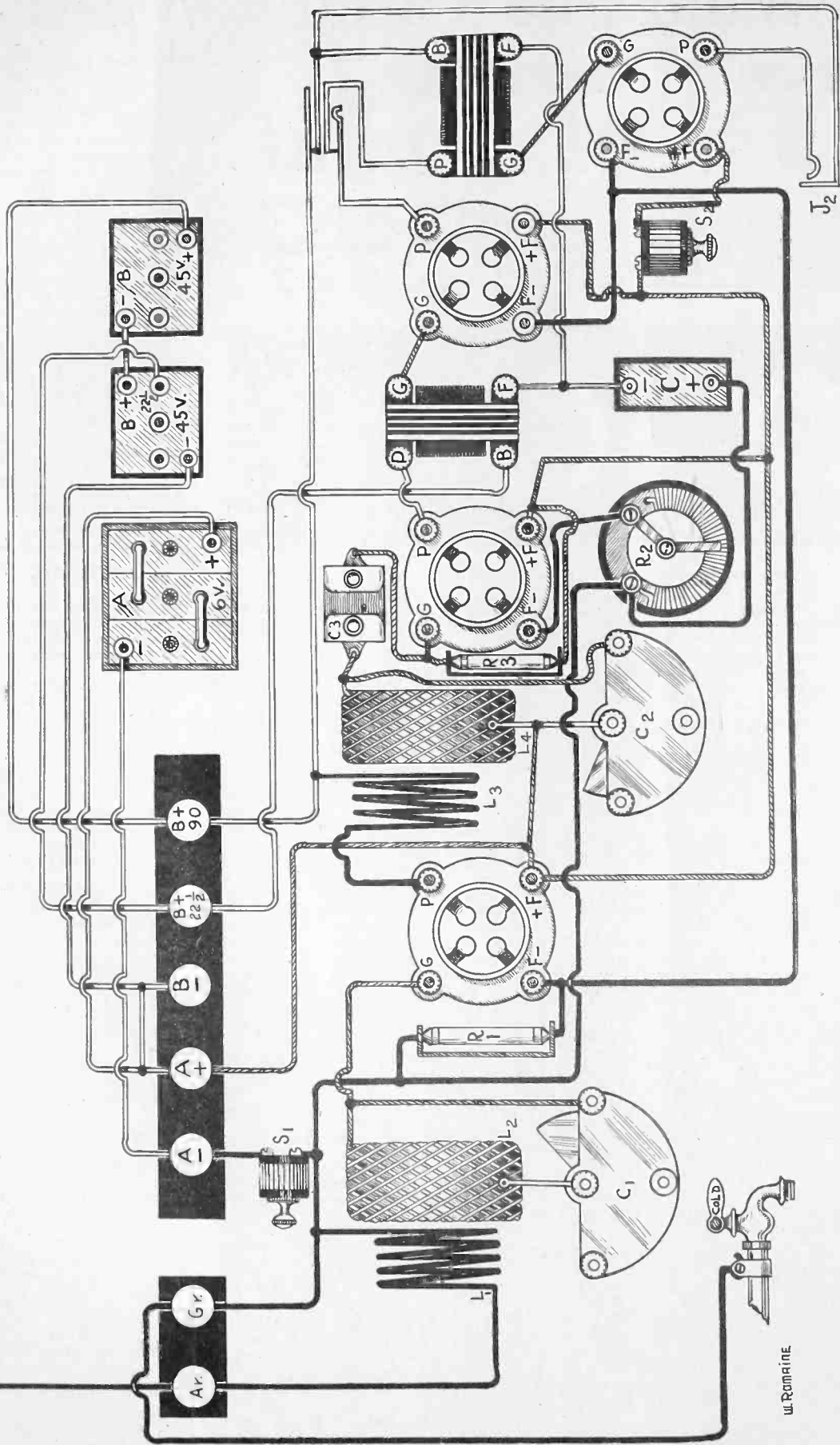


FIG. 2, picture diagram of the wiring of Lieut. O'Rourke's set, designed especially for professional men. The parts are designated to correspond with the lettering in the schematic diagram (Fig. 1).

What the Circuit Will Do

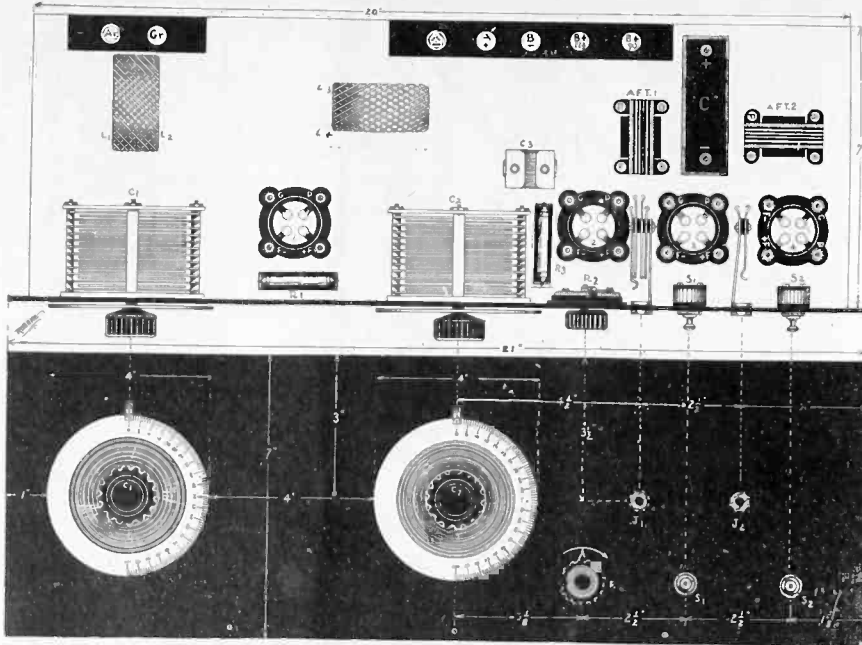


FIG. 3, the combined panel layout and assembly plan. The panel is 7x21". The first dial, at left, has its shaft 3" from the left end of the panel (allowing 2" for the radius of a 4" dial). The other dial shaft is 8" from the right of the C1 shaft. Both condenser shafts are on the midline 3 1/2" from top and bottom of the panel. The switch S2 is 1 1/8" from right, the switch S1 being 3 3/8" from right. The rheostat shaft is 3 3/8" to right of the vertical line on which the shaft of C2 is inserted. In the assembly note how the coils are mounted at right angles.

usually function less inefficiently at the upper and extreme lower reaches of their capacity range.

Wiring Directions

1. Connect the A— to one side of the push-pull switch S1. The other side of that switch goes to one side of the Amperite R1. The other side of this resistance goes to the F— post of the three amplifier sockets (one radio and two audio, Nos. 1, 2 and 3, Fig. 1). The A— (battery side) goes to one side of the 6-ohm rheostat R2, the other side of which goes to the F— post of the detector tube socket (No. 2). The A+ is connected direct from battery to the F+ posts of the three sockets at left (Nos. 1, 2 and 3). The A+ lead to the last audio socket (F post) is interrupted by the second switch S2. That completes the filament wiring. Try out the switches and rheostat and see that they work.

2. The aerial is connected to one terminal of the home-made primary L1 and the other end of the RFT to the ground. The secondary L2 is the 60-turn coil (75 minus 15 turns). The beginning of that secondary goes (a) to the stator plates of the variable condenser C1 and (b) to the grid or G post of the socket of the first tube. The end of the secondary goes to the rotor plates of the C1. (The beginning emerges from under the winding.)

3. The plate or P post of the first tube is connected to one side of the primary of the other RFT (L3) and the end of that winding goes to B+ amplifier voltage, usually 90. The grid condenser C3 is connected, one side to the G post of the second tube, the remaining unconnected side (a) to the beginning of L4, the remaining free secondary, and (b) to the stator plates of the second variable condenser, C2. The end of L4 goes (a) to the rotor plates of C2 and (b) to the A+. This connection may be made direct to the F+ post of the detector tube socket. The gridleak R3 may be mounted on the grid condenser, if the condenser has clips therefor, or if a special leak mount is used, the leak

may be connected from the grid post of the detector tube socket to the F+ post of that socket.

4. The plate of the detector tube socket is connected to the P or P1 post of the first audio transformer (AFT1). The B or P2 post of this AFT goes to B+ detector voltage, normally 22 1/2. These connections are to the primary of the AFT. The secondary is connected as follows: G or S1 to the G post of the third socket, F or S2 to the C—. This C— lead also goes to the corresponding post, S2 or F, of the second AFT. C+ is connected to A— (not to F—, which designates a socket post, as distinguished from A— which designates an unresisted battery pole or lead).

5. The plate of the third tube is connected to the outside spring of the double circuit jack J1, the right-angle or outside frame of the jack going to B+ amplifier voltage. The inside spring that was joined to plate is connected to the P post of the AFT2, the only remaining unconnected spring going to the B or P2 post of this AFT. The secondary is connected with the G post going to the G of the last tube, the F post already having been joined to C—. The plate of the last tube connects to the spring of the single-circuit jack and the right angle of that jack goes to B+ amplifier voltage. The B+ amplifier lead therefore is common to the end of L3 and the right angles of both jacks.

6. The joining of the ground lead conductively to the circuit has thus far been omitted, as this connection will be experimental with some. The lead is therefore not permanently made until the constructor is satisfied which way works best, and his own local conditions will govern the answer to a large extent. First try the switches and rheostat again. If the tubes light, then join B— and A+. Now connect a wire from the ground (or end of L1, primary of the first RFT, previously connected to ground) to the A—, battery side. Tune in stations. Now remove this connection to the battery lead and place it instead at the filament of the first tube (F— on socket). Note the

difference, if any. Watch the selectivity, using as your guide the number of degrees on the dial over which there is some audibility of the loudest station heard. You will find that selectivity is good. As a test, get another piece of wire, joining the ground to the end of L2, whose other connections remain the same. Leave the connection at F— back to A—. Then with the other wiring intact, connect to F—, instead of A—. This gives four options.

This is one of the least troublesome circuits that you can build. If there is not sufficient volume, or if extraneous sounds are heard, place a .002 mfd. fixed condenser across the primary of the first audio transformer. One side of the condenser goes to P, the other to B. If troubled with body capacity (from which this circuit should be singularly free) reverse the leads of the secondaries, L2 and L4. If more volume is desired (say, if some one in the family is partly deaf) and selectivity has proven all-sufficient, add about 35 feet to the aerial.

LIST OF PARTS

Two 75-turn Brantson lateral-wound coils. (L1L2, L3L4).
Two single mounts for the coils.
Two .0005 mfd. variable condensers (C1, C2).

One .00025 mfd. fixed grid condenser (C3).

One 2 megohm fixed gridleak (R3).

One gridleak mount (necessary only if grid condenser has no mounting clips).

Two audio-frequency transformers (AFT1, AFT2).

One 7x21" radion panel.

One 6 1/2 x 20" baseboard.

Two 4" dials (no vernier necessary).

Two dial pointers.

Four sockets.

Four 20A or 301A tubes.

One Amperite, type D11 (R1).

One 6-ohm rheostat (R2).

One double-circuit jack (J1).

One single-circuit jack (J2).

One phone plug.

Two push-pull battery switches (S1, S2).

One 4 1/2-volt C battery.

Two 45-volt B batteries.

One 6-volt storage battery.

One battery charger.

One loudspeaker.

100-ft. aerial wire, 50-ft. YNhradoradoa

100 ft. aerial wire, 50 ft. No. 14 insulated

leadin wire, lightning arrester, solder,

lugs, internal connecting wire (such as

round tinned busbar or No. 18 DCC wire),

hardware.

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A Honeycomb Crystal Receiver

By Raymond B. Wailes

A VERY simple crystal set and which can be built by anyone in a very short time is pictured here. One experimenter drilled the panel, mounted the instruments and soldered the connections in ONE HOUR. Coil winding is not necessary, yet different stations can be brought in with fair selectivity.

The switch shown cuts in any coil desired. The 23-plate variable condenser is then timed to bring the station in with increased loudness. Three honeycomb coils are used—25, 50 and 75 turns respectively.

The switch can have a dead tap or point, on which the switch should be left when the set is not in use.

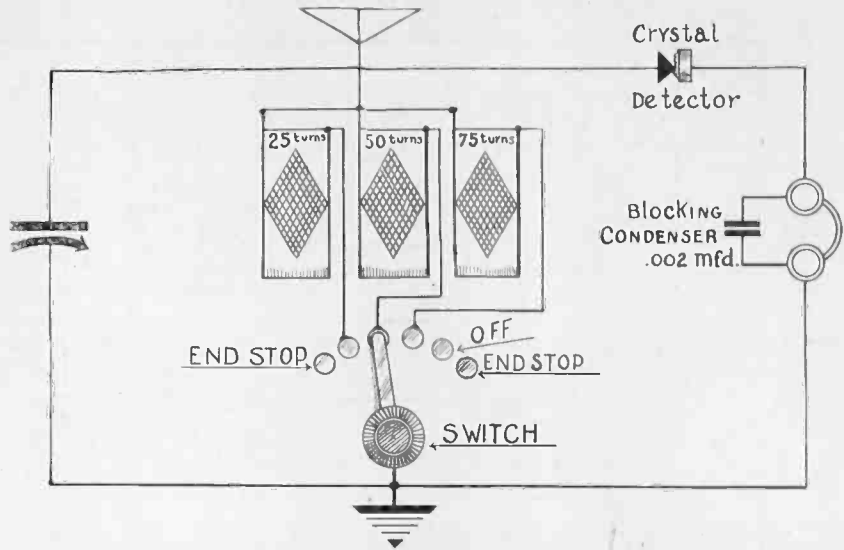
Either a fixed crystal or one of the catwhisker type may be used. If the fixed type is used it may be mounted behind the panel. Place a little slab of rubber bath sponge under it so that jars or knocks will not displace the permanent catwhisker. A movable detector, or one with the catwhisker, may be mounted upon the front of the panel so that adjustment can be made instantly.

It can be seen that only two controls are needed, the rotating switch and the condenser dial. A good arrangement is to mount the dial in the middle of the panel with the switch on the left and the detector to the right of the condenser dial.

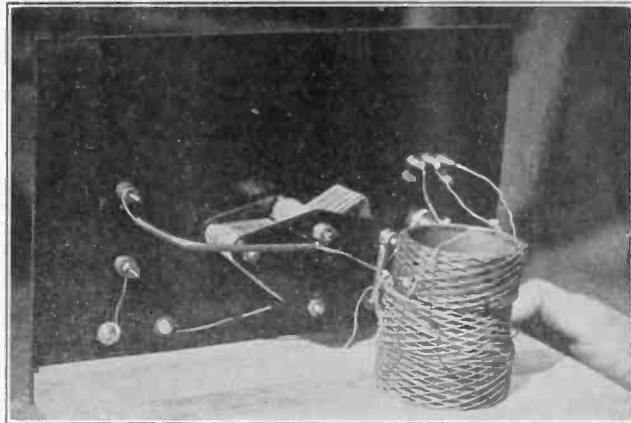
This type of crystal receiver is superior to the tuning coil or sliding contact type, and while not selective enough for use in big cities, is otherwise serviceable.

LIST OF PARTS

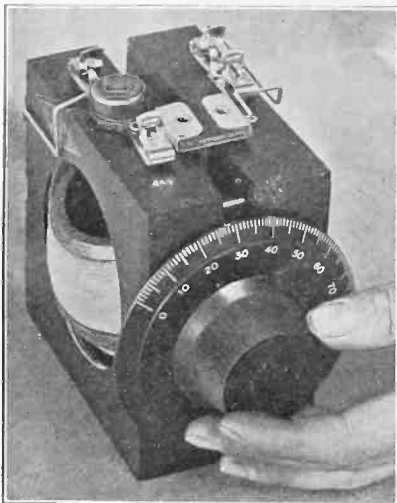
- One 7x12" panel.
- One 6½x11" baseboard.
- One 25-turn honeycomb coil.
- One 50-turn honeycomb coil.
- One 75-turn honeycomb coil.
- One crystal detector.
- One .0005 mfd. variable condenser (normally 23 plates).
- One tapswitch.
- Four tapswitch points.
- Two tapswitch end stops.
- One .002 fixed condenser.
- One pair of earphones.
- 100 ft. aerial wire. 50 ft. No. 14 insulated leadin wire, ground clamp.



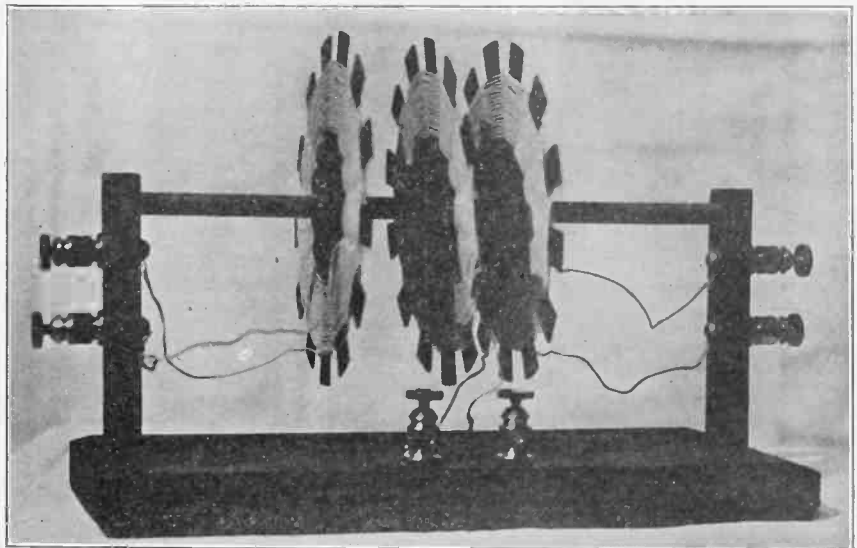
HOW the honeycomb crystal set is wired. Aerial goes to the beginning (inside terminal) of all three coils and to the stator plates of the variable condenser. The outside terminals go to the three switch points. The arm of the switch goes to ground, to the other side of the variable condenser, to one side of the phones and to one side of the fixed condenser. The other side of the phones and of the condenser go to one side of the crystal, the other side of which goes to aerial. Rear view of honeycomb crystal set.



VIEW of the coils in the set.



IF you happen to have a variometer you may build a complete crystal set on it. Connect the aerial to one end of the variometer, the ground to the other end. One side of the crystal also connects to the aerial, the other side of the crystal to one side of the phones. The other side of the phone goes to the ground. A .001 mfd. fixed condenser connects across the phones, that is, bridges the phone side of the crystal and the ground. This type of receiver is not quite so selective as the one described above by Raymond B. Wailes.



HERE is a tuning inductance which can be made from a baseboard, two stick uprights and a wooden dowel. The coil forms can be cut from cardboard. The left-hand or aerial coil is wound with 25 turns of No. 20 double cotton covered wire, the next or tickler coil is wound with 35 turns and the third or secondary coil is wound with 25 turns. The coils may be used in any hook-up employing such triple coils. The inductive relation is varied by sliding the coils on a glass tube such as is sold at any drug store. This eliminates body capacity effects. The aerial and ground posts are at left, the tickler or plate-B battery posts at front and the secondary posts at right.

The 1925 Model Superdyne

Your dealer may have a 6-volt dry battery in stock. That would do nicely for the Sodian.

Therefore, if 199 tubes are to be used, only three may be employed, the detector being a Sodian. The battery problem solution depends on individual taste. The purchase of 13 dry cells proves the more economical in the end, though I confess that 13 dry cells look like a young power plant. Yet they may be hidden easily enough in a box and cretonne used to beguile the unwary.

Storage Battery Better

As I said before, dry cells are an economical makeshift. A storage battery will prove more satisfactory in the end and if you are almost on the verge of being able to get one, wait until you reach that point and do so. If you stock yourself up with dry cell tubes the ultimate change to a storage battery will prove more expensive than you imagine. Selling your "second hand" tubes for more than 30 cents each is not easy. Your customer is likely enough a friend. If the tube is blown out by him or just goes dead inexplicably, he may not think so kindly of you as heretofore.

Yet many experimenters already have dry cells and tubes to match. Being desirous of constructing this circuit they seek information on how to do it and what to expect. I assure them they may safely expect a great deal.

Solving Some Problems

In Fig. 1, to insert the 6-volt battery, disregard the connections to the detector filament and instead connect one side of R1 to the negative of the 6-volt battery and the other side of R1 to F— on the socket. F+ goes to the positive post of the 6-volt battery. Don't forget to connect the 6-volt positive also to the other A+, thus to establish the B— connection.

A question that may arise is whether 4½ volts (a C battery or three series-connected dry cells) could not be directly fed to the detector filament, instead of 6 volts being fed to the rheostat, where more than 1 volt usually is "lost," due to the resistance. This could be done, but the filament would be "shy" ½ volt, needed when the battery weakens. It would be far preferable to use 6 volts and insert an Amperite in place of R1, if the rheostat is objectionable.

If a Sodian tube is used a grid leak (R2) is not necessary. The Sodian in construction and characteristics is different from the run of tubes.

Lest we forget. A dry cell's positive pole is in the center!

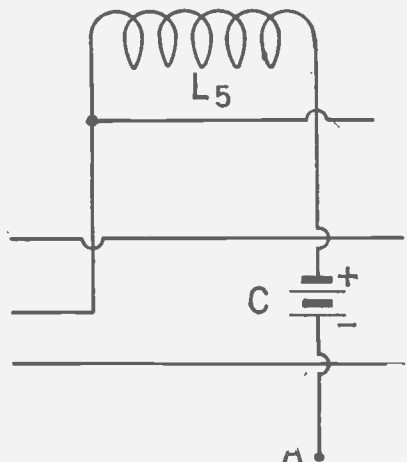
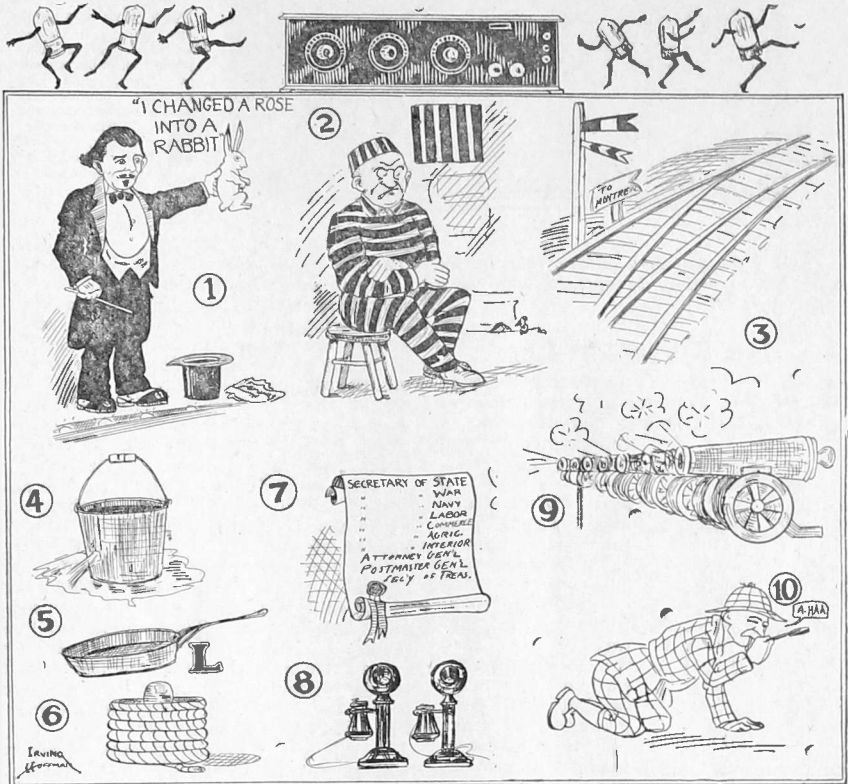


FIG. 2, detail of insertion of a C battery for positively biasing the grid of the detector tube. This detail is to be read into Fig. 1.

The Weekly Rebus

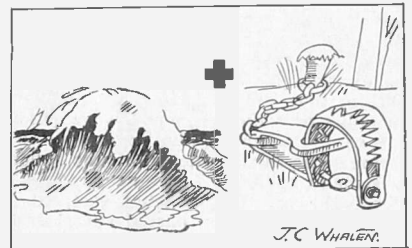


WHAT do these rebuses represent? Send answer to Rebus Editor, RADIO WORLD, 1493 Broadway, New York City.

The names of those sending the solution will be published.

Solvers of Previous Rebuses

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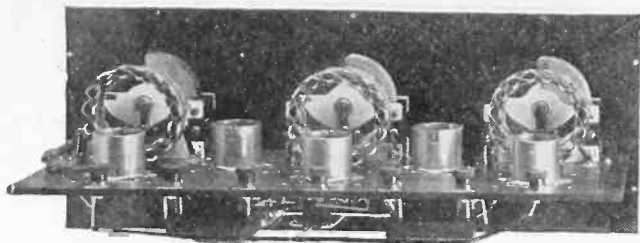
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- R. C. Fisker, 31 Cloverdale Ave., Upper Darby, Pa.
- S. W. Cassidy, Herkimer, N. Y.
- M. C. Williams, Box 353, Rantoul, Ill. (2).
- Norbert Radio Co., 638 W. 160th St., New York City.
- Harry Wilcox, 510 Tinsley Ave., Crawfordsville, Ind.
- J. F. Leverett, Willmar, Minn.

How to Install and Operate the Freshman Masterpiece



INTERIOR VIEW of the Freshman Masterpiece, showing sub-panel and placement of tubes, coils and variable condensers safely away from the audio transformers and wiring, which are below the insulated baseboard.

[This is the first of a series of articles for set owners, relating to operating the most popular circuits.]

By Brewster Lee

THE Freshman Masterpiece is a 5-tube receiver, comprising two stages of tuned radio-frequency amplification, a tube detector and two stages of transformer-coupled audio-frequency amplification. It is therefore a tuned-radio frequency set. The radio-frequency improves "distance." Another way of expressing it is to say that the radio-frequency amplification has the effect of moving the broadcast-



ing station very much nearer the receiver. Thus some distant stations may be received even like locals. The radio-frequency amplification refers only to the increased sensitivity produced in the receiver with respect to the waves as they travel through the air. They are inaudible in that state. After the built-up inaudible or radio-frequency wave passes out of the second radio-frequency tube it enters the third or detector tube, where it is made audible. The detector tube is at right, rear. The detected, rectified or audible signal is then passed successively through the first and second audio-frequency stages. Thus the signal, once it is rectified, may be heard. There is a jack provided so that earphones may be plugged in at the first AF stage. The other jack, at extreme left on the panel, is for the output of the fifth and last tube, and from this source a loudspeaker may be operated on locals and virtually every distant station that can be received at all.

The audio stages simply make the detected signal louder. Both the phones and loudspeaker may be used at the same time.

Tuning is Quietly Done

The tuning of the set is simple and should be quiet. There are three dials. The one at left tunes the first radio-frequency stage, the one in center tunes the second radio-frequency stage and the other dial tunes the detector stage. This tuning is done by rotating the movable plates of the variable condensers, to whose shafts the dials are affixed. There is no tuning of the audio-frequency or audible stages, and never is in any set. Such tuning as is done in the detector stage affects the signal before detection.

The dials may be set so that any receivable station within the broadcast band may be heard. That is, the combination of the capacities of the three variable condensers that are dial-rotated are so

matched with coils, called inductances, that the station having the lowest wavelength, as well as that having the highest, may be tuned in. The different wavelengths are assigned to stations by the Department of Commerce for the purpose of permitting many stations to be on the air at the same time. These different waves do not interfere with each other, if the set is selective enough. Selectivity is another way of expressing the ability to tune in a desired station to the exclusion of all others. This quality the Freshman Masterpiece possesses. Hence owners of this set, if they are troubled with interference, as this conflict of signals is called, should look to the tuning of the set, the trouble arising from incorrect dial settings. This applies to the factory-made set. When a set is made by a fan from a kit he may run into broad tuning difficulty, or other trouble, due to his failure to follow directions explicitly. This applies to all sets.

In tuning the Freshman Masterpiece it will be found that the dial settings for a given station may be almost in step. As a log should be kept, that is, a sheet showing the dial settings for the different stations, it makes no difference if the tuning is in step or not. It is in step, for instance, if a station comes in at the identical number on all three dials (19, 19, 19). That has nothing to do with the "loggability" itself, which simply means that the same stations do come in at the same combination of numbers on the dial in every case, though the numbers are not identical (18, 19, 23). In some sets one station may be heard at various combinations on the dials, but not on this set.

In the set I tested I found that the right-hand dial, tuning the detector circuit, ran a little ahead of the other dials. This advance could be offset for many settings by unscrewing the setscrew of that dial and affixing the dial 4 to 5 degrees to the right. However, this would cause the dial setting to lag on some of the lower wavelength stations, instead of leading, as previously. There is nothing much gained by tuning in step, and the approximation that the Freshman Masterpiece attains is amply satisfactory for all purposes. In fact log sheets are on the inside lid of the cabinet and by filling them out one may know just where to set the dials to tune in a given station. As for the favorite stations, everybody in the family will know the dial settings by heart within two days after the set is in operation.

Preparing For Final Log

Do not write down the dial settings on these sheets on the cabinet lid, however, until you have assured yourself that you know the best settings. Therefore make up a tentative log sheet of your own. It will consist of parallel horizontal lines across a page, with five perpendicular lines. In the margin at left write the

call letters of the station, in the next margin beside it the wavelength, and in the succeeding margins the settings of the three dials, reading left to right, just as your sheet does. On local stations on high wavelengths you may find that the settings for the two dials at left may be varied only slightly to bring in the station at all, yet the one at right may be given a wide sweep and still the station will be heard. However, there is only one point on the right-hand dial that brings in the station with greatest volume. The tests were made on stations WEAJ and WNYC for this condition. Of course there was no trouble at all in separating them, but there was a berth of perhaps two degrees on the right-hand dial that brought these powerful stations in with maximum volume. The stations were about 6 miles distant from the point of reception. So great was the volume that the loudspeaker rattled. The signals, as all transmitted sounds are called, were clear, but the speaker could not handle such tremendous volume, and it was a good speaker. Therefore the right-hand dial was turned a few degrees, the volume dropping until it was just suitable. This presents one of the exceptions to the rule about all stations coming in best at a given dial setting. Powerful locals may have to be detuned because the volume is too great. Therefore, the shifting of the detector dial to this position does not give the setting for another station of the same wavelength that isn't so near and powerful. An alternate way of reducing the volume would be to turn the rheostat so that the filament of the detector tube is heated at a lower temperature. As the rheostat setting otherwise would be constant some would prefer this constancy and detune the set as was described, when faced with this problem of too much volume. Of all the problems in radio, the one of excessive volume is perhaps the most delightful.

On the lower reaches, say below 300 meters, latitude of tuning with any dial does not exist.

After you have tuned in several stations to your satisfaction it is then advisable to transcribe your settings to the log sheets inside the cabinet.

The set employs an aperiodic primary, or small pickup coil, to which antenna and ground are connected. With this type of circuit the aerial length makes very little difference in the dial settings. But some difference may be expected. On the set used with a 55-foot aerial, with 35-foot lead-in and 15-foot ground lead extra (total antenna system, 105 feet) the dial settings as follow produced best results:

WBS, Newark, N.J.	360 meters	12	14	16
WNAC, Boston	278 meters	15	16	19
WPG, Atlantic City	296 meters	19	19	23
WGBS, N. Y. C.	316 meters	23	24	28
WHN, N. Y. C.	360 meters	33	34	38
WEBH, Chicago	370 meters	35	35	40
WMBF, Miami Fla.	380 meters	38	39	43
WJY, N. Y. C.	405 meters	43	44	48
WJZ, N. Y. C.	455 meters	57	58	63
WEAF, N. Y. C.	492 meters	71	71	75
WNYC, N. Y. C.	529 meters	84	84	86

It will be seen that the higher the wavelengths the higher the dial settings. This is due to the necessity for greater capacity settings of the variable condensers for the higher wavelengths.

Use of Switch and Rheostats

The set is equipped with a master A battery switch. If the switch is off none
(Concluded on page 23)

New Device Blocks Radiation, Weagant Announces

By Sidney E. Finkelstein

A METHOD of preventing radiation in regenerative sets is the claim made by Roy A. Weagant, chief engineer of the De Forest Radio Co., for an invention explained at a dinner to the radio press in New York City. The device just invented has not been christened yet, nor is it yet on the market. It is designed to be an effective protection against the production of squeals and howls in neighboring receivers. It is the invention of a member of the De Forest company's engineering staff and has been in process of development by the company for several months.



SIDNEY E. FINKELSTEIN

Fig. 1 illustrates the necessary connections for attaching the new device to an ordinary single circuit regenerative set having one stage of audio frequency amplification, with a jack connection made to the second audio stage.

A choke coil A is in series with the telephones and plate circuit of the first audio frequency amplifier.

A small condenser B connects the plate of this audio frequency tube to the grid of the regenerative tube.

The antenna connection, instead of going to the usual place for this type of circuit, is connected at point C to the grid of the audio frequency tube. An aperiodic primary, if used, evidently would go, beginning to aerial, end to G or S1 of first AFT.

The rest of the circuit shown is the ordinary arrangement of this set.

The operation is as follows:

Signal e.m.f. is impressed upon the grid of the first audio-frequency tube, which then acts as a radio-frequency amplifier, resulting in radio frequency variations in the plate current of the audio-frequency tube.

The insertion of the choke coil A results in the development of radio-frequency potentials, which are impressed on the grid of the regenerative tube through the small condenser B.

As the condenser B is very small and the capacity between the grid and plate of the audio tube is very small when the regenerative tube oscillates, a negligible amount of radio-frequency current goes out of the antenna, with the result that no disturbance is produced on neighboring antennas, says Mr. Weagant.

The overall result on the received signal is a material increase in selectivity and in general no loss of efficiency. When storage battery tubes are used there is often an increase in efficiency, Mr. Weagant declared.

The function of the choke coil A being to develop an e.m.f. over a considerable range of wavelength, it is desirable to make this of several sections having natural periods, say of 300 meters and 450 meters; the more sections used the more uniformly will the efficiency be held over the range of broadcasting wavelengths.

From this diagram and description the manner in which the device may be attached to any regenerative circuit will be readily apparent. It will apply to any set which contains two or more tubes.

The choke coil may be a honeycomb of 150 turns, natural period 282 meters. A

200-turn HC has a period of 358 meters, a 250-turn coil 442. Hence a 150-turn coil connected to a 50-turn coil, which in turn is connected to another 50-turn coil, three taps connected to one terminal and to the

two joints would give the variation or, if an untapped choke coil is preferred, the 150 or 200-turn type may be used.

The small condenser B may be a Neutrodon or a Chelton or Midget condenser.

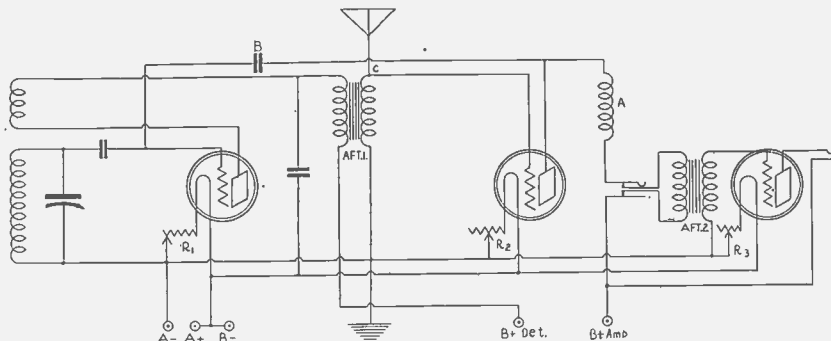


FIG. 1, wiring of a 2-circuit regenerative set, with tickler feedback, the radiation being prevented, according to Roy A. Weagant, partly by the presence of the small condenser B. The aerial, instead of going to the usual place, goes to the G post of the first audio-transformer (grid of the first AF tube, marked C). The ground goes to the end of that AF secondary and to A—The particular detector tube in this circuit (UV200) has a negative grid return. The system can be used, however, only if at least one stage of AF is employed. An aperiodic primary, if used, would be connected as follows: Aerial to beginning of primary, G post of AFT No. 1, F post of AFT1 to beginning of aperiodic primary, end of that primary to ground.

Solving Phone Problem



Germans Pick Up Programs from Pittsburgh

BERLIN

GERMAN radio fans for the first time are listening in on American stations. The powerful Stuttgart receiving center transmitted music played at Pittsburgh by an automatic amplifying process to individual receivers throughout the whole of the Reich. Even the weakest German apparatus now is able to hear American broadcasting.

MANY persons start their career as radio experimenters with a 1-tube set or a crystal set. This gives only ear-phone service. The crystal folk eventually include tubes in their sets. Also the 1-tube folk add at least two more tubes, to work a speaker. Sometimes the problem arises, before the audio tubes are included, whether to buy several pair of earphones, so more persons may listen in at the same time. If it is decided to have three sets of phones, for instance, two pair eventually will become excess material, when the tubes are added for audio amplification. Therefore it is unwise to invest in several pair of ear-phones when you have a crystal set or a 1-tube set. Apply the money toward the purchase of the extra tubes, sockets, loudspeaker, etc., necessary to fill the whole home with speech and music. In nearly ever case where there is a family the progression from earphone service to speaker performance is inevitable. Most persons use transformer-coupled audio-frequency amplification, but resistance-coupled AF, which requires three extra tubes instead of two, gives better quality of reproduction while consuming more B battery current. Transformer-coupled AF is very satisfactory if the best transformers are used, but resistance-coupled is nearly always of still better quality.

BROADCASTING MAKES SUCCESS OF TOTTERING LONDON REVUE

LONDON.

THE war between the managers and the British Broadcasting Company will be the big question this year, and looks as if it would come to a head pretty quickly. Donald Calthrop, who announced the withdrawal of his revue, "Yoicks," in London, then broadcast it with splendid box-office results, is keeping the run on, but has resigned from the Managers' Association, and "Patricia" which was doing badly at His Majesty's, has started a new lease of life.

Now Andre Charlot has decided to broadcast his revue and we are going to hear a whole first night show of Harry Welchman's new musical comedy from the Adelphi. The situation is tense, however, for the Unions are meeting, and there is a possibility of a huge theatrical workers' strike, if an agreement is not reached.

For Crystal Set Owners

Illustrated articles on the making and use of crystal sets appeared in Radio World dated Dec. 6, 20 and 27, 1924, and Jan. 24, 1925. 15c per copy, or the 4 copies for 60c. RADIO WORLD, 1493 Broadway, New York

The Radio University



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

PLEASE show the wiring of Bernard's 3-tube DX Superdyne.—Al Oberender, 367 Seventy-fifth Street, Brooklyn, N. Y. The diagram is Fig. 90. See issue of December 27 for constructional data.

published, may be obtained from circulation manager, Radio World, 1493 Broadway, New York City.

WHICH is the better set for volume and

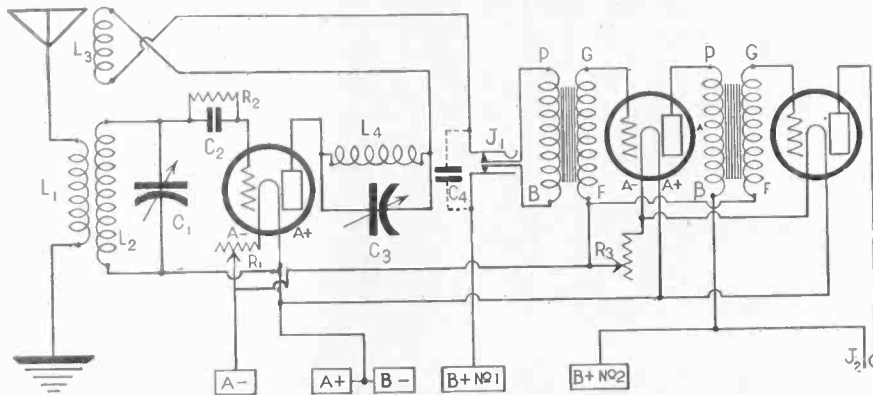


FIG. 90, showing the wiring of Bernard's 3-Tube DX Superdyne.

I READ in the University Department, in reply to a question regarding crystal distance that 50 miles may be considered DX on a crystal. I was radioman aboard of coastwise passenger liner during the World War and using an ordinary crystal receiver was able to copy the signals of NAH when at a 500-mile distance and received time from NAA while 1350 miles away. Yet you say that 50 miles may be considered good distance. How do you figure it?—Howard W. Nichols, 24 Hobson St., Springfield, Mass.

You fail to consider the fact that both NAH and NAA are using transmitting power many times that of the most powerful broadcasting station. Furthermore, code signals may be read with comparative ease when the voice couldn't be heard at all. Obviously if broadcasting stations used 50-kilowatt power, crystals 500 miles away could listen in as easily as they now listen to locals.

CAN an audio-frequency amplifier be used with any detector circuit? (2) How is it connected to the detector circuit?—P. R. an Arnsdale, Box 298, Springfield, N. J.

(1) Yes, except that there is not enough volume in conjunction with a crystal set. (2) To the output of the detector circuit, i.e., take the phones out of circuit and place the primary of the first AF transformer in place of it.

WHERE can a person get the 216 tube sets, made in the United States?—Albert F. Richardson, 1811 Lawn Ave., Kansas City, Mo.

They are not licensed for amateur or experimental use.

WHERE can I obtain the complete description of the crystal set by Barkett?—Edw. E. Farren, 81 College St., Springfield, Mass.

The issue of Dec. 6, in which this circuit was

selectivity, the 3-tube Superdyne or the DX Wiz?—A. F. Naegler, Yardville, N. J., R-1. The 3-tube Superdyne.

KINDLY tell me how many turns I should have for a 3-circuit tuning coil to cover the waveband of 150 to 500 meters?—E. Gendron, 2173 B., Ft. Dennis, Montreal, Can.

On a 3/4" diameter tubing, aperiodic primary, 8 turns, secondary 40 turns, tickler 35 turns, on 2/4" diameter tubing, using a .0005 variable condenser shunted across the secondary coil.

IN reference to Herbert Hayden's 1-tube set as described in the issue of Oct. 4, is the rotor coil wound in the same direction as the stator? (2) Are the WD11 and WD12 tubes the same?—G. E. Brown, 337 Scarboro Rd., Toronto, Can.

(1) Yes. Try reversing the connections, however. (2) WD11 has the special base, WD12 uses standard base, otherwise the same.

I BUILT G. N. Barkett's "Wonder" circuit (Dec. 6) using a crystal. Would a 3-circuit tuner work in place of coils L1, L2, L3?—Chas. H. Jordan, 291 Bay St., Springfield, Mass.

IN winding a 3-circuit tuner what size wire, how many turns and what size forms shall I use? (2) What size rheostat shall I use for a 1-tube, 199 tube?—H. C. Noryes, Lock Box 578, Worcester, Mass.

(1) See answer to E. Gendron. (2) 30-ohms.

IN using the 3-circuit tickler hookup, how can I more easily control regeneration? (2) Should I use any fixed condensers other than the grid condenser? (3) Will a C battery help when using 90-volts on the plate? (4) Do the Hedgehog AF

transformers require shielding?—Lewis J. Wise, 618 Alabama Ave., Selma, Ala.

(1) Take off about 5 turns from the tickler coil. (2) One across the primary of the first AF transformer may help you in controlling regeneration. Before removing any turns from the coil, try the condenser. (3) Yes; 4.5 volts negative. (4) No.

COULD I use type 199 tubes in Caldwell's reflex as described in the issue of Dec. 6? (2) Will the fact that the batteries are of the dry-cell type be a disadvantage? (3) Where can I purchase the parts for the set?—John J. Kern, Perth, Kan.

(1) Yes. (2) The tubes give a little less volume than 201A. (3) Any reputable radio supply house. Consult the advertising columns of Radio World.

IN reference to the 3-tube Superflex, I cannot get any distance reception although locals come in with very good volume.—Robert Dixon, 123 E. 5th St., Brooklyn, N. Y.

The trouble may lie in tuning the set, which is a bit unusual in tuning in that you must be very careful that you don't skip over the station. If you feel that tuning in locals is sufficiently sharp to warrant a slight broadening of tuning, it would be advisable to lengthen the aerial, even 150 feet. The set in itself is very sharp and the additional length of aerial will not broaden tuning to any great extent, and will tend to stabilize the entire circuit. Be sure that you constructed the coil unit correctly.

REGARDING the regenerative Neurodyne described in the issue of Jan. 31: Is the size wire No. 20 or 22?—Ed. Jones, 1024 Rockland St., Phila., Pa.

Use No. 20.

I HAVE a B battery eliminator and a regular 6-volt storage battery. Can I use a push-pull amplifier in conjunction with these two instruments, yet use them on the tuner-detector circuit?—A. Smith, Punta Gorda, Fla.

Yes.

WHERE can I obtain the filter transformer for the 6-tube Super-Heterodyne as described in the issue of Dec. 6?—A. H. McNaughton.

(1) It would not be well to purchase a filter transformer to be used with home-made inter-frequency transformers as the filter must be designed to operate at about the same frequency as the IFT. If you do not care to make the filter, it would be advisable to purchase the filter and the rest of the transformers, such as the Remler.

IN reference to the regenerative Neurodyne as described in the issue of Jan. 31, will you tell me how I can test the coils L2 and L4 with the separate stators of C1, to match them before I place them in the standard circuit as described? (2) Could you tell me where I could get a set of these coils matched evenly enough for use in this set?—William J. Steffens, 210 Valentine Ave., Glendale, L. I., N. Y.

Using one of the stators of the split condenser, place one coil in a 1-tube single non-regenerative circuit. Tune in any station to maximum volume. Note the dial setting. Repeat this process with the other coil. Both coils are matched when maximum volume is obtained at the same dial setting, using the same condenser. (2) Wallace, Eastern or Globe. Ask for ones with Neurodyne tap at 15th turn from grid end.

CAN an Ambassador coil be used in the Superdyne? (2) If so, what kind of RF transformer shall I use to match it? (3) What resistance should the rheostat be?—John Acampa, 655 Moonachie Ave., Woodridge, N. J.

(1) Yes. (2) primary and secondary of RFT same as primary and secondary of variocoupler.

COULD I use two 21 or 23-plate variable condensers instead of one in the 1925 Model Superdyne? This is the fifth set I've built and want to get everything of the best.—Geo. L. Cowan, 54 Central St., Turners Falls, Mass.

Yes, but you would have three controls instead of two. For three controls build Anderson's Superdyne (Nov. 22 and 29).

I GET more volume when the B battery current runs through my body to the set than when I place the lead to the battery direct. Can you tell me what this is likely to indicate?—Ed. J. Cosgrave, 714 Wood St., Parkersburg, W. Va.

You have too much plate voltage on the detector or RF tubes.

IN the 1-tube reflexed Superdyne as described by Herman Bernard in the issue of Dec. 6, why isn't there a rheostat for filament control? (2) Will this set cover the entire wavelength band? (3) What kind of aerial would you recommend? (4) Should I desire to change the crystal to a tube, is it difficult? (5) Would this set operate with 3 stages of resistance-coupled amplification added? (6) What kind of wire would you recommend, bare or covered? (7) Can the batteries be contained in the same cabinet as the set, if desired? (8) Is the operation of the set improved by shielding the panel?—Geo. E. Manser, 613 Belmont Ave., Manhattan, Kans.

(1) Using 1 1/2-volt dry-cell tubes, a filament control is not necessary in this circuit. However, if storage battery tubes are to be used, insert a rheostat. (2) Yes. (3) 100-foot enamelled 7-strand wire, one stretch. (4) No. (5) Yes. (6) For wiring the set, bare. (7) Yes. (8) No.

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The Radio Trade

R. C. A. Restrained from Selling Tubes Made by Subsidiary of Westinghouse Co.

WILMINGTON, Del. FEDERAL Judge Hugh M. Morris granted a temporary injunction to the De Forest Telephone and Telegraph Company restraining the Radio Corporation of America from selling radio tubes of the De Forest patent manufactured by the Westinghouse Lamp Company. The Court denied a temporary injunction, whereby De Forest sought to prevent the Radio Corporation from using tubes manufactured by the Westinghouse Electric and Manufacturing Company, parent company of the lamp concern. The case will now go on to final hearing to determine whether the injunction shall be made permanent and an accounting ordered. The patent under which the suit is brought will expire in a few weeks.

The Radio Corporation of America maintained that the De Forest Company had given the right to manufacture these tubes to the Westinghouse Electric and Manufacturing Company and that this gave the right to the Westinghouse Lamp Company. The Court held that the license before the Court did not show that this was the case but did show that the Westinghouse Electric and Manufacturing Company had a right to make and sell the tubes. The Court therefore restrained the use of tubes made by the lamp company but denied the injunction to stop the use of tubes made by the manufacturing company.

Price of Radio Stock Breaks

The preliminary injunction restraining the Radio Corporation of America from selling vacuum tubes manufactured by the Westinghouse Lamp Company caused a sharp reaction in Radio Corporation shares on the Stock Exchange. Radio common, which has been much in the speculative limelight lately, broke nearly four points on the news to 59½, under a wave of selling in the last hour. Before the market closed, however, the shares had recovered to 61½, for a net loss on the day of only 2½ points.

De Forest Radio shares on the Curb went up as sharply as Radio Corporation went down. The voting trust certificates representing the De Forest stock were up 4½ points on the day at 33½, a new high. Trading in both Radio Corporation and De Forest stocks was extensive, transactions in the former aggregating more than 53,000 shares, while in the De Forest shares dealings amounted to more than 41,000 shares. At the closing price of 61½ Radio Corporation was a half point below the year's previous low and compares with the year's high of 77%.

ANOTHER STORE OPENED BY WALLACE RAIDO CO.

THE Wallace Radio Co., 135 Liberty Street, New York City, has opened an additional store for the convenience of their uptown customers, at 2325 Broadway. A stock of the finest tested sets of different types, from one tube to Superheterodyne, will be carried at all times. Among the featured sets will be RADIO WORLD'S Bernard Superdyne, the Wallace Superdyne and the Pressley Army Airplane Superheterodyne. The new Wallace low-loss coil will be carried in stock, and speakers, batteries

and parts of the highest quality. W. C. LaCombe, well-known radio expert, will be on the premises afternoons and evening to give advice and help to inquiring fans.

New Corporations

Radio Supply Co., Wilmington, Del., manufacturing, \$175,000. (Corporation Service Co., Attys.)

Osadampa Corp., make radio instruments. 100 shares common, no par. W. Scandron, I. Seikle, L. Isaacs. (Atty., L. Seadron, 1540 Broadway, New York City).

BANKRUPTCY PROCEEDINGS

Dixie Radio Co., Inc., 133 Seventh Ave., New York City: Liabilities, \$5,781; assets, \$1,689.

Business Opportunities Radio and Electrical

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

FINANCING—Will negotiate with new enterprise, individual or established business needing capital. Incorporating attended to. Box 95, Wall Street Station, New York.

RADIO STORE—ONE OF THE BEST known retail radio stores in the city; established business; best class trade; excellent mid-town location; owner's health demands retirement; large capital not necessary; no brokers. Address for information Box 01, Radio World.

RADIO-STATE MANUFACTURING Licenses new radio receiving set; requires no batteries; operates from 60-cycle alternating current light socket; no hum; thorough demonstration any time, big demand. 02, Radio World.

ESTABLISHED RADIO STORE on Broadway, in 80s, all new equipment and merchandise; owner now engaged in manufacturing; about \$3,000 cash required. Box 02, Radio World.

RADIO MANUFACTURING MAN of vision with \$25,000 to join exploitation, the newest development, most practical radio receiving apparatus (patent pending), fully equipped for production; highest references given and required. 79 Times, 165 Broadway, N. Y. C.

MANUFACTURING BUSINESS IN THE electrical and radio line needs a partner with moderate capital and best of business experience; can have control, if necessary; engineer of unusual ability and scientific experience now associated; only principals considered. Box 03, 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.

Service Editor,
Radio World,
1493 Broadway, New York City
I desire to receive radio literature
Name
City or town
State
Are you a dealer?
If not, who is your dealer?
His Name
His Address

C. Schmidt, 5209 Ellis Ave., Chicago, Ill.
G. D. Black, Kingsport, Tenn.
F. Kenneth Inglis, Briar Hill, N. Y.
Edw. W. Trigg, 150 Willis Ave., Youngstown, Ohio.
Joseph Kouba, 57 W. College Ave., Flat 3, St. Paul, Minn.
Gus Egarius, 7212 Kendron St., Pittsburgh, Pa.

Allen B. Beegle, Atlantic Highlands, N. J.
C. A. Rolitzer, 214 Grant Ave., Belevue, Pa.
John Shimkus, 711 Barber St., Chicago, Ill.
G. H. Stetson, Monmouth, Me.
Louis Ingram, Box 429, Clarksville, Tenn.
Randolph Whitfield, Tallahassee, Fla.
Chas. Palcardi, 5352 Christy Ave., St. Louis, Mo.
W. O. Nangle, 601 Washington Blvd., Oak Park, Ill.
Sterling Cole, Kenova, W. Va.
E. A. Felix, Litchfield, Ill.
Juan I. Bribiesca, Excelsior, Cia. Editorial, S. A. Bucarell 17, Mexico, D. F.

Coming Events

MARCH 2 TO 7—Fifth Annual Radio Show and Convention, Hotel Pennsylvania, New York City. Executive Radio Council, Second District.

MARCH 2 TO 7—Kansas City Radio Show, Convention Hall, Kansas City, Mo.

MARCH 4—Broadcasting of President Coolidge's inaugural speech.

MARCH 9 TO 14—Cincinnati Radio Show. Public Auditorium.

APRIL 19 TO 25—International Radio Exposition, Steel Pier, Atlantic City, N. J.
SEPT.—(Early in month; date not settled.) Fourth Annual National Radio Exposition, by American Radio Exposition Co., 522 Fifth Ave., N. Y. C. Exposition will be held in Grand Central Palace.

SEPT. 14 TO 19—Second Radio World's Fair, 258th Field Artillery Armory, Kingsbridge Rd. and Jerome Ave., New York City.

SEPT 14 TO 19—Pittsburgh Radio Show, Motor Square Garden. (Postponed from Jan. 19.)

SEPT. 15 TO 19—Washington (D. C.) Radio Show.

NOV. 9 TO 15—Milwaukee Radio Exposition. Civic Auditorium.

DEC. 1 TO 6—Boston Radio Show, Mechanic's Hall.

Date not set yet for Chicago Radio Fair, under direction of Kerr & Herrmann.

Date not set yet for exposition, also to be held in Chicago, direction of Harold Bolster.

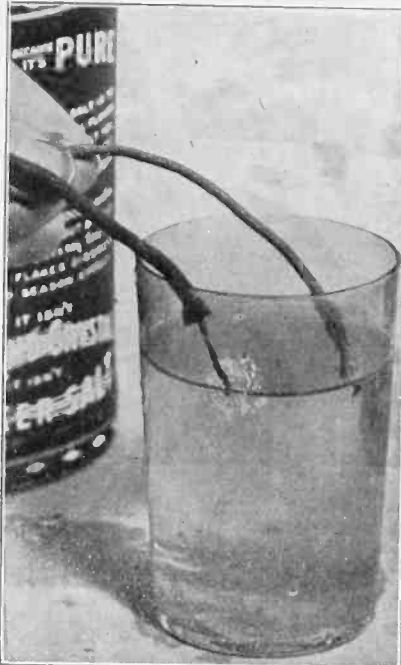
SUPERDYNE THEORY AND TUNING discussed by Herman Bernard in the Feb. 7 issue of RADIO WORLD. Send 15c for a copy or start subscription with that number. RADIO WORLD, 1493 Broadway, New York City.

Restorative

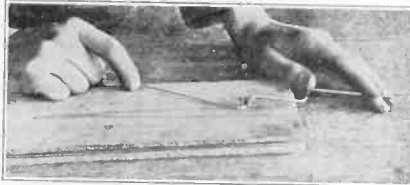


IF you're economical, you'll use this method of recharging the old dry cell A "battery." Punch a number of holes in the base of the cell as shown in the lower photo. Place the battery for a 24-hour period in a container of ordinary vinegar. You will find that the battery will give you many more hours of faithful service.

Pole Test

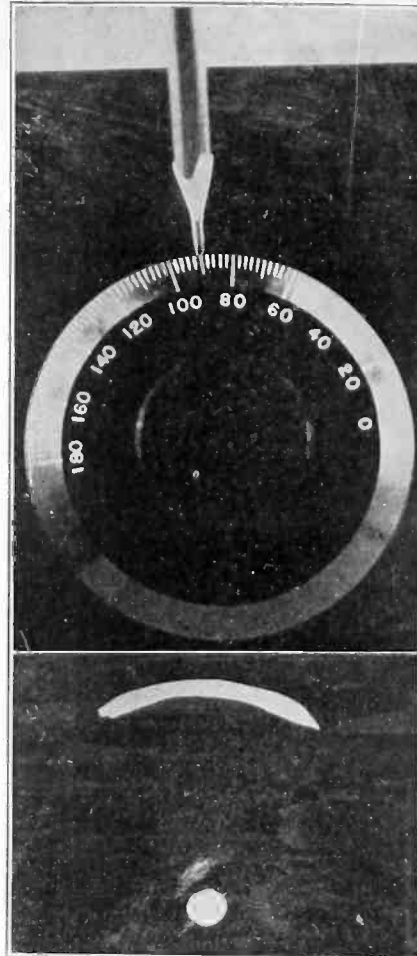


BY placing a lead from each terminal of a battery or main in a solution of salt water you will be able to ascertain the polarity. The lead that gives off bubbles, which is hydrogen gas, is negative.

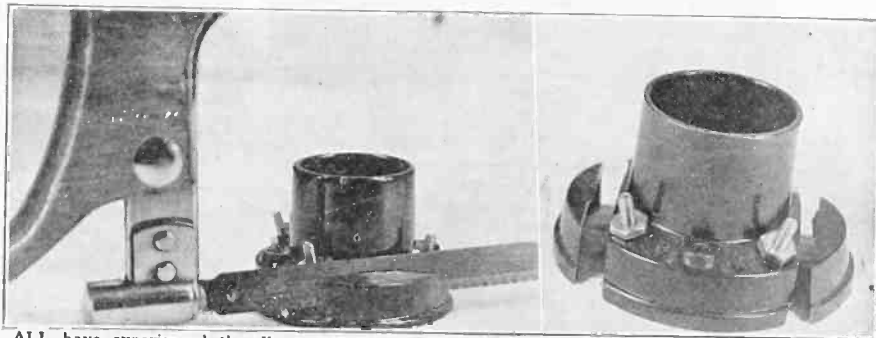


TO BEND BUS-BAR a pair of flat-nose pliers is not necessary, if you have two nails about the work-shop. Drive the two nails on a board close together as shown above. By placing the bus-bar between the two nails, an excellent round bend may be formed. It is not good practice to make a right-angle bend.

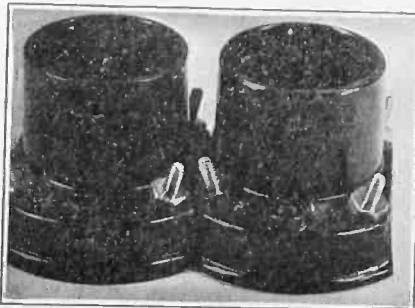
Pointer Use



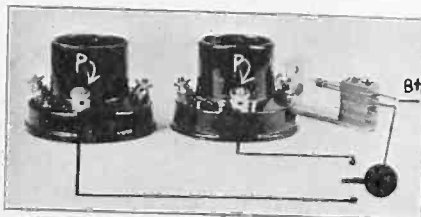
IF you desire to use commercial dial pointers, be sure that you get them on correctly, i. e., so that the pointer will be at the right place on the panel and that it will be absolutely vertical to the dial. Place the dial on the shaft. With a pencil trace the circumference of the dial as shown in top photo. At the highest point is the place where the pointer should be set. Drill the one hole necessary at the proper point above this line. Chinese white may be used as a guide, too (lower photo).



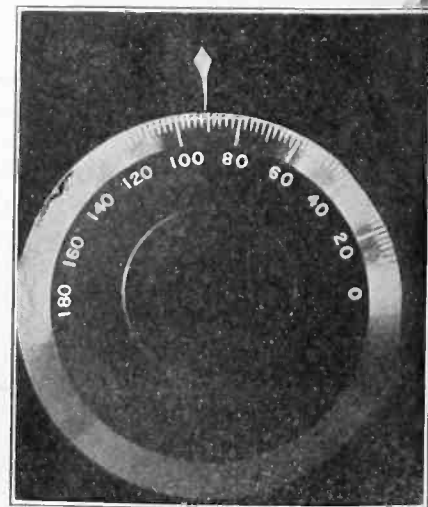
ALL have experienced the disconcerting realization, after the panel is drilled and instruments laid out, that there isn't enough room. If you do not care to purchase a new panel and baseboard you will appreciate this wrinkle. File or saw the socket as shown in two upper photos.



HOW the two sockets are fitted together to save room on the baseboard.

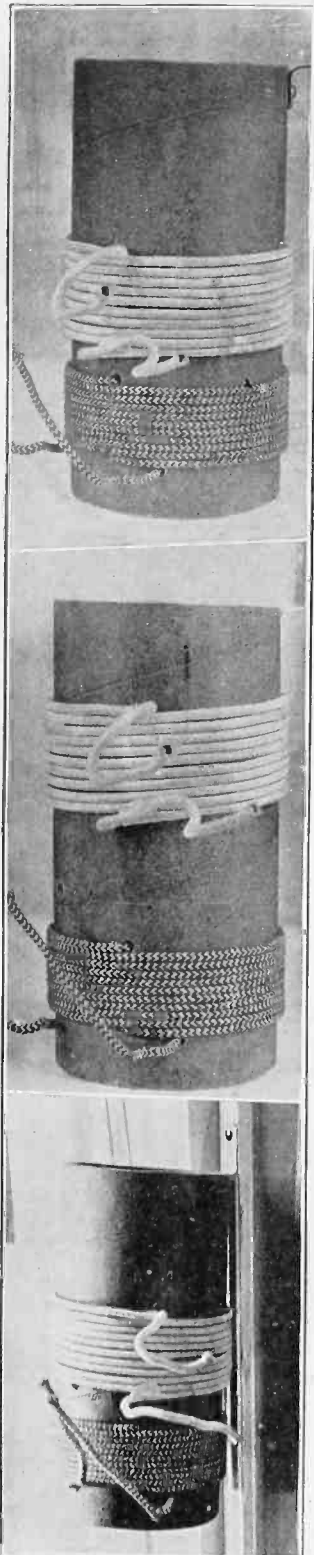


ELIMINATE the double jack system for switching over from first to second stage if you desire. Only one jack, or two binding posts, are necessary. One prong of the single-circuit jack or binding post connects the switch lever. One prong (or the other post) connects to the plate of the first AF tube, the other tap to the second AF plate. The positive amplifier battery connects to the remaining prong or binding post.



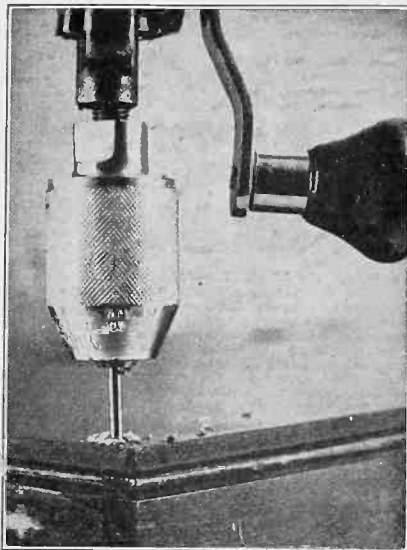
THE dial pointer after it has been mounted on the panel. Be very careful that the hole is drilled correctly or there will be lots of trouble in drilling another hole to make up for the fraction of an inch that the pointer is off. The custom of scratching the panel for obtaining an indicator for dial settings is bad practice. At best, it results in a poorly-made line and spoils the effect of an otherwise well-designed panel.

A Help

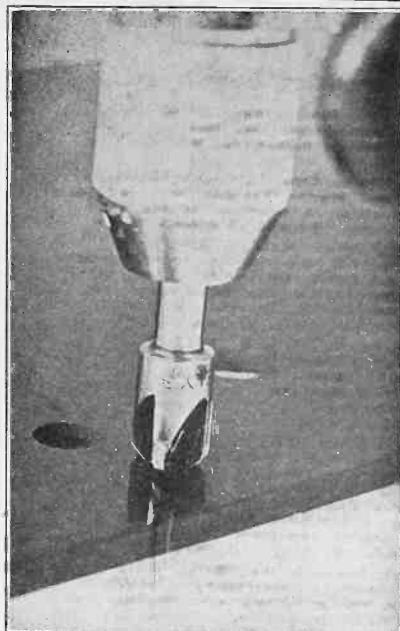


A COIL may be placed out of the inductive field entirely and selectivity improved. It is a good idea to place it in the corner of the room near the aerial lead-in (lower photo). The upper photos show the best way to wind the aperiodic primary—one coil above the other. The space between coils should be varied experimentally. Use No. 22 DCC wire, 10-turn primary, 42-turn secondary. The ground should be connected to the primary upper end, aerial to the lower. The other coil connects to the aerial and ground posts of the set.

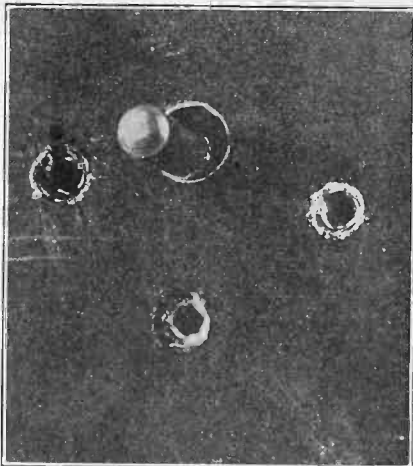
Solution of Drilling Problems



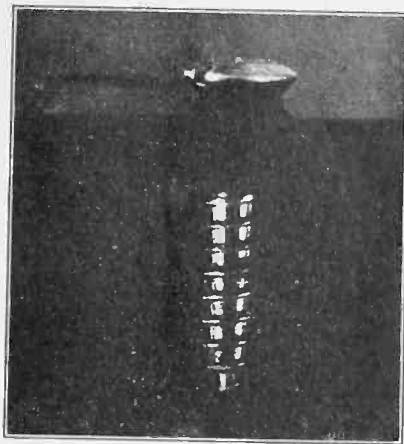
KEEP the drill absolutely vertical when drilling the panel for attachment to cabinet.



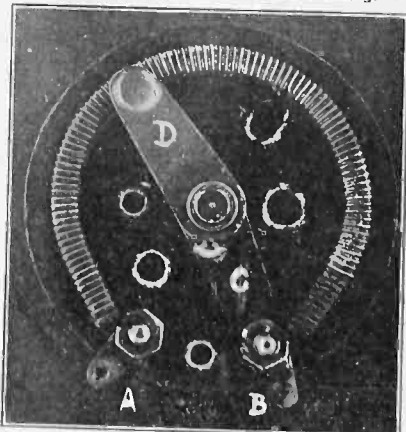
ALL HOLES drilled for bolts or screws should be countersunk. If the hole is to be of a larger diameter than any of your drills will bore, the countersink may be used to make the desired diameter.



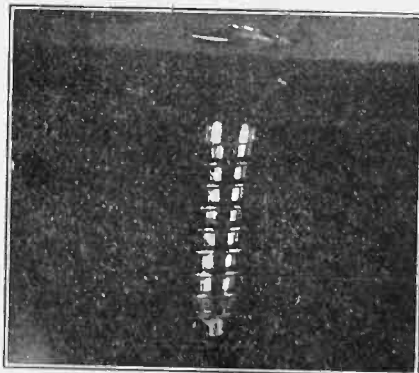
SOMETIMES one has drilled the small holes for the mounting screws of a variable condenser or other rotatable part and finds that, while these holes are according to template, the job is nevertheless a failure, due to the present impossibility of getting the threads in the condenser to meet the screws. An easy solution is to drill an oversized center shaft hole. The condenser may then be moved so that the part is mounted straight and the shaft moves without binding.



HOW an imperfectly drilled hole causes the screwhead to protrude. Note the slant and the possibility of the windings being scraped or cut. Do not countersink too deeply, but only far enough for the top of the screwhead to be a trifle beneath the plane of the panel.



IF you desire to change the rheostat in your set for one of a higher resistance or for a new one of the same resistance, and haven't one of the same manufacture as the one now in your set, you may drill new holes in the bakelite of the rheostat, measured by the panel holes of the old one.



UNLESS the drill hole in the panel is countersunk the screw head will protrude. The photo shows how a perfectly drilled hole accepts the screw head.

BROADCAST PROGRAMS

Thursday, February 19

KTHS, Hot Springs, Ark., 375 (C. S. T.)—8:30 P. M., special concert and frolic by the Royal Peacock orch. of Indianapolis, from the Rainbow Gardens.

KOA, Denver, Colo., 323 (M. S. T.)—1 P. M., N. Y. stock reports, livestock, fruit and vegetable; weather. 3, half hour matinee. 6, final reading, stock, livestock, vegetables and news.

WMAQ, Chicago, 446 (C. S. T.)—4 P. M., household hour. 4:30, women's clubs. 6, organ recital. 6:25, Hotel LaSalle orch. 6:50, "Daddy," 8, to be announced. 8:15, Boy Scout hour. 8:35, to be announced. 8:50, University of Chicago lecture. 9:15, Mrs. Louise H. Crum, soprano.

WEEL, Boston, 303 (E. S. T.)—1 P. M., assembly luncheon. 2, Eleanor Cass, "Personnel and Management of Summer Camps." 2:15, dance orch. 6:30, Big Brother club. 7:15, Alpha ladies trio. 7:55, Pathe News. 8, New York program. 9:30, Jimmie Joy's orch.

WWJ, Detroit, 353 (E. S. T.)—8 A. M., setting-up exercises. 9:30, "Tonight's Dinner" and a special talk. 9:45, Public Health Service bulletins and talks. 10:25, weather. 11:55, time. 12:05 P. M., Jules Klein's orch. 3, News orch. 3:50, weather. 3:55, market reports. 6, dinner concert. 7, The Detroit News orch. 10, dance music by Jean Goldkette's orch. 11:30, News orch.

WHAS, Louisville, Ky., 400 (C. S. T.)—4 to 5 P. M., Louisville Conservatory of Music; police bulletins; weather; Alamo organ; readings; news. 4:55, livestock, produce and grain. 5, time. 7:30, concert by the Happy Hoosier Harmonists; four-minute digest; four-minute welfare talk; news; time.

KGO, Oakland, Cal., 300 (P. S. T.)—10:40 A. M., classroom instruction. 11:30, luncheon concert. 1:30 P. M., N. Y. and S. F. stock reports and weather. 4, concert orch. 6:45, final reading, stock reports, weather, S. F. produce, news, and news. 8, address, Paul Shoup; Chas. F. Bulotti, tenor; Austin Sperry, baritone; Uda Waldrop, pianist. 10, Henry Halstead's orch.

WGR, Buffalo, N. Y., 319 (E. S. T.)—10:45 A. M., talk by Betty Crocker. 8:30 P. M., recital by John F. Gunderman, Jr. 9, J. L. Knell's dance orch. 10, Larkin Company's string orch.

WGN, Chicago, 370 (C. S. T.)—9:31 A. M., time. 9:35, stock and farm quotations. 10, wheat. 10:30, wheat and cable reports. 11, wheat, weather, dairy reports. 11:30, wheat, grain and livestock receipts. 11:56, time. 12, wheat, board of trade. 12:10 P. M., board of trade quotations; hog sales. 12:35, Tea Room orch. 1, wheat. 1:05, Tea Room orch. 1:35, readings. 1:40, Drake concert ensemble and Blackstone string quintet. 2:30, musical recital. 3, miscellaneous entertainment. 5, stock exchange and market. 5:30, Skeezix time for children. 5:57, time.

WGY, Schenectady, N. Y., 380 (E. S. T.)—2 P. M., music; talk, "Stage Style Revue," Helen Spring. 2:30, organ program by Stephen E. Boisclair. 6:30, Hotel Ten Eyck Trio. 7:30, weekly talk on new books, by W. F. Jacob. 7:45, talk, "Manors of New York," Ernest C. Brown.

WCCO, Minneapolis, Minn., 417 (C. S. T.)—10:45 A. M., home service, Betty Crocker. 2 P. M., "Popular Numbers of Music Memory Contest," Mrs. Agnes Fryberger. 4, "The Trembling God," by Emma Lindsay Squier. 5:30, children's hour, Mrs. Charles Ramsdell. 6:30, Dick Long's Nankin Cafe Orch. 7:30, lecture. 7:45, Health talk. 8, "Beef Cattle Outlook," J. S. Montgomery. 8:15, "Feed Lot Problems," W. H. Peters. 10, dance program, Dick Long's Nankin Cafe Orch.

KFI, Los Angeles, 467 (P. S. T.)—5 P. M., Evening Herald news. 5:30, Examiner News Bulletins. 6, Y. M. C. A. speaker. 7, dance orch. 8, Standard Oil Co. 9, Los Angeles Examiner program. 10, vocal program.

WRC, Washington, 469 (E. S. T.)—6:45 P. M., children's hour. 7, dinner music. 7:30, "Latin American Night." 10:45, dance program by the Club Deauville Orch.

KYW, Chicago, 536 (C. S. T.)—6:30 A. M., morning exercise. 9:30, late news and comment of the markets. 1:30, farm and home service. 11:35, table talk by Mrs. Anna J. Peterson. 2:35 P. M., "Afternoon Frolic." 6:02, news, financial and final markets. 6:35, children's bedtime story. 7, Joska DeBabary's Orch. 7:10, Coon-Sanders Original Nighthawks. 7:20, Joska DeBabary's Orch. 8, "Twenty Minutes of Good Reading," by Rev. C. J. Pernin. 7:33, speeches under the auspices of the American Farm Bureau Federation. 9:15, "Safety First" talk by Bert Vanderwarf. 10, "Evening at Home" program. 1, Frolic of the Midnight Sons.

WEAF, New York City, 482 (E. S. T.)—11 A. M., musical program and talks to housewives. 4 P. M., Helen Muller, mezzo soprano; "These Eventful Years," by Franklin H. Hooper; "Poems We Love," by Margaret McLean. 6, dinner music; mid-week services; art talk; Moeller Trio; church choir; Columbia University lecture on contemporary English fiction; "Touring" visiting points of scenic beauty and historic interest; Atwater-Kent radio artists; dance orch.; Leon Kour-

cik, baritone; Harry Jentes, popular pianist; Vincent Lopez and his orch.

KDKA, E. Pittsburgh, Pa., 326 (E. S. T.)—9:45 A. M., stockman reports. 11:55, time. 12 P. M., weather, stockman reports. 12:15, concert by Scalzo's Orch. 3:30, closing quotations on hay, grain and fede. 5, special program for broadcast and relaying S. Africa. 6:15, dinner concert by Broudy's Orch. 7:15, stockman market. 7:30, Uncle Ed. 8, National Stockman and Farmer Studio. 9:55, time, weather. 77, concert from Pittsburgh Post.

KSD, St. Louis, Mo., 545 (C. S. T.)—4 P. M., the hour hour. 8, Alma C. Hollman, reader; Jesse Ward Beyers, violinist; Rev. B. L. Morris, baritone; "Milk Around the World," by W. A. Foster.

KHJ, Los Angeles, 404 (P. S. T.)—12:30 P. M., program through Loew's State Theatre. 2:30, Check Seal Trio and Maude Dickens Womersley, reader. 6, Art Hickman's Concert Orch. 6:30, children's program. 7:30, "Art" talk by Harold Swartz. 7:45, "Care of the Body," by Dr. Philip M. Lovell. 8, program courtesy the Merchant Tailors' Association. 9, program presenting the Piggy Wiggly Girls. 10, Art Hickman's Dance Orch.

WLIT, Philadelphia, 395 (E. S. T.)—11:45 A. M., daily almanac. 12:02 P. M., organ recital, features from studio; Arcadia Concert Orch. 2, Arcadia Concert Orch.; Julia Gilbert, contralto; Edna Hochstetter, soprano; Marcella North, pianist and accompanist. 4:30, Miriam J. Vilecco, soprano; Michael Luggi, accompanist; Blanche Brunswick, pianist; Mrs. Anna B. Scott on "Market Basket." 5, question period. 7:30, Dream Daddy.

WJY, New York City, 405 (E. S. T.)—7:30 P. M., Irving Cohen, violinist; Ruth Cohen, accompanist. 7:45, "What the Earth Is Made of," Dr. Henry S. Washington. 8, Mendelssohn Club Male Chorus of Albany. 10, field and stream talk. 10:15, Pierre's Orch.

WJZ, New York City, 455 (E. S. T.)—10 A. M., Housewives' League daily menu. 10:20, Review of Reviews. 10:30, "Household Equipment," Ethel Peysor. 10:40, needle art talk. 10:50, Eleanor Gunn's fashion talk. 11, "Be Your Own Decorator," Ami Mali Hicks. 1 P. M., Nathan Abas' Hotel Pennsylvania Orch. 4, The Melodians. 4:30, Bernard Levitow's Hotel Commodore Orch. 5:30, State and Federal agricultural reports; farm and home market reports; closing quotations of the New York Stock Exchange; foreign exchange quotations; news. 7, Bernard Levitow's Hotel Commodore Orch. 7:55, "Shocks for Shicks," John B. Kennedy. 8, Wall Street Journal Review. 8:10, "Aesthetics," Albert R. Chandler. 8:35, St. Paul's Cathedral address. 8:30, Pan-American program, U. S. Army Band; Secretary of Labor Davis, speaker. 9:15, Church Club annual dinner. 10:45, Jacques Green and his Club Deauville Orch.

WGBS, New York City, 316 (E. S. T.)—10 A. M., talks with Teresa. 10:10, Irene Jones, pianist. 10:20, Rosario Duprez, "Perfumes of Personality." 10:40, Lillian Regan, fashion talk. 1:30 P. M., Scripture reading. 1:35, Hispano American String Quintet. 2:10, Leon Kourcik, baritone. 3, interview with Mexican Consul General by Teresa Rose Negel. 3:10, Luz Gonzalez, Mexican soprano. 3:20, Alberto Cantogliano, flutist. 3:30, Senor Gonzalez, cellist. 3:30, Gonzalez Ensemble. 6, Uncle Gee Bee. 6:30, Wentz and his Jersey Collegians. 7, "What the World Is Doing." 7:10, Jersey Collegians. 7:30, Armand Vescey and concert orch. 8:30, Oliver Saylor, "Footlight and Lampshade."

WIP, Philadelphia, 509 (E. S. T.)—1 P. M., Gimbel Tea Room Orch. 1:30, weather. 3, inter-collegiate debate, "Co-Education." 6:05, Benjamin Franklin Concert Orch. 7, Uncle Wip's roll call. 8, "Health Work in the School," by Dr. Walter S. Cornell. 8:15, concert by the Laserow Quartet.

KFDY, Brookings, S. D., 273 (C. S. T.)—8 P. M., saxophone solos by Glen Querna. 8:15, "The Early Lamb Crop," by A. H. Kuhlman. 8:25, solos by Jack Vronegar, baritone. 8:35, "Training for Citizenship," by Captain C. B. Howard. 8:45, saxophone solos. 8:55, vocal solos.

KFOA, Seattle, Wash., 455 (P. S. T.)—12:30 P. M., Young Men's Business Club luncheon. 4, The Times, Wm. F. Hoffman's concert orch. FEB 19

Friday, February 20

WGBS, New York City, 316 (E. S. T.)—6:30 P. M., Herman Bernard, managing editor of RADIO WORLD, "Radio Hookups, Questions and Answers."

KOA, Denver, Colo., 323 (M. S. T.)—1 P. M., N. Y. stock reports, livestock, fruit and vegetable; weather. 3, half hour matinee. 6, stock reports, livestock, vegetables and late news. 6:40, Book of Knowledge program. 8, the oratorio "St. Paul," by the quartet, choir and orchestra of Methodist Episcopal church.

WEEL, Boston, 303 (E. S. T.)—2 P. M., dance orch. 6:30, Big Brother club. 7:30, Charles W. Williams, tenor. 8, Neapolitan Ice Cream Co. program. 8:30, Gilchrist quartet. 9, All Saints choir, Geo. C. Phelps, organist and director.

WWJ, Detroit, 353 (E. S. T.)—8 A. M., setting-up exercises. 9:30, "Tonight's Dinner" and a special talk. 9:45, Public Health Service bulletin. 10:25, weather. 11:55, time. 12:05 P. M., Jules Klein's orch. 3, News orch. 3:50, weather. 3:55, market reports. 6, dinner concert. 7, News orch.; Anne Campbell, poet.

WHAS, Louisville, Ky., 400 (C. S. T.)—4 P. M., Louisville Conservatory of Music; police bulletins; weather; Alamo organ; "Just Among Home Folks"; readings; late important news bulletins. 4:55, local livestock, produce and grain market reports. 5, official Central Standard time announced. 7:30, Shawnee Melody Makers; contralto solo. Mrs. Emont Nold Henderson; news; time.

KGO, Oakland, Cal., 300 (P. S. T.)—11:30 A. M., luncheon concert. 1:30 P. M., N. Y. and S. F. stock reports and weather. 3, studio musical pro-

gram and speaker. 4, concert orch. 6:45, stock reports, weather, S. F. produce news, and news.

WOS, Jefferson City, Mo., 441 (C. S. T.)—8 P. M., address, John Ashton. FEB 19

KOB, State College, N. M., 349 (C. S. T.)—7:30 P. M., readings by Mrs. Hugh M. Milton; popular science course.

WFAA, Dallas, Tex., 476 (C. S. T.)—12:30 P. M., Witt McMurray; humor, pathos and wisdom. 6:30, Jack A. Davis and his orch. 8:30, A. & M. College of Texas. 11, Frank Davenport and his orch.

KFOA, Seattle, Wash., 455 (P. S. T.)—12:30 P. M., Seattle Chamber of Commerce program. 4, The Times, Wm. F. Hoffman's concert orch. 6:45, Sherman, Clay & Co. program. 8:15, weather report; Pathe News bulletin. 8:30, The Times program, artists' recital. 10, Eddie Harkness and his orch.

WGY, Schenectady, N. Y., 380 (E. S. T.)—2 P. M., music; talk, "The Food Value of Gelatin," by Gertrude King. 6:30, International Sunday school lesson. 7, Mark Strand Theatre Orch. 7:30, health talk. 7:45, address, "Some Common Faults in Spoken English," Theodore Bard. 8:15, radio drama, "Harvest." 10:30, American Trio and Lillian Rosenthal, soprano.

WCCO, Minneapolis, Minn., 417 (C. S. T.)—10:45 A. M., home service, Betty Crocker. 2 P. M., old folks' program by the Jones Harrison Home. 4, "A Bargain with Fate," by Oma Almonia Davies. 5:30, Court of Gold Medal. 6, sport talk. 6:30, dinner concert, Dick Long's Nankin Cafe Orch. 7:30, "Minnesota's Interest Bearing Debt," Ray P. Chase, State Auditor. 7:45, "Inverse Duplex," John DeQuincy Briggs. 8, St. Paul's Chapter Chi, Sigma Alpha Iota Musical Sorority musical. 9, The B. & R. Family.

KFI, Los Angeles, 467 (P. S. T.)—5 P. M., news. 5:30, news. 6:45, Aeolian organ. 8, Herald program. 9, Examiner program. 10, Jay Plowe presenting a flute ensemble; Mary Elliott, coloratura soprano, and Ellen Douglas, contralto.

WRC, Washington, 469 (E. S. T.)—4 P. M., fashion developments of the moment, by Eleanor Gunn. 4:10, piano recital by Eleanor Glynn. 4:20, "Beauty and Personality," by Elsie Pierce. 4:30, tea music by Meyer Davis' New Willary, broadcast from the Palm Room of the New Willard Hotel. 6, children's hour, by Peggy Albion.

KYW, Chicago, 536 (C. S. T.)—6:30 A. M., morning exercises. 9:30, late news and comment of the financial and commercial markets. 11:35, table talk by Mrs. Anna J. Peterson. 6 P. M., news, financial and final markets. 6:35, children's bedtime story. 7, Joska DeBabary's Orch. 7:10, Coon-Sanders Original Nighthawks. 7:20, Joska DeBabary's Orch. 9, midnight revue. 1 A. M., frolic of the Midnight Sons.

WEAF, New York City, 482 (E. S. T.)—11 A. M., musical program and talks; market and weather. 4 P. M., Milton Katz, pianist; elementary French lessons; children's stories. 6, dinner music; Elizabeth Kunzer, pianist; Blanche Elizabeth Wade; Futh Morgan, soprano; the Ellington Candy Boys; Hohner harmony hour; Spear Davis' Lido-Venice orch. Emerald Ball; Meyer Davis' Lido-Venice orch.

KDKA, E. Pittsburgh, Pa., 326 (E. S. T.)—7:45, morning exercises. 8, morning exercises. 9:45, stockman reports. 11:55, time. 12 M., weather, stockman reports. 1:30 P. M., closing agricultural quotations. 6:15, dinner concert. 7:15, stockman reports. 7:30, Daddy Winkum. 8:15, "Read America First." 8:30, program courtesy Rick-McJunkin Co. 9:55, time, weather.

KHJ, Los Angeles, 404 (P. S. T.)—12:30 P. M., Perry's Orch. 2:30, Grace Currey, harpist and the Immanuel Male Quartet. 6, Art Hickman's Concert Orch. 6:30, children's program. 7:45, Capt. Through Orange Country." 10, Art Hickman's Dance Orch.

WLIT, Philadelphia, 395 (E. S. T.)—11:45 A. M., daily almanac. 12:02 P. M., organ recital; features from the studio; Arcadia Concert Orch. 2, Arcadia Concert Orch.; playlet. 4:30, dance program. 7:30, Dream Daddy. "Fifteen Minutes with Sam Windfield." 10, meeting of the Morning Glory Club. 1, features from the studio.

WJY, New York City, 405 (E. S. T.)—7:30 P. M., Guarantee Trust Choral Society. 8, "Coin Week." 8:15, "Review of Work of N. Y. Assembly." 8:30, Philharmonic String Quartet, 10, Loosleaf. 8:50, rent topics. 10:15, Monte Carlo Virgians. 8, Wall Street Review. 5:30, State and Federal ports; Stock Exchange; foreign exchange quotations; news.

WJZ, New York City, 455 (E. S. T.)—10 A. M., Housewives' League daily menu. Mrs. Julian Heath. 10:20, "Books," by Grace Isabel Colbron. 10:30, Good Housekeeping talk. 10:40, arts and decorations. 10:50, Eleanor Gunn's fashion talk. 12:15 P. M., noon hour of music. 1, Hotel Ambassador Trio. Henry Van Der Zanden, director. 4, Doris Markstein, soprano. 4:15, Karen Spange, pianist. 4:30, Hotel Belmont tea music. 5:30, State and Federal agricultural reports; farm and home market reports; New York Stock Exchange and foreign exchange quotations; news. 7, Bernard Levitow's dinner music. 8, Wall Street Journal. 8:40, Chas. M. Courboin, great Belgian organist; Marcel Grandjean, harpist. 9:30, U. S. Navy.

WLW, Cincinnati, Arts Orch. 423 (C. S. T.)—8 A. M., setting up exercises. 10:45, weather, business reports. 11:55, time. 12:15 P. M., concert. 1:30, 3, business reports. 4, French lesson; piano solos by Adelaide Apfel. 6, Selinsky instrumental quintet. 8, chorus of 700 high school students. 10, cert program, the Cooper Orch. and Male Quartet. **WGBS, New York City, 316 (E. S. T.)**—10 A. M., talks with Teresa. 10:10, Muriel Anderson, contralto. 10:20, Mrs. Maybelle Burbridge, "Beauty Talk." 10:40, Mme. Georgette. "Fashion Talk." 1:30 P. M., Scripture reading. 1:35, Blue Horse

strumental Quartet. 3, interview with Willing, 3:20, Regalibuto Sisters, pianists, 3:20, win. 3:10, Ethel Kelly, 3:40, Ethel Kelly, 3:40, mous novelist, 6, Uncle GeeBee, 6:30, Abner elula, "What's Your Radio Problem?", 6:40, rry Funk and his orch.

WIP, Philadelphia, 509 (E. S. T.)—1 P. M., mbel Tea Room Orch. 1:30, weather, 3, "Sug- tions for Special Holiday Luncheons," by Mrs. na B. Scott, 3:15, Emmanuel Bennett, tenor; r. Leroy Work, violinist, and Mrs. Paul Swope, anist, 4, "Dickens' Queer People as an Ancient es Them," by Dr. Charles W. Burr, 6, weather, 6:05, Mark Fisher and Joe Burke, 6:15, Marburger and his vaudeville orch.

WGN, Chicago, 370 (C. S. T.)—9:31 A. M., time, 9:35, stock and farm quotations, 10, wheat, 10:30, wheat and cable reports, 11, wheat, weather, dairy reports, 11:30, wheat, grain and livestock receipts, 11:56, time, 12, wheat, board of trade, 12:10 P. M., board of trade quotations; hog sales, 12:35, Tea Room orch, 1, wheat, 1:05, Tea Room orch, 1:35, readings, 1:40, Drake concert ensemble and Blackstone string quintet, 2:30, musical recital, 3, miscellaneous entertainment, 5, stock exchange and market, 5:30, Skeezix time for children, 5:57, time.

Saturday, February 21

KTHS, Hot Springs, Ark., 375 (C. S. T.)—8:30 P. M., talent from Ouachita College, 10, Meyer Davis Hotel orch.

WHAS, Louisville, Ky., 400 (C. S. T.)—4 P. M., Louisville Conservatory of Music; police bulletins; weather; Alamo organ; readings, 4:55, local livestock, produce and grain markets, 5, time, 7:30, Dix Bluegrass Serenaders; news; time.

KGO, Oakland, Cal., 300 (P. S. T.)—11:30 A. M., luncheon concert, 12:30 P. M., stock reports and weather, 4, concert orch, 8, oratorio, "Elijah," by Mendelssohn; Zilpha Ruggles Jenkins, soprano; Beatrice L. Sherwood, soprano; Ruth Waterman, contralto; Mabel Walsh, contralto; Jwmyvi Jones, tenor; Robert E. Saxe, tenor; Henry L. Perry, bass; Richard L. Lundgren, bass; address, "Mendelssohn's Oratorios," Ray C. B. Brown, music critic, San Francisco Chronicle, 6, Henry Halstead's orch.

WMAQ, Chicago, 448 (C. S. T.)—2 P. M., Union League club forum, 6, program to be announced, LaSalle Hotel orch, 8:30, radio photologue, "Holland," by Leroy D. Owen, 9, weekly theatre revue.

WGR, Buffalo, N. Y., 319 (E. S. T.)—6 P. M., Hallpryd string quartet.

WGN, Chicago, 370 (C. S. T.)—9:31 A. M., time, 9:35, stock and farm quotations, 10, wheat, 10:30, wheat and cable reports, 11, wheat, weather, dairy reports, 11:30, wheat, grain and livestock receipts, 11:56, time, 12, wheat, board of trade, 12:10 P. M., board of trade quotations; hog sales, 12:35, Tea Room orch, 1, wheat, 1:05, Tea Room orch, 1:35, readings, 1:40, Drake concert ensemble and Blackstone string quintet, 2:30, musical recital, 3, miscellaneous entertainment, 5, stock exchange and market, 5:30, Skeezix time for children, 5:57, time.

WGY, Schenectady, N. Y., 380 (E. S. T.)—9:30 P. M., dance music by Romano's Orch.

WCCO, Minneapolis, Minn., 417 (C. S. T.)—10:45 A. M., home service, Betty Crocker, 2:30 P. M., matinees musical, 8, "Fireside Philosophies," Rev. Roy L. Smith, 8:30, surprise program, 9:30, Joe Peyer's St. Paul Athletic Club orch.

KFI, Los Angeles, 467 (P. S. T.)—5 P. M., news, 5:30, news, 6:45, speaker, Dr. Clyde Sheldon Shepherd, 7, White's Californians, with vocal soloist, 7:45, The Book Shelf, 8, Electa Felt Ferry, contralto; Mary Teitsworth, soprano, and Georgia Woodruff, Mezzo-soprano, in solo and trio-classic, Spanish and operatic numbers, assisted by Margaret Johnson, violinist; accompanist, Elizabeth Liddell Johnson, 9, Los Angeles Examiner program, 10, Packard Radio Club; Ruth and Lilah Carlson, Barney Weber.

WRC, Washington, 469 (E. S. T.)—6:45 P. M., children's hour, by Madge Tucker, 7, Boernstein Orch, 8, Bible talk, 8:15, Phyllis Howe Price, soprano, 8:30, "Our Engineer Presidents," by Mohrs Bien, 9:55, time, 10:30, dance program by the Astor Hotel Orch, 11:15, organ recital by Otto Beck.

KYW, Chicago, 536 (E. S. T.)—6:30 A. M., morning exercises, 9:30, late news and comment of the markets, 10:30, farm and home service, 11:35, table talk by Mrs. Anna J. Peterson, 6:02 P. M., news, financial and final markets, 6:35, children's bedtime story, 7, dinner concert, Poska DeBabary's Orch, 7:10, Conner-Sanders Original Nighthawks, 7:20, Joska DeBabary's Orch, 8, Carolen Encell, soprano; Charlotte Benensohn, soprano; Lillian Jeshel, accompanist; Edna Hopkins, violinist; Frances Allen, accompanist, Stehenson & Heather vocal duo, 9:05, Youth's Companion, 9:35, "Congress Classic," 12, "Congress Carnival," 1, frolic of the Midnight Sons.

WEAF, New York City, 492 (E. S. T.)—4 P. M., Willie Bruno's Orch, Katherine Peters, soprano, 6, dinner music; Pinewood Trio; thrilling adventure stories for boys; Bruno Huhn and group of singers; Mrs. Frank Southard, impersonator; Waldorf-Astoria Orch.; Alfred Orner, tenor; Herbert Ralph Ward, composer-pianist; Guy Hunter, blind entertainer; A. Taraffe, cellist; Vincent Lopez and his orch.

KDKA, E. Pittsburgh, Pa., 326 (E. S. T.)—9:45 A. M., stockman reports, 11:55, time, 12 M., weather; stockman reports, 1:30 P. M., Daugherty's Orch, 6, Westinghouse Bank, 7:30, Wimble, the Wanderer, 7:45, Bible, school teachers' luncheon, 8:30, special program, 9:55, time, weather.

KSD, St. Louis, Mo., 545 (C. S. T.)—8 P. M., St. Louis Symphony Orch., Rudolph Ganz, conductor.

KHJ, Los Angeles, 404 (P. S. T.)—10 A. M.,

broadcasting class, 12:30 P. M., program presenting Hi Maltoro and his orch, 2:30, program through the courtesy of the Pacific States Electric Co., Art Hickman's Concert Orch, 6:30, children's program, 7:45, Capt. John T. Riley on "Income Tax," 8, G. Allison Phelps, "Radio Philosopher," 10, Art Hickman's Dance Orch, 11:30, Lost Angels.

WLIT, Philadelphia, 395 (E. S. T.)—11:45 A. M., daily almanac, 12:02 P. M., organ recital, features from the studio; Arcadia Concert Orch., Prof. Feri Sarkozi, 2, Arcadia Concert Orch, 4:30, Cotton Pickers, Wilbur De Paris, director, 7:30, Arcadia Concert Orch.

WJZ, New York City, 455 (E. S. T.)—11 A. M., American orchestral concert, 1 P. M., Erdody's Park Lane Orch, 12:15, Saturday discussion of the National Republican Club, 4:30, Sherry's tea music, 5:30, State and Federal agricultural reports; farm and home market reports; New York Stock Exchange; foreign exchange quotations; Art news, 7, Freddie Rich and dance orch, 8, "Art for Laymen, Walter M. Grant, 8:15, Ida Davenport, soprano, 9, "Federal Meat Inspection, Aims and Results," by Dr. Albert Long, 9:15, Washington Square College Players, 29:45, "The Texans," Sanchez & Milsaad, 10, Great Northern Trio, 10:30, Joseph Knecht's Dance Orch.

WGBS, New York City, 316 (E. S. T.)—10 A. M., timely talks with Terese, 10:10, Eleanor Schorer's Kiddie Klub program, 10:40, Dean Moore, 1:30 P. M., Scripture reading, 1:35, Bob Krub's College Orch, 2, Kenneth Burdick, "Original Songs," 2:15, Bob Krub's College Orch, 3, interview with Major Stanley Washburn, 4, John Dunbar, tenor, 3:20, Dr. Stephen H. Wise, 3:40, Evelyn Goldsmith, 6, Uncle GeeBee, 6:30, Cameo Collegians, 8:30, Huguenot Players in "Lamplight," 9, John Oakley, basso, and Doris Sheldon, contralto, 9:30, Sam Comly, inside movie chats, 9:45, Beatrice Birnbaum, pianist, Irving Cohen, violinist; Ruth Cohen, accompanist, 10:15, Charles Mayer, wild animal trapper, 10:35, Irving Cohen, violinist, 10:45, Frank Sullivan's version of timely topics, 11, Vincent Rose and dance orch.

WIP, Philadelphia, 509 (E. S. T.)—1 P. M., organ recital by Karl Bonawitz, 1:30, weather, 3, Tom Sneads' Ramblers, 4:15, Yvonne Farr, 6, weather, 6:05, Hotel St. James Orch, 6:45, livestock and produce market, 7, Uncle Wip's bedtime story, 8, "Why Soap?" by E. Fullerton Cooke.

KFOA, Seattle, Wash., 455 (P. S. T.)—4 P. M., The Times, Wm. F. Hoffman's concert orch, 6:45, Rhodes Dept. Store, Howe College orch; Mrs. Reid, soprano; J. B. Carmichael, tenor; Miss Jernberg, accompanist; address, "How Banks Help a Community," by C. L. LeSourd, 8:30, The Times dance program, 10, Eddie Harkness and his orch.

WGN, Chicago, 370 (C. S. T.)—9:31 A. M., time, 9:35, stock and farm quotations, 10, wheat, 10:30, wheat and cable reports, 11, wheat, weather, dairy reports, 11:30, wheat, grain and livestock receipts, 11:56, time, 12, wheat, board of trade, 12:10 P. M., board of trade quotations; hog sales, 12:35, Tea Room orch, 1, wheat, 1:05, Tea Room orch, 1:35, readings, 1:40, Drake concert ensemble and Blackstone string quintet, 2:30, musical recital, 3, miscellaneous entertainment, 5, stock exchange and market, 5:30, Skeezix time for children, 5:57, time.

WGN, Chicago, 370 (C. S. T.)—11 A. M., Uncle Walt reads the funnies, 11:45, concert, 2 P. M., master artists' recital, 9, concert.

KGO, Oakland, Cal., 300 (P. S. T.)—11 A. M., service, Rev. Frank M. Sitsley, D.D., pastor, 3:30 P. M., KGO Little Symphony Orch.; Arthur S. Garbett, musical interpretative writer; guest artists, 7:30, service, Rev. Frank M. Sitsley, D.D.

KOA, Denver, Colo., 323 (M. S. T.)—11 A. M., service of church, 7:45 P. M., service of church, Rev. Loren M. Edwards, D.D.

WDAF, Kansas City, Mo., 366 (C. S. T.)—4 P. M., classical music from the Star's studio, 5, international Sunday school lesson, Dr. Walter L. Wilson.

KGW, Portland, Ore., 492 (P. S. T.)—10:30 A. M., service, Dr. Harold Leonard Bowman, pastor, 3 P. M., municipal concert, 6, church services, 7, Colburn Concert Orch.

WLW, Cincinnati, O., 423 (C. S. T.)—9:30 A. M., school by Sunday school publications, 11, service, Dr. Frank Stevenson, minister; soprano, Charlotte Sandman Angert; alto, Louise Koetter; tenor, Erwin Meyer; bass, Edwin Weidinger, 11:55, time, 7:30 P. M., service, Frederick McMillan, minister, 8:30, concert by the Western and Southern Orch.; soloist, George Muhlauser, tenor.

WIP, Philadelphia, 509 (E. S. T.)—10:45 A. M., morning service, 4 P. M., services under the auspices of the Germantown Y. M. C. A.

Sunday, February 22

WGN, Chicago, 370 (C. S. T.)—11 A. M., Uncle Walt reads the funnies, 11:45, concert, 2 P. M., master artists' recital, 9, concert.

KGO, Oakland, Cal., 300 (P. S. T.)—11 A. M., service, Rev. Frank M. Sitsley, D.D., pastor, 3:30 P. M., KGO Little Symphony Orch.; Arthur S. Garbett, musical interpretative writer; guest artists, 7:30, service, Rev. Frank M. Sitsley, D.D.

KOA, Denver, Colo., 323 (M. S. T.)—11 A. M., service of church, 7:45 P. M., service of church, Rev. Loren M. Edwards, D.D.

WDAF, Kansas City, Mo., 366 (C. S. T.)—4 P. M., classical music from the Star's studio, 5, international Sunday school lesson, Dr. Walter L. Wilson.

KGW, Portland, Ore., 492 (P. S. T.)—10:30 A. M., service, Dr. Harold Leonard Bowman, pastor, 3 P. M., municipal concert, 6, church services, 7, Colburn Concert Orch.

WLW, Cincinnati, O., 423 (C. S. T.)—9:30 A. M., school by Sunday school publications, 11, service, Dr. Frank Stevenson, minister; soprano, Charlotte Sandman Angert; alto, Louise Koetter; tenor, Erwin Meyer; bass, Edwin Weidinger, 11:55, time, 7:30 P. M., service, Frederick McMillan, minister, 8:30, concert by the Western and Southern Orch.; soloist, George Muhlauser, tenor.

WIP, Philadelphia, 509 (E. S. T.)—10:45 A. M., morning service, 4 P. M., services under the auspices of the Germantown Y. M. C. A.

Monday, February 23

KGO, Orkland, Cal., 300 (P. S. T.)—9 A. M., music and lectures, 10:40, classroom instruction by Oakland public schools, 11:30, luncheon concert, 1:30 P. M., N. Y. and S. F. stock reports and speaker, 4, Henry Halstead's Dance Orch, 5:30, Aunt Betty stories, 6:45, stock reports, weather, S. F. produce news, and news, 8, educational program, 10, Henry Halstead's Orch.

KOA, Denver, Colo., 323 (M. S. T.)—12 M., organ recital, 1 P. M., N. Y. stock reports, livestock, fruit and vegetable report; weather, 6, N. Y. stock reports, livestock, vegetables and news, 8, ten minutes of music from Fred Schmitt's Rialto Orch, 8:10, studio program.

WDAF, Kansas City, Mo., 366 (C. S. T.)—3:30 P. M., program broadcast from the Newman and Royal Theatres, 5, weekly Boy Scout program, 5:30, marketgrams, weather, time and road report, 6, weekly "request story night," Trianon ensemble, 8, Ivanhoe Bank Glee Club, directed by Edward N. Gill, Jr. 11:45, Nighthawk Frolic.

WGN, Chicago, 370 (C. S. T.)—9:31 A. M., time, 9:35, stock and farm quotations, 10, wheat, 10:30, wheat and cable reports, 11, wheat, weather, dairy reports, 11:30, wheat, grain and livestock receipts, 11:56, time, 12, wheat, board of trade, 12:10 P. M., board of trade quotations; hog sales, 12:35, Tea Room orch, 1, wheat, 1:05, Tea Room orch, 1:35, readings, 1:40, Drake concert ensemble and Blackstone string quintet, 2:30, musical recital, 3, miscellaneous entertainment, 5, stock exchange and market, 5:30, Skeezix time for children, 5:57, time.

WWJ, Detroit, 353 (E. S. T.)—8 A. M., setting-up exercise, 9:30, "to-night's dinner" and a special talk, 9:45, public health service bulletins and talks, 10:25, weather, 11:55, time, 12:05 P. M., Jules Klein's Hotel Statler Orch, 3, News Orch, 3:50, weather, 3:55, market reports, 6, dinner concert, 8:30, Ray Seeger and string quartet; Eugene Wilson, baritone; Margaret Foy, soprano.

KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather, 5 P. M., children's program, 7:15, markets, weather, news bulletins and police.

WLW, Cincinnati, O., 423 (C. S. T.)—8 A. M., setting-up exercise, 10:45, weather, 11:55, time, 12:15 P. M., concert, 1:30, business reports, 3, market reports, 4, Babson reports, 6, Selinsky Instrumental Quintet; Howard Thurston, master magician, 8, chorus of 700 boys and girls from high schools, 8:30, Times-Star Orch.; Howard Hafford, tenor; Robert Alter, hand-saw virtuoso; Ary Van Leeuwen, flute.

WGN, Chicago, 370 (C. S. T.)—9:31 A. M., time, 9:35, stock and farm quotations, 10, wheat, 10:30, wheat and cable reports, 11, wheat, weather, dairy reports, 11:30, wheat, grain and livestock receipts, 11:56, time, 12, wheat, board of trade, 12:10 P. M., board of trade quotations; hog sales, 12:35, Tea Room orch, 1, wheat, 1:05, Tea Room orch, 1:35, readings, 1:40, Drake concert ensemble and Blackstone string quintet, 2:30, musical recital, 3, miscellaneous entertainment, 5, stock exchange and market, 5:30, Skeezix time for children, 5:57, time.

Tuesday, February 24

KGO, Oakland, Cal., 300 (P. S. T.)—11:30 A. M., luncheon concert, 1:30 P. M., N. Y. and S. F. stock reports; weather, 4, Concert Orch, 6:45, stock reports, weather, S. F. produce news, and news, 8, Brunswick-Radiola program, 10, Henry Halstead's Orch.

KOA, Denver, Colo., 323 (M. S. T.)—12 M., organ recital, 1 P. M., N. Y. stock reports, livestock, fruit and vegetable report and weather, 3, half-hour for housewives, 6, dinner music, 6:30, final reading, N. Y. stock reports, livestock, vegetables and news.

WDAF, Kansas City, Mo., 366 (C. S. T.)—3:30 P. M., the Star's Radio Trio, 5, weekly child talent program, 5:50, marketgram, weather, time and road report, 6, the Tell-Me-a-Story Lady; radio piano lessons, Maudellen Littlefield; Trianon Ensemble, 11:45, Nighthawk Frolic.

WWJ, Detroit, 353 (E. S. T.)—8 A. M., setting-up exercises, 9:30, "to-night's dinner" and a special talk, 10:25, weather, 11:55, time, 12:05 P. M., Jules Klein's Hotel Statler Orch, 3, News Orch, 3:50, weather, 3:55, market reports, 6, dinner concert, 8:30, News Orch.

KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather, 12:30 P. M., concert, 5, children's program, 7:15, markets, weather, news and police, 8, Oregon Agricultural College Extension, 8:30, concert, 10, Multnomah Hotel Strollers.

WLW, Cincinnati, O., 423 (C. S. T.)—8 A. M., setting-up exercise, 10:45, weather, 11:55, time, 12:15 P. M., program by Delta Omicron Sorority; Cliff Lang, 1:30, business reports, 3, market reports, 4, recital by pupils of William Kyle; "Mah Jongg" by Lucy Blackburn, 6, Selinsky Instrumental Quintet; Howard Thurston, master magician, 7, "Washington," by C. M. Ritchie, 10, duets, A. W. Bradford, tenor; Margaret Philip, contralto; Mrs. A. W. Bradford, accompanist, Five minute talk on "Your Eyes," 11, Higginbottom's Orch, De Luxe.

WGN, Chicago, 370 (C. S. T.)—9:31 A. M., time, 9:35, stock and farm quotations, 10, wheat, 10:30, wheat and cable reports, 11, wheat, weather, dairy reports, 11:30, wheat, grain and livestock receipts, 11:56, time, 12, wheat, board of trade, 12:10 P. M., board of trade quotations; hog sales, 12:35, Tea Room orch, 1, wheat, 1:05, Tea Room orch, 1:35, readings, 1:40, Drake concert ensemble and Blackstone string quintet, 2:30, musical recital, 3, miscellaneous entertainment, 5, stock exchange and market, 5:30, Skeezix time for children, 5:57, time.

Wednesday, February 25

KGO, Oakland, Cal., 300 (P. S. T.)—11:30 A. M., luncheon concert, 1:30 P. M., N. Y. and S. F. stock reports; weather, 3, musical program, and speaker, 4, concert orch, 6:45, stock reports, weather, S. F. produce news, and news.

KOA, Denver, Colo., 323 (M. S. T.)—12 M., organ recital, 1 P. M., N. Y. stock reports, livestock, fruit and vegetable report and weather, 6, final reading, N. Y. stock reports, livestock, vegetables and news, 8, ten minutes of music from Fred Schmitt's Rialto Orch.

WDAF, Kansas City, Mo., 366 (C. S. T.)—3:30 P. M., the Star's Radio Trio, 5:50, marketgram, weather, time and road report, 6, speaker under the auspices of the Health Coiservation Association; speaker from the Meat Council; the Tell-Me-a-Story Lady; Trianon Ensemble, 8, classical music.

WLW, Cincinnati, O., 423 (C. S. T.)—8 A. M., setting-up exercises, 10:45, weather, 11:55, time, 12:15 P. M., Mu Phi Epsilon Sorority; Ahaus Brunswick Orch, 1:30, business reports, 3, market reports, 4, program for the "shut-ins," 6, Selinsky Instrumental Quintet; Howard Thurston, master magician, 8, William Stoess, violin; (Continued on page 26)

A THOUGHT FOR THE WEEK

HONESTY is the best policy—even among cut-rate radio dealers. The successful ones discovered this long ago. The diffident ones must fall into line— or go out of business.

RADIO WORLD

The No. 1 U. S. Paper



TELEPHONES: LACKAWANNA 8978 AND 2068

PUBLISHED EVERY WEDNESDAY

(Date Saturday of same week)

FROM PUBLICATION OFFICE

HENNESSY RADIO PUBLICATIONS CORPORATION

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M. B. HENNESSY, Vice-President

FRED S. CLARK, Secretary and Manager

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1/2 Page, 7 1/2 "x6 3/4", 231 lines	150.00
1/4 Page, 4 1/2 "x7, D. C., 115 lines	75.00
1 Column, 3 1/4 "x11", 154 lines	100.00
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FEBRUARY 21, 1925

The Nerve of Some Employers



"I left Mrs. Pinchley's employ."
 "You did! After being there nearly a solid month?"
 "Yes."
 "Why?"
 "She only had a crystal set."

Too Many Poor Programs; Too Much Interference, Readers Complain

Radiating Receivers Condemned — Radio's Virtues Lauded by Others — Phenomenal Growth Forecast—Dependability and Quality Stressed As Requisites for Sets — Fans Give Views in RADIO WORLD'S Survey.

READERS of RADIO WORLD, not only fans but also dealers, jobbers and manufacturers are sending in their views on "What's the Matter With Radio?" (32d on the list of industries, yet the world's greatest invention). Every reader of RADIO WORLD should send in his views. Letters published will be paid for at usual rates.

SURVEY EDITOR:

THE biggest reason why Radio is not more popular is because of the mediocrity of the stuff sent out over the "tube."

They can make all the dynes they will, they can bring in DX from Medicine Hat or Timbuctoo, but what is really going to keep interest alive in the final test is the stuff that we hear after we tune in.

Radio, being public entertainment, is really just another new addition to the family of show business, and its success will depend entirely upon how well it caters to its audiences. All of show business found that out long ago. Radio, however, is under a tremendous handicap because nobody actually knows how well the radio program is being received. Cards are received, certainly. But those cards mean nothing. Since the hearer paid nothing to be in the radio audience his boost means little and may have been inspired by any one of a hundred motives.

On the box office side of show business we can quickly tell whether people like what they are getting.

To listen in on half of the programs on the air leads me to believe that radio is being conducted by an experimental class of boys and girls who know nothing about entertainment values. I know positively that some of the "help" connected with broadcasting stations will do more to stop the sale of sets and parts than any other factor. They don't know how to put shows together, nor how to properly introduce their favorites, nor how to make selections of the matter presented.

We thought it would be wonderful if radio would stop trying to be Jack of all Trades and Master of None, and reverse the process by having a station present one kind of entertainment on one night. For instance, say it is Monday. A station could specialize on jazz music that night. On the same night another station could be handling a concert program; another an educational lecture and the assisting feature to accompany; another theatrical performance—and so on.

We don't mean that one station should begin to build a reputation as a concert station, another a jazz station, another an educational station—although we believe that finally it will come to that, just as theatres have developed upon a policy. But if at the present time they will de-

vote an entire evening to one style or program they will have started toward radio betterment.

BERT A. SPEARS,
Beacon Entertainment Exchange,
240 Tremont St., Boston, Mass.

* * *

SURVEY EDITOR:

THE majority of the programs are not worth listening to. Cut out 75% of the stations, so we can separate a bad station from a good one. I notice those who have no set are not over-anxious to buy any. If there weren't so many stations dealers could sell ten times as many sets.

A. J. BAKER,
Deputy Treasurer, Lee County,
Dryden, Va.

* * *

SURVEY EDITOR:

HARDLY 20% of the things we can get on the radio are worth listening to. However, probably the broadcasters through their many requests for criticism have found about what the ordinary listener likes best.

I think the improvement that would appeal to me the strongest would be the ability to get the station I want without its being drowned out by a stronger station.

J. WALTER SMITH,
East Brookfield, Mass.

* * *

SURVEY EDITOR:

LACK of variety in the average program of the broadcasting stations is one radio drawback. Let the announcer say "The next number on our program will be a contralto solo by Miss Marie Blank" and see how quick the average dial-twister will turn to some other station. Personally I had rather listen to such musicians as Wendell Hall, Harry Snodgrass and others of their type than the highest-paid artists or the most popular jazz orchestras, and I feel safe in saying that I express the sentiments of ninety per cent. of the radio fans with whom I have come in contact. Give us better programs.

J. B. COVINGTON,
Derry, Pa.

* * *

SURVEY EDITOR:

I AM a technical radio man. All owners of radiating sets should be educated as to how to tune their sets properly so that others can enjoy the same programs that they are listening to, for the majority of interference is caused by radiating sets.

Then there are those who have not got sets, and thousands of people in the United States have never listened to one. A majority of these people will say that radio is too technical, even as to operation, or again others will say that they are not going to get a set until sets become simpler, so they will push a button and the set will operate.

I believe that a great many of these difficulties will be overcome by greater advertising and by demonstrations. The man who is selling the sets should give everybody an example of the wonders, NOT mysteries, of radio. The radio industry is progressing very rapidly and has made wonderful progress. I think that it will continue to grow in spite of the pessimists (they are in every age), who say that radio is just a toy, and that it will never be more.

In regard to the letter by Wm. L. Alflaud in the issue of Jan. 17, I take exception to some of his remarks. He says that the greater part of the programs are

THE SURVEY

(Concluded from preceding page)

terrible. Well, I should like to know just what particular complaint he has to make against them, as I am sure that the majority of set owners enjoy the programs from 90 per cent of the stations. I should like to know just what his idea of a good program is.

HAROLD W. REILEY,
3 1/2 N. Post St., Spokane, Wash.

* * *

SURVEY EDITOR:

WHAT'S the matter with radio? Nothing in particular. It's what is mixed with it that I find fault with. How many persons care to listen to a collection of broken, worn-out phonograph records? Could they be much interested in buying a phonograph if this class of entertainment is all we could offer them?

People do not become over-enthusiastic over a bunch of sizzling, crackling, puffing, frying noises such as we get from radio such as it is. And if one gives a demonstration the usual comment is: "Why all the noise?" By the time it is explained to them that soon as the spark sets are worn out, when we have eight or ten more radio conferences at Washington, and finally, when Congress awakens to the fact that the Government should have control over the licensees, by this time some one has suggested a phonograph record be played and radio is forgotten.

W. R. VAN SICKLE,
RFD 1, Dearborn, Mich.

* * *

SURVEY EDITOR:

SOME of the ills of radio:

- (1) Receivers that radiate.
- (2) Receivers and horns that distort.
- (3) Code interference.
- (4) Inefficient parts and sets.
- (5) Poor tubes.

Some recommendations:

- (1) Manufacturers to discontinue making sets that radiate. Publishers to omit hookups of same.
- (2) Manufacturers to maintain a joint laboratory for research and experiments.
- (3) Government ban on spark transmitters.
- (4) Radio industry to be put on a sound financial basis.
- (5) Sets to be sold on installments.
- (6) Better sets. Better tubes. "No battery" sets.

F. W. BARTHOLOMAE,
1010 W. 69th St., Chicago, Ill.

* * *

SURVEY EDITOR:

I FIRST became interested in radio in 1899, and have never let my interest in it waiver. It is my pet hobby, so, naturally, I wish to see it take the place it should and that is in the home of every one in the United States.

I have built many radio sets and am well posted on the commercial side. It is harder to sell a radio set this year than it was last year in the large cities. The rural districts are doing the buying. Why? Because they can listen to a program without it being spoiled by the squealing and howling of hundreds of radiating receivers. This is absolutely the worst form of interference and is far worse than static and spark stations.

I use a 10-tube Super-Heterodyne and can pull in anything that is stronger than the noise. As an example, during the international tests I received nearly all the foreign stations with the loud speaker volume, but what did it amount to? Every few seconds it was punctuated with a wail that sounded like a lost soul. People in the cities are becoming disgusted with radio for this reason. If they have a phonograph they can hear their favorite artist or whatever they care to listen to without some obsolete receiver wrecking

their nerves. Radio will never take its proper place so long as conditions are like this, yet broadcasting stations are spending millions for their programs.

The solution is not in super-power stations to hog the air. That would be fine for the manufacturers, but would not suit the public at large. There will have to be drastic action against the radiating receiver, and all receivers of this type should be compelled to use a stage of RF ahead of any set that radiates.

Who is responsible for the present conditions? The manufacturers, dealers and radio publications are mostly to blame.

Another black eye is the false claims made by manufacturers and dealers as to their particular set or part. The papers and magazines are full of Coast to Coast bunk and people are led to think they can buy that particular piece or apparatus and get any station they want. They are not informed that weather conditions, location and little Johnnie with his squealer have anything to do with the reception.

There is also a large number of magazines in this country that specialize in trick hook-ups requiring certain named parts. I suppose they get theirs from the manufacturers and do not care how their readers are gypped. There is another type of magazine that publishes experimental hook-ups of the radiating type. They are cheap and easy to build. It does not make any difference if they do ruin the broadcasting for thousands while they are twisting the tails of their pets. And what a thrill they have when they hear something like a band from Texas or Los Angeles and just one tube, too! Papa tells all the boys at the office the next day how little Willie heard the Coast on a homemade squealer.

It is up to the magazines to help put radio where it belongs and it is up to them to get the public educated as to the truth of radio reception; also get them interested in some form of legislation that will do away with the radiating receiver.

There are a large number of stations that broadcast programs that are of poor quality, but these stations will die a natural death as receivers are made more selective. People will not listen to them.

I like RADIO WORLD. That is the reason I subscribed for it, and I am glad to see it make the stand it has in this matter.

Radio is simply a hobby with me and I have spent a thousand times more in

experiments than I have received from the same. I am employed as a locomotive engineer on the Pennsylvania Railroad and am not a radio dealer. I have been with the Pennsylvania company for 23 years.

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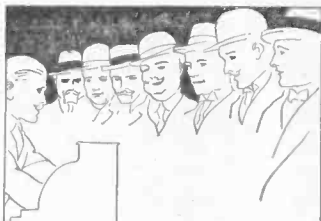
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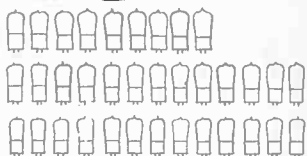
CHICAGO, ILLINOIS

You Don't Have To Sharpen The Old Pencil To Figure This!

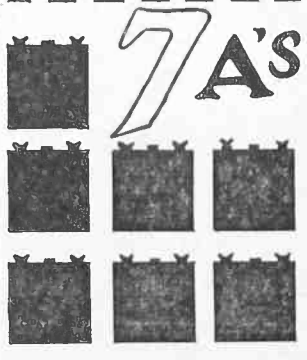
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35 Tubes



14 B's



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It doesn't take any long figuring to know that with SEVEN times as many sets going out of your store, you have SEVEN times as many customers coming back for ATTACHMENTS, BATTERIES, TUBES and INCIDENTALS.

As perfect as engineering skill can make it—giving efficiency of service never before equaled in radios at anywhere near its price, THE BRUNSWICK DE LUXE is bound to please your customers. **SATISFIED CUSTOMERS** will sell other sets for you.

It's the **VOLUME BUSINESS** that makes the **BIG PROFITS**, don't forget!

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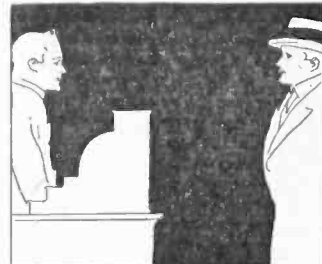
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5 Tubes



2 B's



1 A



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55 Vesey St., N. Y. C.

Send us today, without any obligation, full details and information regarding **THE BRUNSWICK RADIO SET**.

Name

Address

FRESHMAN MASTERPIECE

(Concluded from page 12)

of the tubes will light, no matter if the rheostat controlling the detector tube and the other single rheostat, controlling the four other tubes, are turned up. The reason is that the switch cuts the A battery current off, hence there is no A battery current and no B battery current supplied. Only when the tubes light, in any set, is B battery being used. Therefore,

the rheostats being off, the switch is turned on. Still no tube will light. The detector rheostat, at right, is turned on half way. Then the other rheostat is turned up about quarter-way. Now a station is tuned in. Both rheostats are readjusted until best volume and quality are produced. If the sound is rather "raggedy," then there is not enough current passing into the filaments and the tubes should be lighted more brightly. But do not light them a bit more brightly than is necessary for best results. Do not look for much brightness from 201A tubes in any case. During operation the settings of these rheostats may remain permanent. One exception is that when the storage A battery is run down the rheostat will have to be turned up more, and when the storage battery is freshly charged (the voltage then being usually a little above 6), the rheostat needs be lower than normally. The set should be operated with UV201A or C301A tubes throughout, fed by a 6-volt storage battery, preferably one having 100, 110 or 120 ampere hours. UV199 tubes may be used, with a little less volume.

the tube is too high for the radio-frequency purposes, although this tube would be excellent as an audio amplifier.

As hinted in the table, the set is capable of great DX powers.

FREE BOOKLET FOR INVENTORS

IF YOUR INVENTION is new and useful it is patentable. Send me your sketch. Z. H. POLACHEK, 70 Wall St., New York. Reg. Patent Attorney-Engineer

Makes Radio Tuning EASY



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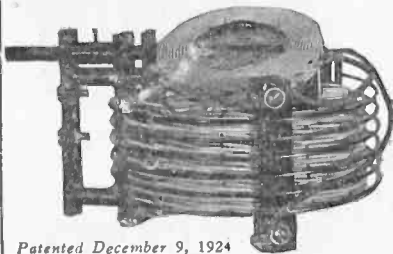
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MORE SELECTIVITY
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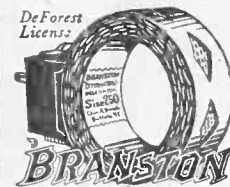
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The set should not oscillate on the low waves so as to produce squeals. On the high waves all sets not regenerative will behave well. The Freshman Masterpiece uses basket-weave coils, primaries reversely wound, low-loss variable condensers and an insulating sub-panel. All these things tend toward the full utilization of all the energy obtained from the antenna. The set is successfully quiet on those notorious low waves, but if a regenerative whistle is heard on an occasion, it will be due no doubt to the tubes. Therefore change tubes about in the set. Always do this when you get new tubes. Preferably have it done for you before you buy the set. Then have the tube bases marked as to which socket they go in. This is done so that the best detector tube will be found (even the same make of tube varies as to detecting qualities) and so that the best radio and audio-frequency amplifying tubes are discovered from among the four remaining tubes. The internal conditions of the tubes decide these points. If the set whistles on an occasional low wave you may be fairly certain that the capacity coupling within

CERTIFIED COILS
for the
PROFESSIONAL MAN'S
4-TUBE QUALITY SET
as published in this Issue



75-turn, lateral-wound honeycomb inductances,
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One Superdyne Coupler.....	} \$7.50	One Bradleystat.....	\$1.85
One Matched Radio-Frequency Transformer.....		One Bradley Push-Pull Battery Switch.....	.60
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One Federal No. 65A Audio-Frequency Transformer.....	4.95	Two Lengths of Spaghetti.....	.20
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One Variable Bradleyleak.....	1.65		

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RESULTS GUARANTEED MAIL ORDERS SOLICITED

RESULTS EDITOR:

I COMPLETED the 4-tube Superdyne described by J. E. Anderson in RADIO WORLD of Nov. 22 and 29 and Dec. 6 with the exception of changing the wiring for grid return as per Cunningham Corp. booklet. This set is the receiver I had been looking for—abundance of volume for loudspeaker operation at noon on WFAA, Dallas; WBAP, Ft. Worth, Tex.; WDAF and WHB, Kansas City; WOAW, Omaha. On the night of Dec. 31 we had

RESULTS

WHAT Results Did You Obtain from Constructing Sets or Parts Following Data Published in RADIO WORLD? Write to Results Editor, RADIO WORLD, 1493 Broadway, New York City.

WOR, Newark, N. J., and WCAE, Pittsburgh, on the speaker. On the night of Jan. 1 we had WGY and had to use the modulator on the speaker. I also hooked up the 1-tube DX Superdyne (Dec. 20 issue) by Herman Bernard and as a result a number of the sets in the neighborhood will be hooked up like it. In the Superdyne I used Samson transformers, 40 volts on detector; Bremer Tully condensers, type L; Unity vernier rheostats, Manhattan speaker.

DR. H. JACOBI. Tulsa, Okla.

RESULTS EDITOR:

HAVE had splendid success with Herman Bernard's "Three Circuit Tuner that Can Be Logged" (issue of Nov. 8), using an attic antenna. I heard Aberdeen and Newcastle.

A. E. MARR. Caldwell, N. J.

RESULTS EDITOR:

BUILT J. E. Anderson's 4-tube Superdyne (issues Nov. 22, 29 and Dec. 6). After building over 30 other Superdynes, Anderson's set was built practically the same as per his instructions, and has been tested and used. I have heard the Pacific coast on two occasions and can at any time bring in KOA, Denver, Col., after ten o'clock in the evening. The set is very selective and clear and for your information the writer has used practically every factory-built set on the market, using the same ground and antenna, for a comparison, and this set has proved without a question of doubt to be far superior to them all. This includes the Super-Heterodynes.

Any of our local stations can be tuned out and stations from Chicago, Iowa, Denver, Cincinnati, Cleveland and distances

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Enough for one set, 25c No. 1 for 14; No. 2 for 12 wire. Ten dozen for \$1.00.

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within this range brought in on the loud speaker regardless as to atmospheric conditions.

The exercises given by KDKA at 7 A. M. are being enjoyed by me. CHAS. A. MILLER. Manager Jos. E. Smyth Co., 638 Federal St., Chicago, Ill.

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DRY cells last longer if kept in an upright position.

TRI-TUNER advertisement featuring an image of the tuner and text: 'Pre-paid \$3.00. This very efficient tuner has been tested and approved by the Radio World. It is very selective, therefore an excellent coil for those who seek distant stations. The TRI-TUNER has many improvements over other coils of distinct advantage to the Home Set Builder. These include the Fenstock solderless clips, pig-tail connections, genuine Litz wire wound on natural Bakelite. Satisfaction with this tuner is guaranteed. ARC RAD PRODUCTS 48 South 7th Street Newark, N. J. Guaranteed Radio Products'

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Ionization Theory Proved by Eclipse

CHICAGO.

TESTS made by the portable station WJAZ at Escanaba, Mich., during the eclipse virtually confirmed that ionization of radio waves results from the sun's rays, observers reported. Reception here during the eclipse was a big improvement over daylight transmission, but not so satisfactory as at night.

Within an hour after the conclusion of the test telegrams from every state reported that reception during totality was similar to that at night.

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New Broadcasters

WASHINGTON.

TEN new class A stations were licensed by the Department of Commerce while five stations were transferred from Class C to A and two from class C to B.

NEW STATIONS

Call	Station	Meters	Watts
KDLR	The Radio Elec. Co., Devils Lake, N. D.	231	5
KFAN	University of Idaho, Moscow, Idaho	231	50
KFLP	Everette M. Foster, Cedar Rapids, Iowa	256	20
KFUY	Irvine H. Bouchard, Butte, Mont.	254	5
WBES	Bliss Electrical School, Takoma Park, Md.	222	100
WGBM	Theodore N. Saaty, Providence, R. I.	234	5
WGBN	Hub Radio Shop, La Salle, Ill.	256	10
WGOB	Dr. Roses Artan, San Juan, P. R.	275	10
WGBP	M. L. Price Music Co., Tampa, Fla.	250	50
WHBA	C. C. Shaffer, Oil City, Penna.	250	20

TRANSFERRED, CLASS C TO CLASS A.

KHQ	Louis Wasmar, Seattle, Wash.	273	100
WBS	D. W. May, Inc., Newark, N. J.	252	100
WCAX	University of Vt., Burlington, Vt.	250	100
WGI	Amer. Radio Research Corp., Medford, Mass.	261	100
WKAP	Duttee Wilcox Flint, Inc., Cranston, R. I.	234	50

TRANSFERRED, CLASS A TO CLASS B.

WKAR	Mich. Agri. College, E. Lansing, Mich.	285.5	500
KFMX	Carleton College, Northfield, Minn.	336.9	750

New Patents

MEANS for Control of Electric Impulses (1,523,139) invented by Edmund B. Wheeler, of New York, N. Y., and assigned to Western Electric Co. Produces pulses as a means for indicating time intervals. Another object of the invention



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is to produce a source of electrical impulses of equal intervals and equal duration for indicating time.

RADIO Antenna for Aircraft (1,523,280) invented by Carlton David Palmer of Washington, D. C. Relates to radio antennae for aircraft and has for an object to provide an antenna that may be instantly changed in effect from a loop antenna to a double trailing wire antenna and vice versa.

WAVELENGTH Indicator (1,523,305) invented by Walter J. Spiro, of White Plains, N. Y. Relates to a wavelength indicator and particularly to a device adapted to replace the customary adjusting dial used upon radio receiving instruments.

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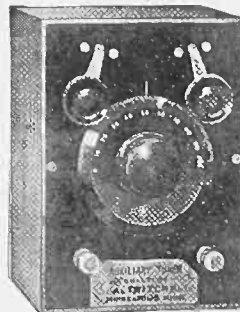
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EFFECT OF ECLIPSE ON RADIO described
 in issues of Feb. 7 and 14. Send 30c, get both
RADIO WORLD, 1493 Broadway, New York
 City.

Programs

(Continued from page 19)

Arthur L. Knecht, 'cello; Rosemary Ellerbrock,
 piano; Columbia Quartet; Clifford Lang; aesthetic
 dances. 9, Formica Orch.; Russian songs by
 Maxim Kastyik.

WWJ, Detroit, 353 (E. S. T.)—8 A. M., setting-
 up exercises. 9:30, "to-night's dinner" and a
 special talk. 9:45, public health service bulletins.
 10:25, weather. 11:55, time. 12:05 P. M., Jules
 Klein's Hotel Statler Orch. 3, News Orch. 3:50,
 weather. 3:55, market reports. 6, dinner concert.
 8:30, News Orch.; Templeton Moore, tenor.

KGW, Portland, Ore., 492 (P. S. T.)—11:30 A.
 M., weather. 12:30 P. M., concert. 5 children's
 program. 7:15, markets, weather, news bulletins
 and police. 8, concert by Lucile Cummins. 10,
 Colburn's Melody Men and Shefler's String Quar-
 tet.

WGN, Chicago, 370 (C. S. T.)—9:31 A. M., time.
 9:35, stock and farm quotations. 10, wheat. 10:30,
 wheat and cable reports. 11, wheat, weather,
 dairy reports. 11:30, wheat, grain and livestock
 receipts. 11:56, time. 12, wheat, board of trade.
 12:10 P. M., board of trade quotations; hog sales.
 12:35, Tea Room orch. 1, wheat. 1:05, Tea Room
 orch. 1:35, readings. 1:40, Drake concert ensemble
 and Blackstone string quintet. 2:30, musical rec-
 ital. 3, miscellaneous entertainment. 5, stock
 exchange and market. 5:30, Skeezix time for
 children. 5:57, time.

Thursday, February 26

KFDY, Brookings, S. D., 273 (C. S. T.)—8 P. M.,
 concert by the State College Military band. 8:20,
 "Seasonable Seeding," by Dr. A. N. Hume. 8:30,
 news items and announcements. 8:35, "Care of
 Bees in Spring," by H. C. Severin. 8:45, concert
 by State College Military band.

KGO, Oakland, Cal., 300 (P. S. T.)—10:40 A. M.,
 classroom instruction. 11:30, luncheon concert.
 1:30 P. M., N. Y. and S. F. stock reports and
 weather. 4, concert orch. 6:45, final reading,
 stock reports, weather, S. F. produce news, and
 news. 8, "Seven Keys to Baldpate," a melodra-
 matic farce. 10, Henry Halstead's Orch.

KOA, Denver, Colo., 323 (M. S. T.)—12 M.,
 organ recital. 1 P. M., N. Y. stock reports, live-
 stock, fruit and vegetable report and weather. 3,
 half hour for housewives. 6, final reading N. Y.
 stock reports, livestock, vegetables and news.

WDAF, Kansas City, Mo., 366 (C. S. T.)—3:30
 P. M., the Star's Radio Trio. 5:50, marketgram,
 weather, time and road report. 6, reading. Cecile
 Burton; book talks by Louis Mecker; the Tell-
 Me-a-Story Lady; Trion Ensemble. 11:45,
 Nighthawk Frolie.

KGW, Portland, Ore., 492 (P. S. T.)—11:30
 A. M., weather. 1:30, P. M., concert by Civic
 Music Club. 5, children's program. 7:15, market,
 weather, news and police. 8, the Oregonian Orch.
 10, Multnomah Hotel Strollers.

WWJ, Detroit, 353 (E. S. T.)—8 A. M., setting-
 up exercises. 9:30, "to-night's dinner" and a
 special talk. 9:45, Public Health Service bulletins.
 10:25, weather. 11:55, time. 12:05 P. M., Jules
 Klein's Hotel Statler Orch. 3, News Orch. 3:50,
 weather. 3:55, market reports. 6, dinner concert.

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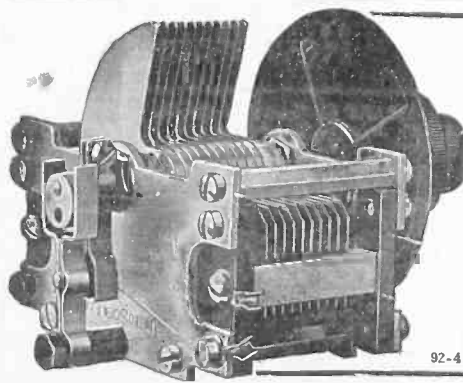
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LOUDSPEAKER ON TWO TUBES accom-
 plished by the Bluebird Reflex, described by
 Lieut. Peter V. O'Rourke in the Feb. 7 issue of
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 of tuned RF, crystal detector, one reflexed
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Programs

(Concluded from preceding page)
 8:30, News Orch.; Mme. Homer DuBard, soprano; Graeme Gillies, bass; Jean Loughhead and Theone Hubbard, 10, Jean Goldkette's Victor Recording Orch. 11:30, the Detroit News Orch.; Wilfred Head, composer-pianist.
WGN, Chicago, 370 (C. S. T.)—9:31 A. M., time. 9:35, stock and farm quotations. 10, wheat, weather, wheat and cable reports. 11, wheat, weather, dairy reports. 11:30, wheat, grain and livestock receipts. 11:56, time. 12, wheat, board of trade. 12:10 P. M., board of trade quotations; hog sales. 12:35, Tea Room orch. 1, wheat. 1:05, Tea Room orch. 1:35, readings. 1:40, Drake concert ensemble and Blackstone string quintet. 2:30, musical recital. 3, miscellaneous entertainment. 5, stock exchange and market. 5:30, Skeezix time for children. 5:57, time.

Friday, February 27
KGO, Oakland, Cal., 300 (P. S. T.)—11:30 A. M., luncheon concert. 1:30 P. M., N. Y. and S. F. stock reports and weather. 3, studio musical program and speaker. 4, concert orch. 6:45, stock reports, weather, S. F. produce news, and news.
KOA, Denver, Colo., 323 (M. S. T.)—12 M., organ recital. 1 P. M., N. Y. stock reports, live-stock, fruit and vegetable report and weather. 3, half hour matinee for housewives. 6, final reading N. Y. stock reports, livestock, vegetables and news. 6:40, book knowledge program. 8, ten minutes of music from Fred Schmitt's Rialto Orch. 8:10, studio program.
WDAF, Kansas City, Mo., 366 (C. S. T.)—3:30 P. M., Radio Trio. 5:50, marketgram, weather, time and road report. 6, speaker from the Kansas City Children's Bureau; the Tell-Me-a-Story Lady; the Trianon Ensemble. 8, popular program. 11:45, Nighthawk Frolic.
WWJ, Detroit, 353 (E. S. T.)—8 A. M., setting-up exercises. 29:30, "to-night's dinner" and a special talk. 9:45, Public Health Service bulletin. 10:25, weather. 11:55, time. 12:05 P. M., Jules Klein's Hotel Statler Orch. 3, News Orch. 3:50, weather. 3:55 market reports. 6, dinner concert. 8:30, the Detroit News Orch.; Anne Campbell, poet; Mrs. Claudine Secor, soprano; Norman Butterfield, baritone; the Three Knights of Harmony.
KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather. 12:30 P. M., concert. 5, children's program. 7:15, market, weather, news and police. 8, lecture by University of Oregon. 10:30, Hoot Owls.

WGN, Chicago, 370 (C. S. T.)—9:31 A. M., time. 9:35, stock and farm quotations. 10, wheat. 10:30, wheat and cable reports. 11, wheat, weather, dairy reports. 11:30, wheat, grain and livestock receipts. 11:56, time. 12, wheat, board of trade. 12:10 P. M., board of trade quotations; hog sales. 12:35, Tea Room orch. 1, wheat. 1:05, Tea Room orch. 1:35, readings. 1:40, Drake concert ensemble and Blackstone string quintet. 2:30, musical recital. 3, miscellaneous entertainment. 5, stock exchange and market. 5:30, Skeezix time for children. 5:57, time.

Saturday, February 28
WLW, Cincinnati, O., 423 (C. S. T.)—8 A. M., setting-up exercise. 10:45, weather, business reports. 11:55, time. 12:15 P. M., Ahaus-Brunswick Orch. 1:30, business reports.
KGO, Oakland, Cal., 300 (P. S. T.)—11:30 A. M., luncheon concert. 12:30 P. M., final reading, stock reports and weather. 4, concert orch. 8, San Jose School Band; guest artists. 10, Henry Halstead's Orch.
KOA, Denver, Colo., 323 (M. S. T.)—12 M., organ recital. 1 P. M., final reading, N. Y. stock reports, live stock and weather. 9, Joe Mann and his Rainbow-Lane Orch.
KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather. 10 P. M., Colburn's Melody Men.

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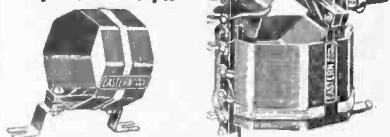
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Secretary of Commerce and Radio Chief of the United States.

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IN view of the very rapid changes in radio technology within the last six months and to give greater clarity to departmental policies, it seems to me desirable to review the situation.

There can be but one point of view in the consideration of radio regulation and development. That is to assure increasing service to the listener. The radio is steadily enriching our homes. More particularly to our farmer folks it is bringing more of those contacts that the town populations have alone enjoyed up to this time. The road of progress is to stimulate the development of the art; to prevent interference with and between broadcasting stations through maintained competition; to secure greater perfection of reception, increase in the number of alternative programs and better programs.

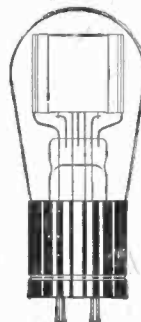
There are today 563 broadcasting stations either in operation or under construction.

Of these 455 are Class A (of 500 watts power or less) and 108 are Class B (over 500 watts). It is generally believed that Class A stations have a radius of good practical reception of not more

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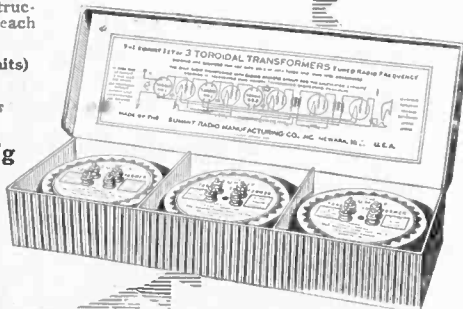
One builder using these Transformers in the SUMMIT circuit received 54 stations in two nights, traveling West to Denver and South to Mexico City. This circuit with instructions for building enclosed with each set of Transformers.

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No New Waves for Big Cities

than 25 or 50 miles, while Class B stations with their larger and increasing power have a much wider radius. By practical reception I do not include the reception which radio listeners are able to secure by playing radio golf, but the effective,

"It Is Highly Important That Those Who Contemplate Entering the Broadcasting Field Should Clearly Understand There Is No Assurance That They Can Be Allotted a Class B "Wavelength" (the Most Important License)—"The Department Cannot Give What It Hasn't Got"—"The Worst Conditions (of Wavelength Shortage) Are at Chicago and New York."

serviceable, reliable reception of programs which must be the real purpose of radio. The recent policy of the department of allowing the increase in power toward a possible maximum of 5,000 watts will mean that the radius of serviceable reception will be greatly increased and the reception itself within the present radius will become very much more reliable. This is of particular importance to our agricultural people especially in summer and during daytime. The present plan in this particular is to permit advance in power use in stages of 500 watts, resting at each stage to determine what interference with other stations results. Probably 20 or 30 Class B stations are now increasing or planning to increase their power. It is quite possible that good serviceable reception will be obtained for a radius of several hundred miles from such stations, thus increasing the alternative programs to listeners. This advance toward 5,000 watt stations has no relation to the so-called "super power" 50,000 watt stations.

Wavelength Distribution

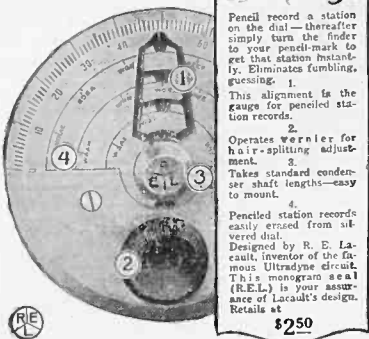
The most difficult problem in radio regulation and development is the distribution of wavelength use so as to prevent interference between stations. There are in all 86 different wavelengths available if we keep the stations ten kilocycles apart and stagger the assignment of wavelengths geographically so as to prevent overlap in the area of effective reception. The recent experiment of the department in attempting to increase the number of wavelengths by decreasing the difference to seven kilocycles proved unsuccessful with the present development of instruments.

Class A stations (500 watts or less power) were assigned the wavelength of 278 meters and below by recommendation of the Radio Conference and there are in this area 39 possible wavelengths. Owing to their limited radius and the irregular character of their program (largely churches, educational institutions, etc.) Class A stations have not presented

so many difficulties in wavelength assignment and interference as Class B stations although there are 455 of them.

Class B stations present a far more serious situation because of their wider radius and their regular performance. There are 47 wavelengths to be divided

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Must Pay Artists, Says Hoover

over a total of 108 stations now operating or under construction. That is, there is

now an average of less than one wavelength for each two stations, which means that they must divide their time of operation. The Class B stations are the ones which furnish most of the regular programs and from which the public receives its most effective service. Most of them naturally desire and need to operate continuously as the cost of overhead is much increased by dividing time.

The department has asked for appropriations with which to carry out an investigation to determine accurately the effective service area of different stations and different degrees of power. Such an investigation may disclose possibilities of a better basis of wavelength distribution.

Physical Limitations on Number of Stations

One of the great difficulties in the distribution of wavelengths arises from the tendency of stations to congest in large centers of population. The worst conditions are at Chicago and New York. At Chicago five wavelengths are available for ten operating Class B stations and there are several others in course of construction. For New York there are six wavelengths available for eight Class B stations and more are under construction.

It is practically impossible to increase the number of wavelengths available to these cities because they are all in use in other communities and because it is absolutely necessary to maintain a wide kilocycle separation between stations so close together. Otherwise they will destroy each other. Such multiplication as has already occurred in these centers gives no better service to the public and if further division in time is forced it will decrease the value and efficiency of the established stations. Neither under the present law nor under the provisions of the White Bill was there any limitation of the number of stations. It is highly important that those who contemplate entering the broadcasting field should clearly understand that there is no assurance that they can be allotted a Class B wavelength and justice maintained to radio listeners. The department cannot give what it hasn't got. One reason for delay in legislation has been the hope of determining whether or not it would be necessary to include such limitations.

Present Interference

There is so far but little interference between broadcasting stations. There is considerable interference from telegraphic code transmission although it does not destroy the listeners reception from nearby stations. The code transmission is a product of harmonics from telegraphing in higher wavelengths and is also a problem of foreign shipping. A good deal of such interference has already been removed and exhaustive studies are under way for its further elimination.

The great body of radio listeners in the country today have good practical reception of three or four different programs simultaneously and with the gradual advance in power in different parts of the country the number of effective alternative programs should shortly increase up to 8 or 10.

The interconnection of stations has

made distinct progress in the last six months. Programs are being simultaneously broadcast fairly regularly over the northeastern states. There is evidence that regular interconnection into the Middle West will come in the near future. I believe that nationally organized interconnection for important national events is an inevitable development and is one

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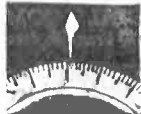
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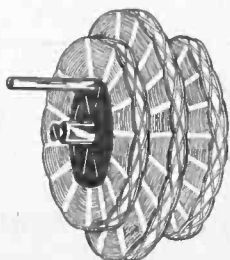
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Send in your old and burnt out Tubes—We will send you new AMPLITRON—any model—at \$2.50
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of the most serious missions of the radio. It does not follow, as some have assumed, that this would displace local programs for such events do not take place at the same time each day nor do we usually expect them (except political conventions) to last more than an hour. The payment of artists for broadcasting has already begun, and it is my present anticipation that it is only a question of time until stations will join together in groups and bear mutually the cost of interconnection for national programs and events of importance, thus effecting somewhat the same organization which our newspapers maintain through the press associations.

A misapprehension which I would like at this time to correct is that any suggestion has been made by me or the Department of Commerce that there should be a tax on the sale of radio material

for the provision of a national program. Such proposals were discussed at the recent Radio Conference but were abandoned and at the present moment it seems evident that from the vast increase in broadcasting stations there is no need for a direct or indirect charge upon listeners in order to secure service.

The broadcasting stations deserve the appreciation of the public for their efforts to serve the listener, for the constantly improving character of their programs and the maintenance of a very high moral standards.

No Monopoly in Radio

There is no monopoly in radio broadcasting or any sign of it. There are only four or five concerns in the entire United States which own or operate more than one station, and of the total of 563 stations in action not more than four belong to any one of them.

Legislation

Some misunderstanding seems to have arisen, due to failure of many people to read the White Bill and the recommendation which I made to Congress for the postponement of legislation for the control of radio until next session. The law of 1912 secures to the government the fundamental control of radio, for it retains in its possession the channels through the air, just as effectively as it does the channels of navigation upon our rivers. There can be no monopoly unless the government deliberately gives monopoly, and that would be parallel to the giving of exclusive right of navigation upon one of our rivers.

The proposed legislation heretofore formulated was based upon our knowledge of the development of the art now nearly two years old. That legislation proposed to give very extensive authorities to the Secretary of Commerce, his discretion being practically unlimited, and very much broader than anything which I prepared as a temporary measure. There are some things, such as the assignment of wavelengths and limitation of power use, which are absolutely necessary for the external conduct of radio. My recommendation for immediate legislation was narrowed down to this field, leaving the bigger issues of regulation until we have enlarged knowledge of the art and of the problems with which we are now confronted. These milder proposals were in the direction of reducing departmental authority, not increasing it. Nor has the department ever proposed the control of programs, as has been said, but on the contrary has consistently opposed it. The character of the matter sent out must be left to the stations themselves and they, in turn, must be governed by the wishes of their listeners. The public will unquestionably turn to the station from which it gets the most worthwhile material, and, in any event, interference by the government in the character of programs would inevitably mean censorship. It would become the negation of the fundamentals of free speech and free dissemination of information.

The whole art, both from the point of view of its expansion, the number of stations, character of the programs, purposes of the broadcasters, the scientific development going on in increased use of power and in improved instruments and, therefore, better and wider radius of reception to the listeners, together with the complex social and legal problems involved, is in a state of complex flux, and it is my feeling that our ideas as to the character of legislative regulation should be clarified within another year. In the meantime the fine cooperation of the industry is preventing any infringement

of public interest and the free competitive development of the art is bringing fine results in public service.

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COMPLETE 1924 INDEX OF RADIO WORLD, appeared in RADIO WORLD dated Oct. 18, 1924, and Jan. 10, 1925. 15c per copy.

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