OCT. 24
1925

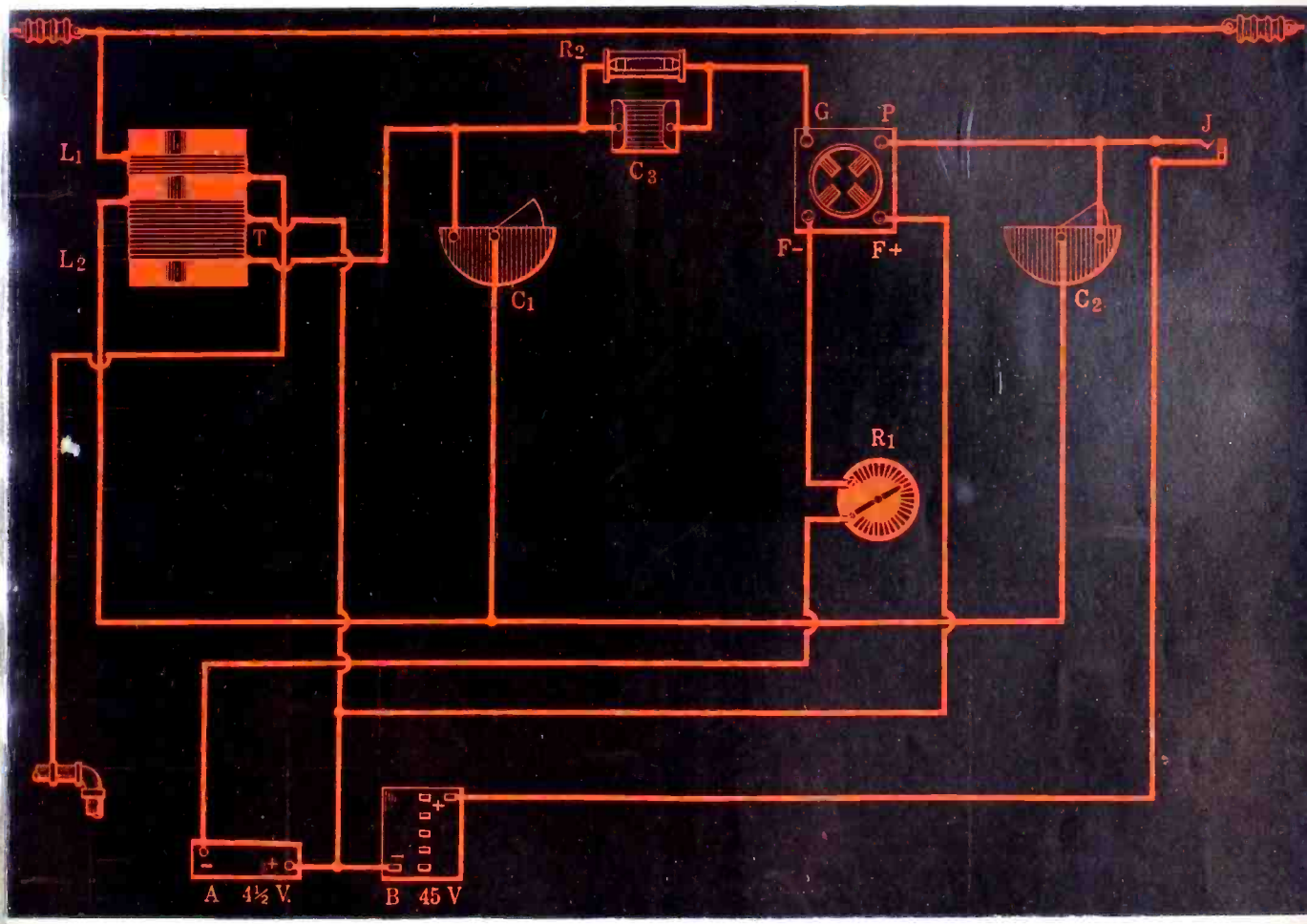
15 Cents

CORRECT USE OF FIXED CONDENSERS
By J. E. Anderson

RADIO WORLD
Title Reg. U.S. Pat. Off
Vol. 8. No. 5 ILLUSTRATED Every Week
155-187

SET TO PUT IN PHONOGRAPH
By Lewis Winner

THE BERNARD 1-TUBE DX SET



THE 1-TUBE SET wiring is shown above in picture form. See article on page 16.

SET TUNES 3 STAGES WITH ONE CONDENSER

Dr. Taylor Discusses Short-Wave Phenomena

FINAL VICTORY FOR PUBLISHERS OVER COPYRIGHT

Again They said it couldn't be done!

Here it is

New and Improved
FRESHMAN MASTERPIECE

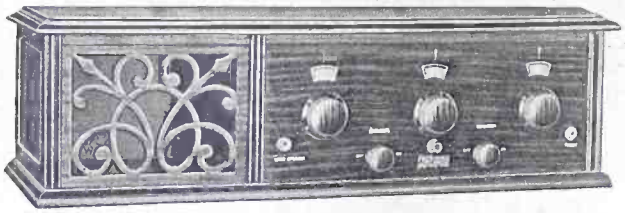
$60

But now - - -

Complete with built-in loud speaker of great volume and superb tone quality.

Encased in - - -

As fine a heavy genuine solid mahogany cabinet as ever graced any radio set.



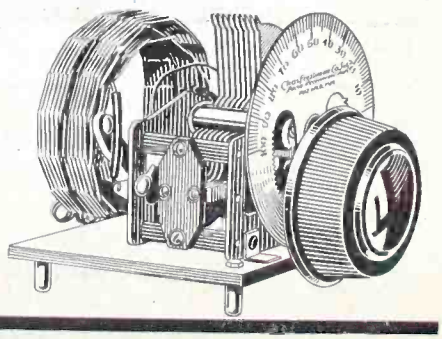
Model 5-F-5

At sixty dollars - - -

Not only complete with built-in loud speaker and massive mahogany cabinet, but this wonder circuit has been scientifically perfected and each and every single part strengthened and co-ordinated.

For example - - -

The new Freshman Masterpiece straightline wave length condenser with vernier attachment which assures hair-line selectivity—permitting you to tune in the station you want without interference over the entire wave length range. This is merely one exclusive feature of this New and Improved Freshman Masterpiece Receiver.



For sale at AUTHORIZED FRESHMAN dealers only

Write for 24-page illustrated booklet full of useful information for all radio fans.

Chas. Freshman Co., Inc.
NEW YORK CITY, 240-248 W. 40th St.
CHICAGO, 2626 W. Washington Blvd.

RADIO WORLD

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

A Weekly Paper Published by Hennessy Radio Publications Corporation from Publication Office, 145 West 45th Street, New York, N. Y. Telephones: BRYant 0558, 0559

Vol. VII. No. 5. Whole No. 187. October 24, 1925 15c per copy, $6.00 a year

The 3-in-1 RF Receiver

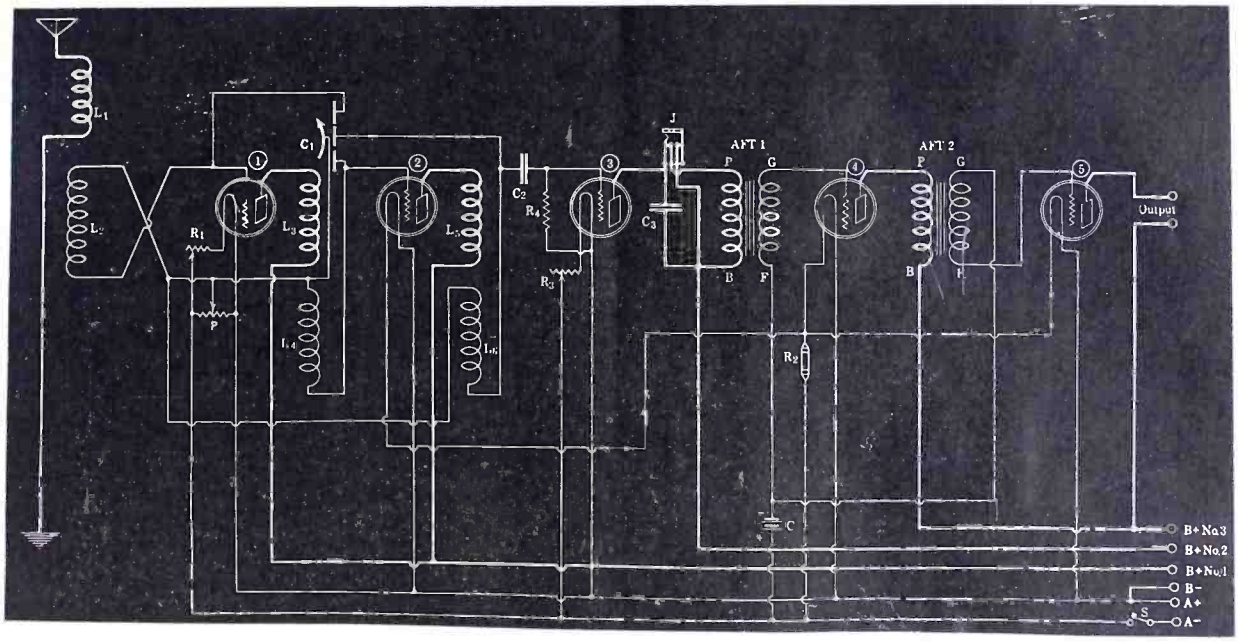


FIG. 1, the wiring diagram of the set that tunes three secondaries with one condenser motion. The reversed secondary of the second AFT may improve some sets.

By Sidney E. Finkelstein

Associate, Institute of Radio Engineers

PART I.

THE tuning of three circuits by one motion is possible by several means, one of the most attractive being by use of 3 - section condenser, C1 in Fig. 1. It is used in a 5-tube tuned radio-frequency set in which a potentiometer is used for stabilizing purposes.

SIDNEY E. FINKELSTEIN

Granting that the proper inductances are used in the secondaries it is possible to make a mighty fine receiver that will prove popular with all members of the family. The tuning ease is remarkable, as there is only one dial to handle. The volume is at least as much as anybody would want, and in some cases a little more than that, due to the fact that some speakers can not handle a terrific amount of volume. In any event it is possible to drop the volume by turning the first radio-frequency stage rheostat down a little lower. This is R1 in Fig. 1 and should be 30 ohms for the 201A line of tubes. The usual value recommended for other circuits using this tube is 20 ohms, and that is correct there, but in this case the control is rendered finer by the inclusion of a rheostat of higher resistance. The only other rheostat used, R3, which governs the detector tube, should be 20 ohms. The detector rheostat and potentiometer, once their settings are determined, may generally be left that way.

The potentiometer P, which should be 400 ohms or more, plays an important part in the operation of the circuit, since it varies the bias, if any, on the two RF tubes. In effect it is a synchronizer, because it brings the operating characteristics of one RF tube to about the same plane as those of the other. A given bias for one tube will cause it to work in the most efficient manner, while a different bias will have to be used to produce the same effect on the other tube whose grid return is connected also to the potentiometer arm. Hence the better tube is brought down to the level of the poorer one, in point of performance, and this has been used as an argument against the employment of a potentiometer as an RF stabilizer common to two or more circuits. Two separate potentiometers could be used, of course. The argument is sound, but it hardly stands up under the practical considerations of the day, which are decidedly in favor of simplicity, and so long as simplicity is consistent with good reception over long distances, fine selectivity and plenty of volume, no more is asked. Those who care to abide by the other school of reasoning may use a potentiometer for each of the two RF tubes, but for practical purposes this is decidedly unnecessary, and the results obtainable from the receiver just as it is shown in Fig. 1 will confirm this.

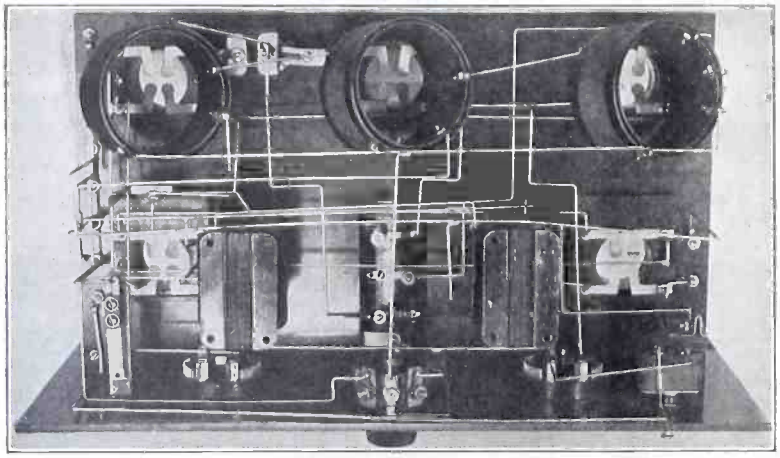
It will be noticed that a C battery is used. This might not be necessary in all cases, but it is well to have the connections there, for they may be bridged by busbar if the C battery, on experiment, proves not to improve the signal. It is used in the audio circuit only. About 3 to 4½ volts should be tried.

The actual construction of each tube has much to do with the necessary bias, and discussions of biasing all too often disregard the tube construction, which may not be the same for any of the five tubes you would buy for the set. The distance of the grid from the plate is important, and this is something you can not judge, for you can not see, much less, measure it. The C battery takes care of these considerations, and often will more than compensate for its use, cutting down the B battery drain particularly.

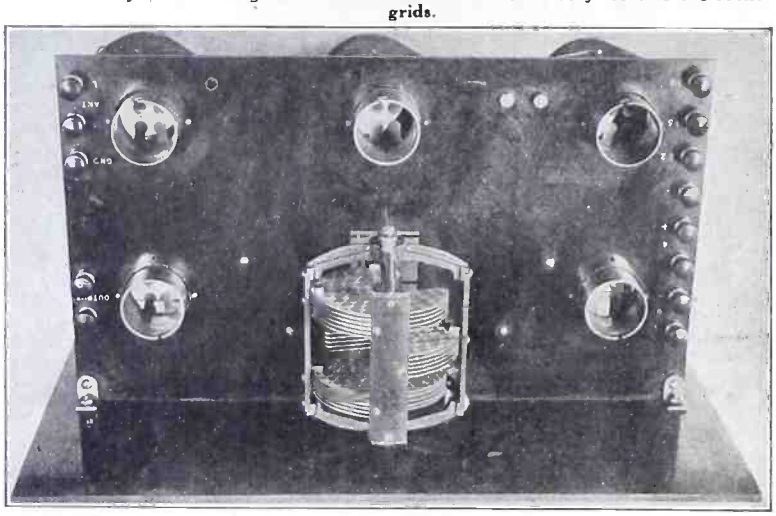
The Stabilization

All forms of stabilization or neutralization must necessarily introduce some form of loss. In the case of the neutralizing condenser it may be only that slight loss occasioned by the extra resistance incorporated by the small balancing condenser in the counter-oscillatory circuit. This is no indictment against the Neutrodyne, which is an excellent circuit, but it merely expresses the condition existing by virtue of the tube action itself, where at the higher frequencies in the broadcast belt (lower wavelengths) the capacity existing between the elements inside the tube itself set up free oscillations that either roughen or distort reception or prevent it entirely. Naturally some means must be provided for getting reception, and

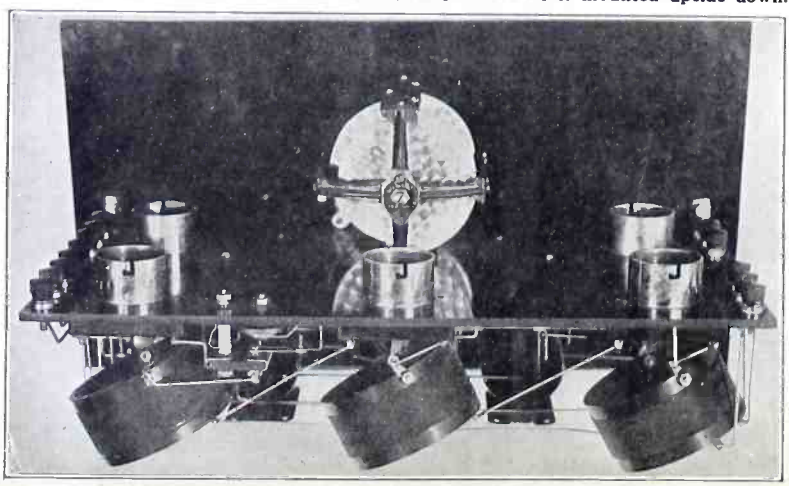
Stabilizing of Sets Explained



HOW THE WIRING is done underneath the subpanel is shown in this bottom-view photograph. The audio-transformer bases are on the same horizontal plane as the bottom of the front panel, although the photographic perspective does not indicate this. Note the slot through which a peep is obtainable at a part of the variable condenser. The potentiometer is in lower center. Note the arm or mid-point of the potentiometer is connected to one end of L4, on a straight line, and that a busbar lead is soldered at right angles and connected to the corresponding terminals of L2 and L6. In the coil at left, looking at the core, lower right, one catches a glimpse of the mounting bracket. This photograph shows that an extra half turn is put on the secondary so that the grid terminals of the coils will be very close to the socket grids.



TOP VIEW, showing how the brass angles secure subpanel to the front panel. Both are hard rubber. Note that the variable condenser is mounted upside down.



THE ANGLE of mounting the coils is shown very clearly in the above photograph.

good reception, at that, and no matter what means that happens to be, so long as it succeeds, it is a good one. A given manner of stabilization may function a little more efficiently than some other, but this is something for the hagglers to worry about, rather than a matter of great concern to the home-constructor, to whom practical demonstrations in terms of quality of reception, volume, distance and simplicity mean more than geometric computations based on meter readings.

The Coil Connections

The best way to connect the coils is that shown in Fig. 1, where the terminal joints are defined, but where the position of the coils themselves is not shown, for that is at an angle in fact, say 57.3 degrees. To measure this angle accurately a protractor is necessary, or some other mathematical calculation must be used, but assuming that these means are not at every one's command, it is all-sufficient to mount the coils as near as possible to the fashion shown in the photographs. The distance between coils is great enough (2" at nearest points) to allow some leeway, and besides the potentiometer control is bet ter equipped for getting rid of over-oscil lations, even those induced by interstage coupling, than the neutralizing condense. method, because of the greater scope of variation and the broader method of approach.

The Coils

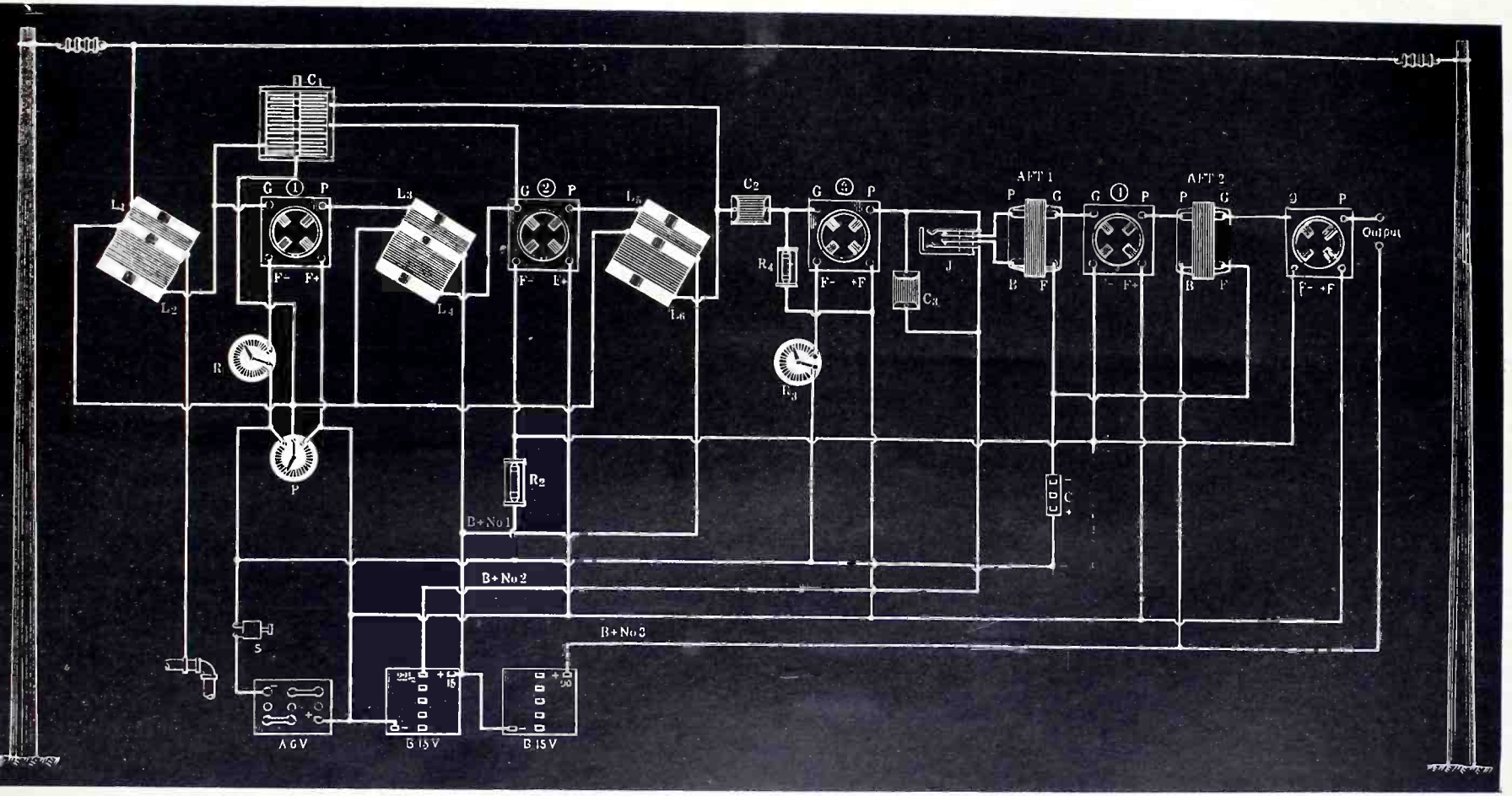
The coils for the set depend of course on the capacity of the condenser. As the whole wavelength band may be tuned in with the .00025 mfd. type variable condenser, provided suitable inductance is used in the secondary, and as a 3-section condenser is embodied in the hookup, both electrical needs and space conservation are served when the coil is made for the .00025 mfd. type of 3-section condenser. This instrument may be rated .00075, where the combined capacities are considered, or .00025, where the manufacturer refers to the maximum of a single section, but you will be getting the right instrument if you ask for a 3-section .000025 mfd., for even the manufacturer who identifies his product by the sum of the total capacities will know what you mean.

The tubings necessary are three of 3" outside diameter, 1¾" high, and three of 2¾" outside diameter, 1¾" high, The primaries will be wound on the smaller diameter forms and the secondaries on the others. The primary will then be inserted inside the secondary.

Using No. 26 single-silk covered wire, put on 60½ turns for each of the secondaries. Four tiny holes are drilled whenever a winding is put on any of the forms. Two of these will be in parallel and in the direction of winding, and through them the wire end will be threaded for anchorage. For instance, in starting to wind the coil, measure down ¼ or ⅜" from one circumference, make the two holes. Leave a few inches of wire as excess and start winding. It will be found that the winding takes up approximately 1", but if it is a little more or less do not let that concern you. Hold the end of the winding and drill the two remaining holes on the same line that would be followed if the winding were continued farther. Then cut the wire about 2" from the point where it will be introduced in the pinholes and thread. It is safe to measure 1" (axial length of winding) and arbitrarily put the two pair of holes on circumferential lines. but each pair at diametrically opposite points, because the winding will fit on

(Continued on page 26)

Picture Diagram of Wiring of 3-in-1 Receiver



THE SET WIRING in picture form. The jack may be wired as shown above or as in Fig. 1

A Phonograph Cabinet Set

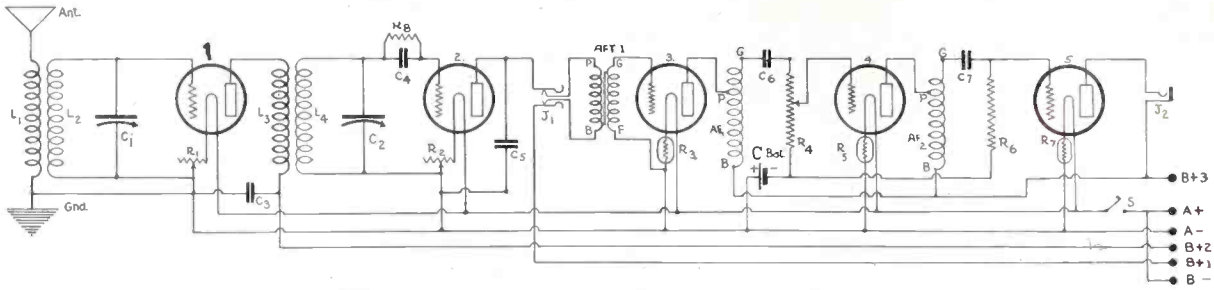


FIG. 1, showing the electrical diagram of the set built in a phonograph cabinet.

Receiver is designed for utilization of the cabinet, without use of the phonograph itself and with an external speaker placed in the record compartment next to the one used for the panel.

By Lewis Winner

Associate, Institute of Radio Engineers

PART I.

"I HAVE a console phonograph. I would like to place a radio set in there, but I don't know of any manufactured set that will fit in the compartment, which has such odd measurements."

LEWIS WINNER

My brother, Herman, said this to me over the telephone one night.

"Can't you build the set?" I asked.

"No, not very satisfactorily," he answered.

"Yes, you can," I insisted. "Go to it. There's lots of fun in it. Also when you build your own you nearly always know just what the trouble it, in case the set stops dead or just gets blah."

Problems to Solve

He finally agreed to build the set himself. Soon after he said goodbye and I started to think what type of receiver was best to place into a phonograph. The set should give plenty of volume and at the same time quality must be good. He might want to use the tone chamber, and to make one that gives any sort of decent volume requires a very large output. This is only obtainable with at least three stages of audio-frequency amplification. Of course, he might still want to use an external speaker, which could be placed into the other record partition. There are two record partitions in every console type, one on each end. In the center is the tone chamber. In any event, a loud set was desirable. But that does not mean that quality of reproduction must be ignored.

No matter how many radio-frequency tubes you add in front of the detector, the volume does not increase in proportion to what it does when adding an AF stage. In the many sets that I have made I found that when adding more than one tube ahead of the detector, the volume increase was so small that the extra RF tubes could be taken out, the wiring being rearranged, and you wouldn't notice the difference. This, of course, happened mostly on locals. On distance stations the extra tube did help, but to only a small extent. That is, if you are a careful tuner you could tune in those same stations with the extra RF tube or tubes out. In other words, the first portion of the circuit need contain only one stage of radio-frequency amplification ahead of a regenerative detector. Follow that by three-stages of audio-frequency amplification and you would have enough.

Now what stumped me was: what type of audio-frequency amplification was to be used? The first stage should be of the regular transformer coupled type. The second and the third stages stuck me for a few moments, during which period resistance coupled, choke coil and auto transformer coupling were thought upon, the auto-transformer method was chosen. Why? This will be explained later.

Trying Circuit on a Breadboard

I went over to my test board and tried out a circuit which I thought to be excellent for this purpose. I had hardly finished wiring up the test circuit when the door-bell rang. There stood my old friend Jack. You remember Jack, the fellow who was so overjoyed at hearing a set of mine that he junked his and built one I described for him and which I had working in my home.

"Hello, Jack. Say, you sure are welcome. How's the set working?"

"Nothing to beat it. Say, you know Bill Beldham?"

"Sure do."

"First I built the set as you described it to me, and it worked fine. However, Mrs. Beldham and Bill paid us a visit. They wanted to know if I could place the set in the phonograph that we have. I said that was a great idea."

"Yes," I reminded, "especially as Bill is an M. E."

"Well, you know, Winner, I am pretty handy with tools myself, and so we started. We took our time with it, and although it took us quite a long time, it was well worth it. It works as well as it looks. There was nothing really difficult to do, except rearrange the parts. The shelf was cut in two, two sockets placed on top, and three on the bottom. Did a little more juggling with the rheostats and the condensers and the result you shall see when you come over to the house."

"Well, if that isn't luck, what is?"

"Why? What do you mean?"

"My brother called me up a few minutes ago and asked me to come over to his house and take measurements of his phonograph compartment, because he wanted to place the radio set in it. I thought a little while about the circuit, but I soon puzzled that out. I had just begun to wire up the set when you rang the bell and if you will wait a while I will hook it up on this bread board, and let you hear it. However, the thing that began to worry me while wiring up the set was where to place the parts, but it seems to me that you have solved that. The tubes also are five in number, there are only 2-controls (except for the potentiometer), and the panel, the layout is the same. The circuit change will not alter the layout. Now, the only thing that I have to worry about is that your compartment should be of the same size as my brother's."

I gave Jack the circuit diagram of the special receiver which I was hooking up and which is shown electrically in Fig. 1.

After three-quarters of an hour of of struggle with the wires I hooked up the set. Of course, folks, you must realize that I had no panel or any thing to drill at all. Everything was laid out on a board.

There is an objectional feature about a bread board layout in that the set always works better here than when on a panel and in a cabinet. This is due to the uncrowded wires. It is therefore wise, when listening to the results, to take this into consideration and expect a little less when the set is placed in a box. In other words, the bread board layout is not a perfectly fair test, but by the proper compensations the results can be made to be almost equal in most cases. This is taken care of in this set.

"Boy, what volume," exclaimed Jack. "Cut it down, will you?"

I realized it was a local, but I was satisfied with the volume that I was looking after was obtainable. The quality was a bit harsh. I then took out a fixed resistance from the grid circuit of tube No. 4, and put a variable resistance there.

"Note any difference, Jack?" I asked.

"No, not yet."

I then started to vary this resistance.

"Leave it at that point," he advised. "Boy, that's great. Say, I am going to try that stunt. I think it's better than the choke coil I have in my set now."

Getting the Panel Dimensions

The volume was not great due to the fact that the potentiometer was out of adjustment. Soon, the volume was brought up, and the set functioned perfectly. The phonograph model had more volume. The plate is coupled to the grid by a by-pass condenser in both the first tube and the detector tube. That gives the set added volume.

At Jack's invitation I went over to his house. I took out my ruler and started to take measurements of his set. The width of the panel was 12". The height (sometimes called depth) of the panel was 18". The depth of the compartment was 14¼".

"Well," I said. "now I have to find out the dimensions of my brother's compartment. If they are both the same I

How to Arrange the Panel

am in luck. I'm going over to his house next Sunday."

On the appointed Sunday I went to my brother's house. I went over to the phonograph, and with a wish that the measurements would be all right, took out my ruler. The width was 12". That was one relief. The height was 17¾.

"There must be some mistake," I said, "because Jack's measured 18" and this one is 17¾".

Jack's Home is Visited

I then took another chance at the length, and found that I had made a slight error, in that I placed the ruler on the inner block, instead of the outer block, which was ¼" in width. This made the length 18" and brought forth a deep sigh of relief. The depth proved to be the same also, or 14¾.

"Herman," I asked my brother, "would you like to go over to Jack's house and see the radio that he has in his phonograph? This will give you an idea of how yours will look. Then you can come over to my house and listen to the set that I am going to put into the phonograph, this being different from the one he has in his."

He readily assented. After a glance at Jack's outfit, Herman exclaimed:

"Looks great. Will mine look like that?"

"Yes."

"Say, Jack, will you please turn on the set and let my brother listen to it?" I asked.

Jack soon pulled the switch, and the music came rolling forth.

We all moved our chairs around the set. Bill disconnected all the wires. Bill though, knew all about the mechanical features and therefore was chosen to do the explaining to my brother. He then took the set out from the compartment, so that we could see all the details of the set proper.

"I think it would be a good idea," said my brother, "if you drew a small sketch of how the exterior looks, so that we could feel more at home when you are telling about the dimensions, as they look quite confusing to me."

Bill Describes Layout

The picture shown in Fig. 2, is the panel view. Bill explained:

"The panel, of course, is 12" wide by 18" deep. The variable condensers, C2 and C3, are placed in the center, that is, 9" from the top and the bottom of the panel, and each 3" from the left-hand edge, hence at this point drill a hole 5/16" in diameter. Now drill the condenser mounting holes from templates. The center hole in each case is for the condenser shaft. Condenser C3 is mounted 6" from C2, on the center line. The two rheostats, which control the filament temperature of the radio-frequency and the detector tubes, are placed at the top, as you see. R1, the RF rheostat, has a hole drilled for its arm 3" from the top and 3" from the left-hand side of the panel. Don't forget the rheostat mounting holes. The diameter of the shaft hole is 5/16" and the dimensions for the holding holes are ⅛". R2 is placed in the same line. The center hole for the arm is 3" from the top and 3" from the righthand side of the panel. The holding holes are usually ½" from the left and the right of the center hole. The diameter of the center hole is 5/16" and the diameter of the holding hole is ⅛". Now for the potentiometer, R4. The center hole for this instrument is 6" from both the left and the right-hand side of the panel, and 3" from the bottom. A 5/16" hole is

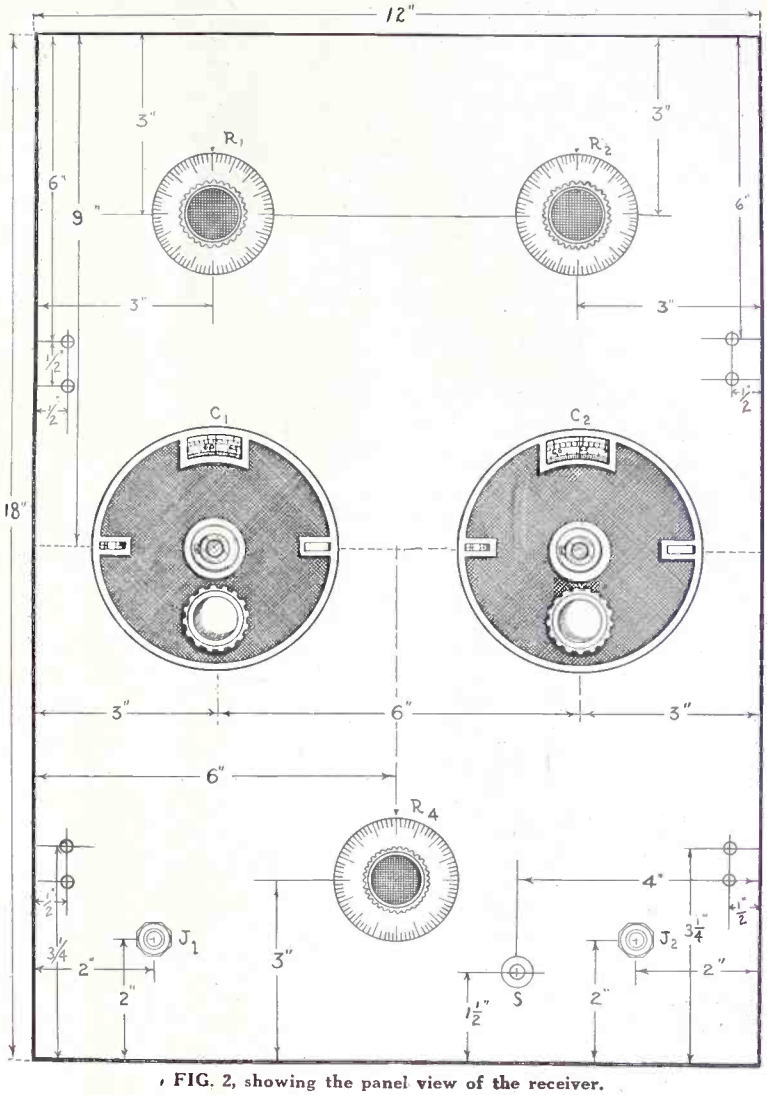


FIG. 2, showing the panel view of the receiver.

utilized for the center hole, and two ⅛" holes are drilled on both right and left-hand sides of the hole, the distance from this point being ½". We will now turn to the jacks, of which there are two, J1 and J2. The first jack, J1, is placed at the left-hand edge of the panel. A ⅞" hole is drilled 2" from the edge and 2" from the bottom. The other jack is placed at the right-hand edge. This is 2" from the edge and 2" from the bottom. The diameter of the hole is also ⅞". The switch now remains. This is placed on the same side as the second jack, J2. The hole is also ⅞" in diameter. It is 4" from the right edge, and 1½" from the bottom. The only holes that remained to be drilled, are the angle iron holes. Here is where you have to follow me carefully, as I had a lot of trouble in getting these dimensions right, and the least little slip will embarrass you. Of course, these dimensions depend upon the type of angle irons you use. I used the plain brass type. These have two holes in them, and they are 2½" long. That means that if they were straightened out they would measure 5". The width of these irons is 1". The diameter of the holes is ¼".

Jack then handed my brother an iron.

"Looking at it so that a straight portion with the holes faces you, and the other portion is on a horizontal line with your eye, the top hole is ½" from the top and the other hole is ½" from the bottom. The same applies to the hole which is on the horizontal axis portion of the iron. The holes on the panel are ½" from the edge. There are two on each edge, and two on each side, making a total of four on one side and four on the other. The top hole is 6" from the top of the panel, on both sides of the panel. The other hole, is 1⅜" from the one just drilled. This means that there will be two holes on the upper portion of the panel which are in line, and 1⅜" from these holes there will be two more holes which are in line. All in all, there will have been 4 holes drilled. Now at the bottom, the iron is in the same position, and the bottom hole is 3¼" from the bottom. Do not confuse this with the top hole, as this has not yet been touched. We are now working upward and not downward as we did with the above iron. The top hole is 1⅜" from the bottom hole. They are both ½" from the edge.

"This applies to both edges. That is, there will be a pair of holes, 3¼" from the bottom on both sides which are in

Assembling Phonograph Set

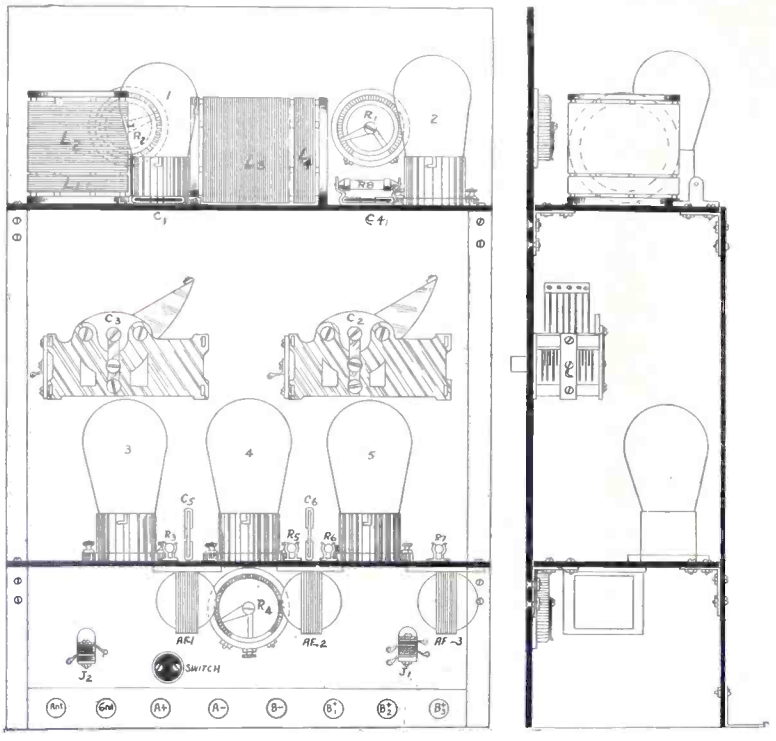


FIG. 3, showing how the back of the set appears. Note the side view on the right of the large drawing.

line. There will also be another pair of holes 1⅜" from the ones just mentioned, which will also be in line.

"That is all there is to the panel drilling and we will now tackle the interior of the set, which is a bit more difficult. Of course several parts already are mounted, that is, the variable condensers, the rheostats, the potentiometer, the jacks, the switch and the angle irons have found their places. Here are the drawings for the interior of the set. Fig. 3 is the diagram Bill referred to. The shelf that the sockets, 1 and 2, the coils, L1, L2, L3, L4, the grid leak and condenser, and the fixed condensers, C1 and C7, are placed on, is 11" long and 2½" wide. Socket 2 is placed 2¼" from the right-hand edge. This will take up 1½". The outer circumferences are ½" from the elongated edges. This will exactly center the socket. Socket 1 is place 2¼" from the left-hand edge. The outer circumferences are ½" from the elongated edges. Socket No. 3 is placed 2¼" from the left hand edge on a shelf 11" long and 3" wide. This as you notice is ¼" wider than the one above. Socket No. 5 is placed 2¼" from the left-hand edge. Socket No. 4 is placed 5¼" from the right and the left had edges. Place all these sockets near the outside edge, that is the edge way from the panel. In between sockets 3 and 4, or 3¾" from the left hand edge, place the audio-frequency transformer, which is called AFT1 in the diagrams. This is placed underneath the shelf. That means that four holes will have to be drilled to hold the transformer. These holes will best be determined by placing the transformer in its place and making small dots through the holes in the feet of the transformer with a pin. Then where these pin marks are, drill holes. The next audio-frequency transformer, which is called AF2, is placed in between sockets 4 and 5, underneath the shelf in the same manner as AFT1. The last audio-frequency transformer is placed in between the righthand edge and socket 5. In all these cases I have not given the special dimensions for centring, as thy special dimensions for centering, as they will vary with the different transformers that you will get.

"Now, the resistances, R3, R5 and R7 are all placed near to the filament binding posts of the sockets. This is clearly shown in the diagram. The large condenser C5 is placed on the left hand side of socket 4. The condenser C6 and the resistance R6 are placed on the left of socket 5. The leak and the condenser can be placed as I have it in a special holder. Don't forget that we are looking at the set from the back, and therefore what is really left-hand on the front is right-hand from the back."

[Part II, the conclusion, will be published next week.]

Plate Voltages for the RX-1 Discussed

By H. C. Hight

In last week's issue we described the construction of the RX1, concerning which a few further remarks are pertinent.

First of all, the antenna coil is of the conductively coupled type instead of inductively coupled, which means that in order to obtain the selectivity necessary when used in districts near broadcasting stations, a short antenna should be used. Remarkable results may be obtained with a wire 30 feet long, this will give plenty of volume and real selectivity, and of course the wonderful tone quality for which this circuit is fast becoming famous.

Where selectivity can be sacrificed for distance antenna length may vary from 50 to 100 feet. While on the subject of DX it must be said that the RX1 is not a set for a rabid distance hound. It will bring in programs from a distance of several hnudred miles, but as there is absolutely no regeneration, it can not be expected to do the impossible. The RX1 is the ideal set for those who desire above all else perfect tone quality, simplicity of control and freedom from squeals and howls. This class of radio listeners will find great delight in the entertainment that can be received so easily and so free from undesirable noises.

Another interesting feature is the lack of any set noises, that is, sounds which originate within the set itself. RF and detector tubes function best when operated with filament rheostats turned very low. This fact coupled with the absence of regeneration make this receiver one of the quietest in operation that has so far been devised.

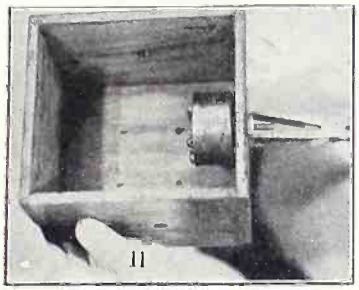
A word on plate voltages. We said last week that 67V on radio frequency tube gave best results when using the tubes suggested, and further tests have proved this to be correct. But in some cases the user may find more than 22 volts to be advisable on detector plate when using the Magnavox tube. 45 volts will produce great volume, and will not be a bit critical but 22 volts will probably satisfy the average person. In the event of being able to secure a Sodion detector. 22 volts is the correct amount to use on its plate.

The use of 30 ohm rheostats for RF and detector cannot be too strongly advised, as they give better control of filament consumption than a 20 ohm rheostat. If the transformer and resistance unit as specified are used, no trouble will be had with the audio end. A "C" battery may or may not be used. It makes practically no difference in tone quality of RX1, but of course will, if used, somewhat reduce B battery drain.

It is advisable to use only the very highest quality of variable condensers in this set. If using condensers of the conventional rotary type, one of .0005 mfd. capacity should be used as antenna tuner, and a .00035 mfd. in the detector stage. Excellent results are obtained by the use of the Wade, which is of unique construction, and accomplishes a very wide separation of low-wave stations. The use of a 360-degree dial and the peculiar construction and operation of plates make this wide spacing possible. As this condenser has a very low minimum capacity it covers a very wide range. And the .0005 mfd. can be used in both stages. Dials can be set together on some given station and they will log very closely in step over the entire broadcast band.

Anyone who properly constructs this set, uses it on a short aerial and a good ground, and with a good speaker, preferably a cone, can be absolutely assured of having a set that will receive the greatest admiration from any one who can appreciate quality and clarity, combined with simplicity and quiet operation.

Completing the Thoroughbred



[*Part I of this article on the construction of The Thoroughbred, a 1-tube set that brings in distant stations (DX), was described in last week's* RADIO WORLD, *issue of October 17. The conclusion is published herewith.*]

By Herbert E. Hayden

Illustrations by the Author

PART II.

THE home-made box that constitutes the cabinet for the Thoroughbred was made larger than was absolutely necessary for the parts employed, the reason being the advisability of having ample room in case some other parts were substituted. For instance, regarding the variable condenser, which is .0005 mfd. maximum capacity, i. e., 500 micro-microfarads, almost any variable condenser of that capacity will fill the bill. As for the tuning coil, you may wind one yourself, if you like, but the regeneration control, which is a Clarostat, has to be purchased, and I suppose that most persons will prefer to buy the commercial tuning element with the Clarostat or variable resister included, and which unit is known as the Clarotuner.

HERBERT E. HAYDEN

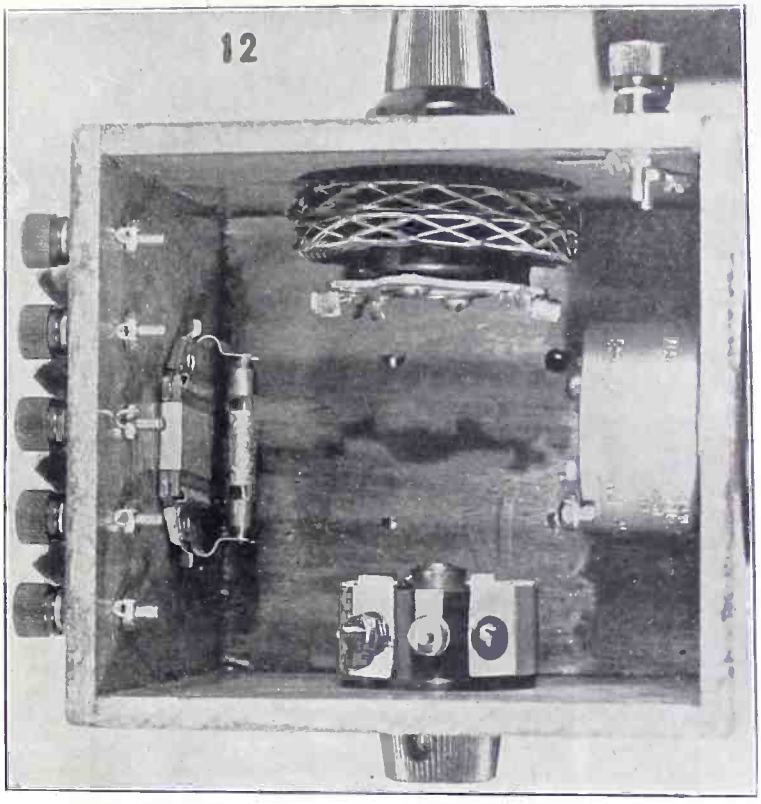
The Coil

The primary should have the regulation amount of inductance, which, on a spider-web form, say, would consist of 12 turns of No. 22 single silk covered wire, if wound at the hub, or about half that many turns if wound on the exterior of the form, which, by the way, should have an outside diameter of 5 or 5½". The secondary would consist of 50 feet of the same kind of wire, while the fixed tickler coil would consist of twice as many turns as the primary.

A good plan for those who would like to construct their own coils would be to wind the primary first, at the hub, putting on the 12 turns, then wind the secondary, which would consist of about 48 turns, or whatever the 50 feet of wire amounts to, which would be approximately that, and then the fixer tickler. That enables the energy to come in through the primary to the secondary, while the feedback is accomplished by means of the fixed tickler without necessitating the feedback energy to traverse the primary. This is a minor consideration indeed, and one need feel no compunction whatever about winding the coil the other way, or using a unit that may be wound the other way.

The Interior Assembly

The completed set was shown in the front cover of last week's issue, and it gives a very good idea of the external assembly. However, for the "interior decorations," as I might properly call them, Fig. 12, shown to the right of this printed matter, clarifies any doubts that may have arisen. The binding posts are shown on the right-hand side of the photograph, and that represents the back of the set. Note how the binding post screws protrude into the interior. Right beside them is placed the fixed grid condenser, .00025 mfd., which has clips for mounting the fixed leak. The value of this leak is not so very critical that from 2 to 5 megohms may not be used, but I used 2 megohms with fine success.



THIS photograph clearly shows the interior view.

The front of the set is represented by the variable condenser, at right in Fig. 11, while the sides of the cabinet are identified by the rheostat, on the one hand, and the Clarotuner knob on the other. The two binding posts beside this knob are for telephone connections. The antenna and ground posts are lined up with the battery binding posts in the rear.

The variable condenser I used (Connecticut) is of the single panel mount type, and the manner of mounting this is shown in Fig. 11.

Tuning

The tuning of the set is simple indeed. The variable condenser, of course, determines the wavelength. This is because the aperiodic primary brings in virtually all frequencies even up to the ultra-frequencies (very short waves), and also the waves higher than those of the broadcast band. Therefore it depends on the condenser, in conjunction with the fixed secondary, to reach the proper limits. This it will do, if of .0005 mfd. maximum capacity.

The set should tune from about 185 to 555 meters. Any station within normal receiving range should be brought in without difficulty. Bringing in DX is, as ever, a little more difficult. The knob of the Clarotuner is turned until a sort of searing sound is heard for the particular condenser setting of the moment. This denotes the approach to the regeneration point. Here is where the set is different from other regenerators. The approach to saturation is so gradual that the likelihood of "spilling over" is greatly diminished, and likewise the facility for tuning out any whistle is enhanced, so that the program may be brought in clearly and beautifully. The variation of the resistance in the plate circuit has a minimum, almost zero effect on the wavelength tuning, and this is another attraction.

Trouble Hints

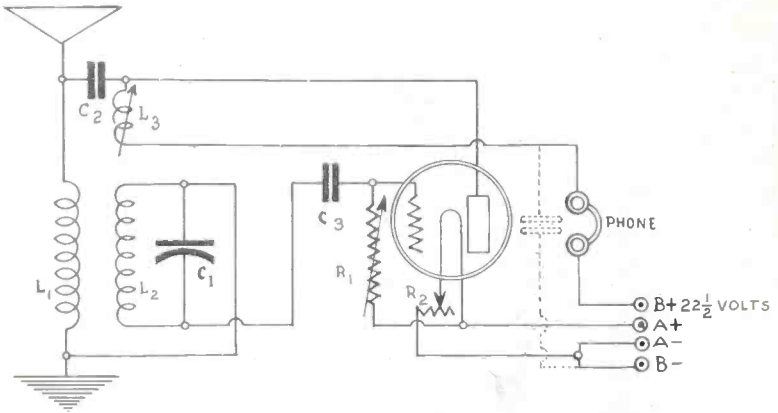
If the set shows a tendency to "spill over" easily, the cause most likely is too high B battery voltage, too low a grid resistor (i. e., leak should be of a higher resistance, so the leakage path will be slower), or a tube that is a very poor oscillator. Also try reversing the leads to the fixed tickler or coil.

Should no signal result at all, look to the battery connections, see that aerial and grounds are connected, and generally look through the set for broken or loose connections. The fault will be in the wiring, of a certainty, provided all external connections have been made.

If the signals are not loud enough, test your B battery voltage with a voltmeter placed in parallel with the B battery, while the set is in operation. Granting you are using the 45-volt post, this should show a reading of no lower than 38 volts for effective use, and if it is lower, then get a fresh B battery.

How to Use Fixed Condensers

To Avoid Distortion and Increase Efficiency



SERIES COUPLING by means of a fixed condenser, C2. It should be very small, say .0001 mfd., for loose coupling and large (e.g., .002 mfd.) for tight coupling. Fixed condensers used, as C2, in RF work, should have only the best dielectric. C3 is the grid condenser, used for blocking the grid current in the detector. The dotted condenser is a bypass. (Fig. 1.)

[In the following important article J. E. Anderson, noted radio engineer, discusses fixed condensers from both practical and theoretical viewpoints and corrects errors commonly made.]

By J. E. Anderson

Consulting Engineer

IN every radio receiver, from the simplest crystal set to the most elaborate Super-Heterodyne, fixed capacity condensers are employed. They are used for a variety of purposes, and they are sometimes misused. Some of their legitimate uses are as by-pass condensers for high-frequency currents across low-frequency or direct current apparatus, as blocking condensers to prevent audio-frequency currents from entering radio frequency apparatus, or to separate alternating current from direct. Their misuse is limited usually to the capacity of the condensers used for a given purpose.

J. E. ANDERSON

Use in the Antenna Circuit

One of the first uses for a fixed condenser is in the antenna circuit to shorten the antenna's natural wavelength. It is connected in series with the antenna and its purpose is to reduce the effective capacity in that circuit so that the circuit may be tuned to shorter waves. It is used either when the inductance in the antenna circuit or the self-capacity of the antenna is too great. Since this condenser is in a tuned circuit, or an approximately tuned circuit, it should be a low-loss condenser, with either air or mica as the dielectric. The required size depends on the loading inductance coil, on the capacity of the antenna and on the wavelength of the signal.

The Coupling Condenser

Another use for a fixed condenser is for coupling, to transfer energy from one circuit to another. Two types of coupling may be distinguished, the series and the mutual. The series type is illustrated in Fig. 1, C2. Mutual coupling exists where a condenser is common to two different circuits and where the voltage across the condenser as set up by a current in the first circuit is the voltage transmitted to the second circuit. For series coupling the condenser must be very small for loose coupling and large for close coupling. For the mutual condenser the capacity must be large for loose coupling and small for close.

Whether a given condenser is to be considered large or small in a certain circuit depends on its impedance to the current flowing in it, and the impedance depends on the frequency as well as on the capacity. For equal impedances in common to two circuits the coupling will be the same. The impedance of a condenser is equal to .159 divided by the product of the capacity and the frequency, the ohm, the farad, and the cycle per second being the units. At 50 cycles per second the impedance of a 1.0 mfd. condenser is 3,180 ohms. At 5,000,000 cycles per second the impedance of the same size condenser is only .0318 ohm.

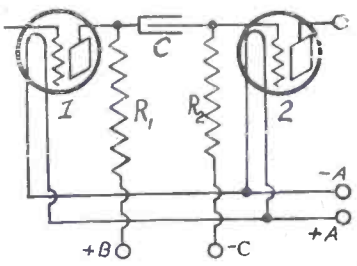
When coupling condensers are used in radio-frequency circuits only instruments having the best dielectric should be used.

The Grid Condenser

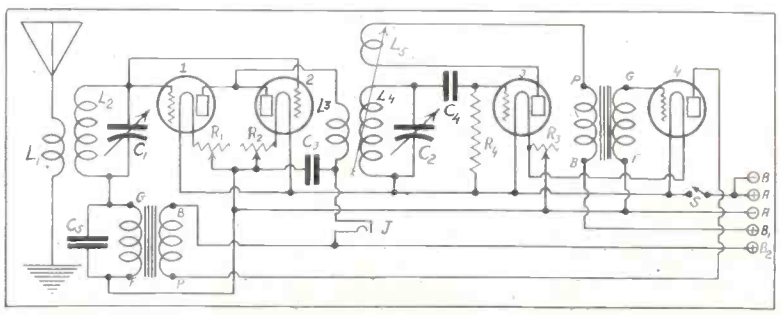
Perhaps the best-known use for a fixed condenser is for blocking the grid current in a detector. This is illustrated by C3 in Fig. 1. Almost invariably the value used for this condenser is .00025 microfarad. The use of this particular value is largely a matter of habit. The optimum value to use depends on many factors, namely, the type of tube used for detector and on the manner in which it is operated, on the value of the grid leak connected across the condenser, on the natural leakage from grid to filament through the insulation of the grid or the condenser itself, and on the intensity of the signal voltage. If the insulation of grid is poor or if a large value grid leak (low resistance but large leakage) is used a small condenser works best. Similarly if the signal is weak a small condenser works best, one very much smaller than the .00025 mfd. ordinarily used. Conversely, if the insulation of the grid is very good, or if a small leakage (high resistance) is used, the condenser may be larger; and if the signal is very strong it is better to use a larger condenser. The best value to use also depends on the ratio of the carrier frequency to the average carried frequently. Ordinarily the value of the grid condenser may be reduced to .000125 or even .00005 mfd. with good results. And the smaller it is, other things remaining constant, the more sensitive will the detector be. The limit of reduction, for a given signal intensity and given grid leakage, will be when the grid blocks.

A Direct Coupled Amplifier

A use for a fixed condenser similar to that of the grid condenser is the blocking



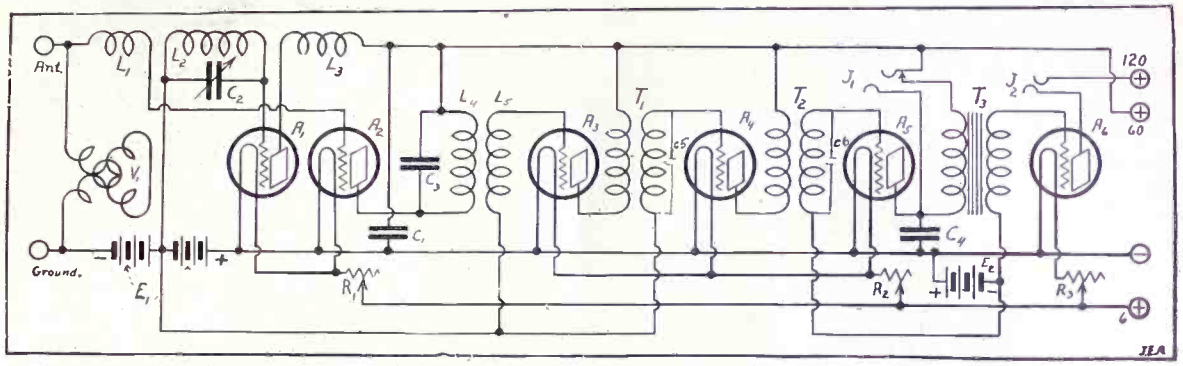
A FIXED condenser, C, used somewhat similarly to a grid blocking condenser. The above is a direct coupled circuit, tubes 1 and 2 being coupled by condenser, with the aid of resistors, for audio amplification. For such audio coupling C should be as large as possible. The large condensers are expensive, so .25 mfd. is a frequent compromise, yet 4.0 mfd. would be much better. The reasons are given in the text. (Fig. 2)



C3, BETWEEN the end of L3 and the A minus lead, to lower right of the second tube, is used as a bypass. C5 is also a bypass condenser in its conventional position on a reflex set, across the secondary of the first AFT (lower left). Bypass condensers should be no larger than necessary. (Fig. 3.)

What Capacity Values Are Best

Explained by One of America's Great Authorities



A FIXED bypass condenser across the B battery is shown above (C), to right of C4, a bypass condenser for RF currents (to right of second tube from left) should not exceed .002 mfd. The intermediate frequency condensers in the above Super-Heterodyne are C3, to right of second tube, across primary, and the ones across succeeding secondaries. (Fig. 4.)

condenser used in a direct coupled amplifier, illustrated by C in Fig. 2. This is used to keep the high positive voltage applied to the plate from reaching the grid of the succeeding grid. This use is a necessary evil. Essentially this condenser is a series coupling condenser. and what was previously said concerning this applies here also. If the direct coupled amplifier operates at radio frequency, either high or intermediate, the value of the condenser may be comparatively small, from .001 to .01 mfd., depending on the frequency of the current to be amplified. If the amplifier operates at audio frequency and the circuit is intended to amplify all audible frequencies to the same degree, the value of the condenser should be as large as possible. Only space and reasonable cost should be the limitations. If the condenser is small, low frequencies will be suppressed owing to the high impedance of the condenser at these frequencies, and distortion will result. Condensers smaller than one microfarad should not be considered if the object is to construct a quality amplifier.

The dielectric in one of these need not necessarily be mica or air if the blocking condenser is used in an audio amplifier. Paraffined paper will do. But it is essential that the condenser be able to withstand the highest plate voltage which may be applied to the amplifier.

Sometimes a large condenser is connected in series with the loud speaker to keep the direct current from the tube out of the speaker windings. In this case it is even more important that the condenser be large than when it is used between the plate and grid, and also that it be able to withstand high voltages. This use of a condenser is illustrated in the 1926 Model Diamond of the Air (Sept. 12, 19 and 26 issues).

As a By-Pass

The fixed by-pass condenser is used in every radio receiver, and in many places in every receiver that is in the least complex. It is used across the headset in a crystal receiver, across the headset or the first audio-frequency transformer in a tube detector circuit, across the first intermediate frequency transformer in a Super-Heterodyne, across the first coupling impedance in a direct coupled amplifier if the detector is direct coupled to the next tube, and they are sometimes used across the A, B and C batteries. They are always used to provide a low impedance path for high-frequency currents across some device which is designed for low-frequency currents.

The dotted line condenser in Fig. 1 is used to by-pass the radio frequency current across both the headset and the plate battery. C3 in Fig. 3 and C4 in Fig. 4 are used similarly.

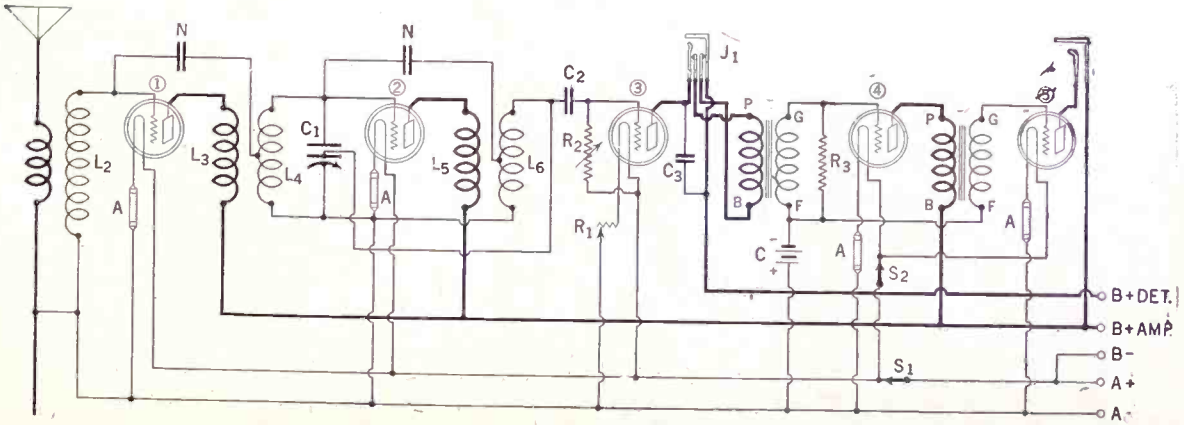
In reflex sets like that shown in Fig. 3 by-pass condensers are used profusely across the windings of the various trans formers and the speaker. Condenser C5 illustrates the use of a by-pass condenser across the windings of the various transformer. The use of a condenser across the B battery is illustrated in Fig. 4, condenser C1.

Plate Circuit Condenser

A by-pass condenser should not be any larger than is absolutely necessary to perform satisfactorily the work it is intended to do. If a condenser is used in the plate circuit of a detector to by-pass the radio-frequency current across the primary of the first transformer, to facilitate regeneration, it should not be larger than .001 mfd. for radio frequency. If the circuit will not oscillate with this condenser across the primary the trouble lies with the tube or with the tuner. If the tube will oscillate over the entire scale of tuning condenser without any by-pass condenser in the plate circuit, then it is best not to use any. In a non-regenerative circuit it is doubtful whether the condenser need be used at all. Certainly it need not be larger than .001 microfarad for radio frequency and .002 mfd. for intermediate frequency. Thus C4 in Fig. 4 should not exceed .002 microfarad in value.

Much larger values than those specified above are often recommended for the various by-pass condensers in a circuit.

(*Continued on page* 24)



THE NEUTRODYNE, in which the neutralizing condensers are designated N. The dielectric should be air, not glass. (Fig. 5.)

DX on Less Than 10 Meters Not Practical, Says Taylor

By Thomas Stevenson

WASHINGTON.

Recent developments in high-frequency experiments at the U. S. Naval Research Laboratory at Bellevue have indicated two rather startling conclusions regarding this phenomena.

One of these theories attempts to explain why stations located within a few hundred miles of a high-frequency transmitter cannot pick up its signals while receivers thousands of miles away, even as far as half way around the world, can receive them clearly.

The other is that it may never be possible to utilize the frequency band below 10 meters for distance transmission.

Dr. A. H. Taylor, physicist in charge of the Bellevue Laboratory, is the author of these conclusions. Dr. Taylor bases them on the results of experiments over a long period as well as on the reports of observers scattered throughout the world. Dr. Taylor would not discuss the possibility of the utilization of high frequencies for broadcast transmission and reception in the near future.

Effect of Earth's Fields

According to Dr. Taylor it is pretty well established that the magnetic field of the earth influences the motion of electrons in the atmosphere and that it has an important bearing on high-frequency waves, whereas the low-frequency waves are not appreciably affected.

"An appeal to this influence and to the well-known laws of the reflection and refraction of waves," says Dr. Taylor, "has resulted in a theory that appears to fit the facts fairly well and which although by no means complete will at least, we hope, encourage theoretical and experimental work which will throw light on the subject.

"Perhaps the most striking fact which has come out of the studies of high-frequency transmission is the obvious existense of a skipped distance combined with the fact that in many cases the signals at relatively great distances are much stronger than they are at relatively short distances.

"It appears that the change from normal radio conditions which has led to extraordinary range of communication with low power occurs at about 130 meters or 2,300 kilocycles."

Cites Ionization

According to Dr. Taylor's theory, there is a gradually increasing state of ionization in the high level of the earth's atmosphere. It is believed this is due to the sun's rays and other causes. The velocity of radio waves is higher when traveling through ionized regions than when through non-ionized space.

When the wave is sent out by the antenna it travels at an angle toward the Heaviside-Kennelly layer. As ionization increases in the high levels, the velocity of the wave increases so that it is gradually bent over because the top of the wave travels more rapidly than the bottom. Thus, it is bent back toward the earth. From the reaction of the induced currents in the earth's surface at the base of the wave, the earth itself has an action tending to straighten the wave out.

This means that the wave cannot be received at any point between the place sent out and the place where it again returns to the earth. Of course, there is also a ground wave which makes the signal audible for a short distance from the transmitting station, but fading on the ground wave is very pronounced.

If the wave happens to come down around 600 miles away, a station in that locality can get a very good signal, while a station 200 miles closer to the transmitting station could not pick it up at all.

Skipped Distances Compared

"The skipped distance in the summer night time is much greater than it is in the daytime," says Dr. Taylor, "and the skipped distance gradually increases toward midnight. This is what we expect. Although the winter night skipped distance is not accurately known, it is very definitely known that the skipped distance is decidedly greater than it is during summer nights."

The length of the skipped distance, Dr. Taylor says, depends entirely on how close the Heaviside Layer is to the earth. The closer the layer, the less the skip, and vice versa. Quite often there is a first, second, third and fourth skipped distance as the wave travels up and down at an angle from the earth to the Layer.

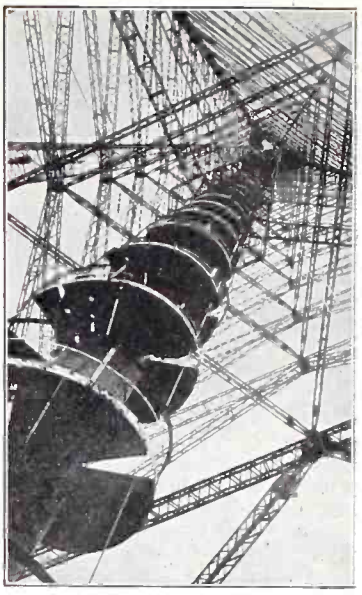
Antenna Angle Important

Dr. Taylor says the angle at which the wave leaves the antenna depends upon the frequency at which transmission occurs. The higher the frequency, the flatter the angle; that is, the nearer the earth's surface the wave will go out.

"This means, for instance," says Dr. Taylor, "that at about 20,700 kilocycles the wave in order to be properly reflected will have to leave so nearly horizontal that it will be very heavily absorbed by the earth. In addition, the curvature of the earth will actually get into the way of it so that it cannot reach the layer with such an angle as to be reflected. According to this, we are not likely to see very satisfactory communication over great distances on waves shorter than 10 meters, that is of higher frequencies than 30,000 kilocycles.

"The only way we can conceive of communication at high-frequencies being feasible over long ranges would be to have them started preferably in a beam from comparatively high altitude, so that they would come to the reflecting area at a low angle without being absorbed by the earth. This point, no doubt, will be proved or disproved in the not very far distant future."

German Eiffel



A GLIMPSE of the winding stairway of the radio tower of "Konigswusterhausener." This new tower is 656 feet high, the highest in Germany, and in the world it is second only to the Eiffel Tower in Paris. An innovation will be an elevator within its girders, plans for which have been completed. (Kadel & Herbert.)

RADIO INSTRUCTION COURSE WILL BE BROADCAST

New York University has announced the addition of a special course to prepare men through training in actual practice as well as in theory, for positions as radio publicity directors, radio program managers, professional radio lecturers and radio announcers. The students, says Dean J. E. Lough of the Extra Mural Division, will be addressed by special lecturers prominent in the field of metropolitan radio.

The class will visit studios and operating rooms of the leading broadcasting stations. Special arrangements for getting the students behind the scenes at these stations have already been arranged for.

Wind Plays Radio Havoc; Moral: Use Strong Aerial Masts

Many fans who were listening one recentt Saturday night realized how important it is to put up a pair of strong poles as antenna masts. Many folk came home from work tuned in the radio and to their surprise heard nothing. Everything was checked up, the batteries, phones, tubes, etc. The erial was then looked at. Either the poles were down, the wire was sagging against the side of the roof or something to that effect was in evidence. The reason was the terrifis wind.

In many homes signals were heard, but they sounded as if they were fading. This was due to the aerial sagging and, therefore, swinging. In some cases the bare copper wire, which was attached to the lead-in was touching the side of the roof. This caused scratchy noises to be heard during the whole evening. Therefore, place your antenna on strong poles, pull the wire tight, leaving very little wire out, place the wire one or two feet away from the wall and have it well insulated at points nearest the roof.

Many persons thought their sets were out of order, though it was only the aerial.

Attention Radio World Subscribers!

Subscribers will note that the end of their subscriptions is indicated on the labels on wrappers. If your wrapper shows the date later than the current issue, you are behind in your subscription. Please send payment for renewal. Thank you!

RADIO WORLD, 145 West 45th Street, New York City.

Invite-Yourself Plan Adopted for the Conference

WASHINGTON.

The Fourth National Radio Conference, to be held November 9, will take up for general discussion and consideration matters affecting radio communication in the United States from the viewpoint of the public interest. The conference will include representatives of all radio activities.

The Eligible List

Representation will be accorded to members of the following groups, one to each concern falling within any of them:

Broadcast stations, radio magazines, newspapers having a radio department, manufacturers of complete radio receiving sets, organizations of broadcast listeners, amateur organizations, commercial land radio stations, radio trade associations, press associations, United States Government Departments.

Representation will also be accorded the following: Institute of Radio Engineers, American Institute of Electrical Engineers, American Steamship Owners Association, United States Shipping Board, Farm Organizations, National Electric Light Association.

Must File Notice

So that proper arrangements may be made for the accommodation of the conference it is essential that concerns or persons desiring to participate advise Secretary Hoover on or before October 26, giving the names of their representatives. No person will be recognized as a delegate whose name has not been filed with the Secretary of Commerce by that date.

While consideration will be given to radio activities generally, the principal problems will be those affecting broadcasting. The subjects, so far as they can be outlined at present, will be:

Recognition of the principle that service to the listening public must be the basis for every broadcasting privilege and for all radio regulations.

The present saturation in broadcasting due to the exhaustion of channels, and the necessity for limiting the number of stations on the basis of public service.

The requiring of permits in advance of construction of broadcasting stations.

The necessity for operators' licenses, particularly for broadcasting stations.

Frequency band assignments for the various classes of radio communication.

The use of high power for broadcasting.

The location of broadcasting stations so as to prevent interference in congested centers.

Time division, duplication of frequency assignments, and a geographical basis for allocations.

The use of broadcasting for advertising.

Matters affecting amateurs.

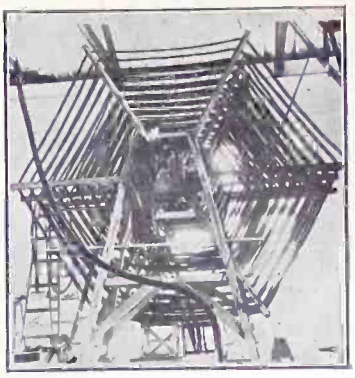
Matters affecting the marine and mobile services.

Rebroadcasting.

Open to Public

Meetings of the conference will be open to the public and opportunity will be afforded for the expression of views upon any of the subjects above outlined.

A Sending Loop



Erecting huge inductance frames which weigh many hundredweights. This photo was taken at the government wireless station at Rugby, England, where new wonders are coming to light. (International News).

Nearly 100 Stations Linked for Series Results

Nearly a hundred stations covering in their range every corner of the United States, some of Mexico and a portion of Canada, were connected in various chains to broadcast the returns from the world series baseball games. WEAF played godfather to its usual array of stations, WJZ was hooked up with a similar chain, but the greatest combination of all was formed by the Associated Press. Seventy-one broadcasting stations arranged to handle reports of the first game received through the various offices of the press association.

Wendell Hall Sails

Mr. and Mrs. Wendell Hall, radio singers, who were recently married by radio, sailed from New York for Europe on the Berengaria.

They will broadcast in England, France and Italy.

Classify Stations by Power, Regardless of Wave, Is Plan

WASHINGTON.

Elimination of the present classification of stations is expected to be recommended by the Fourth National Radio Conference called by Secretary Hoover to meet in Washington beginning November 9. It is believed that stations will no longer be classed by letters as at present (such as Classes A, B, C, and D) but that for purposes of regulation the classification of stations will depend upon their power. This will not affect call letters, e.g., WEAF, WGBS, etc.

Allotment to End

If this idea is adopted, the allotment of wave bands for the different classes of stations will be discontinued. The entire broadcast band will be open to any type of station whenever there is a vacancy.

The purpose of the proposed change is that it will enable more stations to be crowded in and, it is believed, will tend to increase the service generally for the public. For instance, if a station of 500 watts operates on say 350 meters in Boston, it will be possible to also place a 100 watt station on the same wavelength out in the middle west without interference resulting.

Greater Scattering

Under this scheme, the powerful broadcasting stations can be scattered throughout the entire broadcast band with the smaller stations sandwiched in. Such an arrangement would make available more channels for powerful stations without increasing facilities for smaller stations.

Secretary Hoover does not believe the Conference will last more than three days. To extend the Conference beyond that period, he believes, would work a hardship on delegates.

Secretary Hoover personally signed scores of invitations to the Conference.

Speaker's Sales Methods Offend Business Bureau

The special attention of managers of broadcasting stations was directed by the National Better Business Bureau to the activities of Henry F. Vortkamp, advertised as a radio authority, expert on circuits, assembling operations, and nation-wide broadcaster, whose voice is familiar to millions.

Vortkamp, a convincing talker, is now giving attention to the radio industry. Recently, he was introduced to three young men who later formed a radio company and elected Vortkamp president. Several thousand dollars was spent.

Welcomed by Many

Vortkamp has been accorded speaking privileges over some forty or more broadcasting stations throughout the country. In a number of instances he represented to station managers that he is a radio expert on a vacation, and that he will very gladly broadcast a ten-minute lecture. He has shown the manager a typewritten copy of the text to be used. If accorded speaking privileges, he has oft-times stated, at the conclusion of his lecture, that he will be very glad to send free to any "listeners-in" a special hook-up for a one-tube set he has designed.

This has usually resulted in a quantity of mail. The hook-up he faithfully sent. A part of the sheet, says the Bureau, is occupied by advertisements which Vortkamp has sold to radio manufacturers.

A Friendly Letter

On the reverse side of the sheet was this:

"Your letter greatly appreciated. Since talking to you I have gotten the factory to make a bunch of these sets without cabinets for $6.75. Send order if you want one. You can have all parts for $5.25 or special coil for $1.00.

"As a courtesy to me, send me names and addresses with stamps of ten friends who would like copy of this hookup. Copy of lecture as a reference, 25c. I can advise you on radio troubles. Let me hear from you.

"Sincerely,
"H. F. VORTKAMP."

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, 145 West 45th St., New York City.

WILL YOU please give me a schematic diagram of the original Thordarson-Wade hookup, which was published in the Oct. 3 issue of RADIO WORLD.—E. Yoinz, Newport, R. I.

Fig. 220 shows the electrical diagram of the set. L1, the primary, contains 6 turns and is wound on a tubing 3¼" in diameter and 4" high, using No. 22 DCC wire as the winding wire. The secondary L2 is wound inside, or next to the primary with a ¼" separation. There are 60 turns on the secondary. The same wire is used. The primary of the second radio-frequency transformer contains the same number of turns and is wound on a similar tubing, with the same diameter and height dimensions as was L1. The same applies to the secondary L4, except that it is tapped at the 14th turn. C1 and C2 are both .0005 mfd. variable condensers. C3 is a .00025 mfd. variable condenser, C4, is a .00025 fixed grid condenser. R3 is a variable grid leak, having a resistance of from ¼ to 10 megohms. The auto-transformers are used as a means of coupling the audio-amplifying tubes. The coupling condensers are as marked .25 mfd. The tubes used are of the 201A type. The resistance of R1 and R2 are 10 ohms. The resistance controlling the amplifier tubes is of the ¼ ampere type.

* * *

I HAVE a new Atwater-Kent Model 20 Compact. (1) Can I use a loop and still hear WEEI (250 miles distant), and WEAF (400 miles distant)? (2) Would the loop cut out some of the interference and the static. (3) What type of a loop would you advise me to get?—C. C. Goodwin, care Gilman High School, Manual Training Dept., Northeast Harbor, Me.

(1) No, you cannot use the loop with this set and hear those distant stations. If you wish to use the loop, you will have to do some juggling with the wires. The primary and the secondary of the first RFT will have to be disconnected from their respective positions, and the loop shunted across the variable condenser. This condenser originally tuned the secondary of the RFT. (2) The loop would increase the selectivity of the set. Static would be cut down to a small degree. It would not be cut out entirely, unless some special device was used. If this device were used, the signal strength would be very small. (3) Any standard type of loop may be used with success.

* * *

WILL A Birco 3-circuit tuner, when used in connection with a Bruno Radio-Frequency Transformer give good results? (2) I have a Philco 4-volt storage battery which I would like to use to light the filaments of the UV199 tubes that I am using. Will this give me good results?—B. M. Russell, 800 Bluegrass Ave., Louisville, Ky.

(1) Yes it will be O. K., but before putting them in the circuit, count the number of turns on the primary and the secondary and see if they are the same. In other words try to match the windings. You can use either coils as a standard. The 3-circuit tuner will be much better, as you will not have to change the tickler windings. (2) Yes, the set will work very well.

* * *

IN BUILDING the 1925 3-control Diamond, is it necessary that the tickler be controlled by a vernier dial? (2) Can I use the Transcontinental low-loss 3-circuit tuner? (3) Can I place the antenna coil on the baseboard behind the condenser?—John C. Herbert, 1176 Conway St., St. Paul, Minn.

(1) It wouldn't hurt to have a vernier dial, although the tickler should not be found to be so critical, that would necessitate this. (2) Yes. (3) Yes.

* * *

KINDLY GIVE directions for winding coils for the Powertone, using No. 18 double cotton covered wire, and using the basket weave form for winding the coil on.—A. C. Thomas, Box 91, North Birmingham, Ala.

There are 8 turns on the primary and 40 turns on the secondary. There are 15 spokes in a circular form 3½" in diameter. The windings are in and out of every two spokes. That is, the winding is brought underneath two spokes, and then over two spokes.

* * *

IS THE distance and quality feature of the Thordarson-Wade set as good as those of the Diamond? (2) Should I use a Thordarson 2-to-1 transformer or a 3½-to-1 for the first stage on the Diamond? (3) I would like to purchase an SLF variable condenser. Which one would you suggest? (4) I would also like to purchase a first-class vernier dial. Have you any suggestions? (5) I made at home a 3-circuit tuner for another 4-tube set. This called for a 6-turn primary, and a 55-turn secondary, all wound on a basket weave form. The primary is wound on the outside. The secondary is separated from the primary winding by ⅛" and is spaced wound. The tickler was composed of No. 24 double cotton covered wire. I put on 27 feet, and did not count the number of turns. Now, I would like to use this coil on the Diamond. What changes will be necessary?—H. Frencont Holbrook, Warren, Indiana.

(1) The distance and the quality reproduction of both these sets, if built properly are equal. (2) Either one will do. (3) See our advertising columns. They are all good. (4) Consult our advertising columns. (5) Increase the number of turns on the primary to 10 turns and decrease the number of turns on the secondary to 45 turns. No. 22 double cotton covered wire should be used when winding these coils. The secondaries should be tuned by a .0005 mfd. variable condenser. There is no need for spacing the windings. Instead of placing 27 feet of wire on the tickler place 35 turns. The diameter of the form should be 3½". The diameter of the tickler should be 2½".

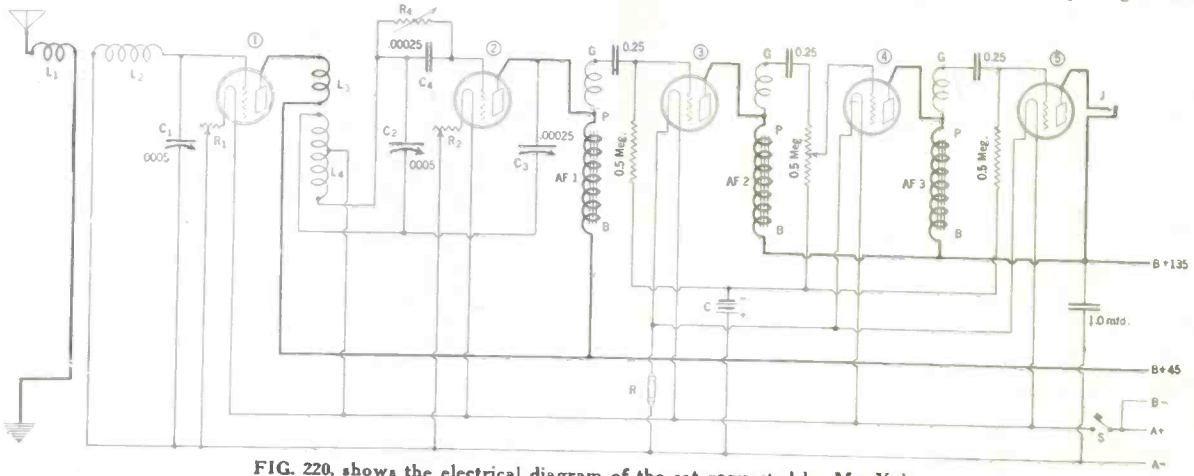


FIG. 220, shows the electrical diagram of the set requested by Mr. Yoinz.

* * *

COULD TWO stages of radio-frequency amplification be successfully added to a regenerative detector? That is, would the volume and the distance be materially increased?—Wesley W. Canfield, East Cannan, Conn.

The volume and the distance would be increased to a very small extent.

* * *

COULD THE Acme D Coil be used as a radio-frequency transformer in the Diamond. I would also like to use the same make variable condensers to shunt the secondary. (2) Would any type of a 3-circuit tuner work O. K.?—Thomas Lyons, 68 Fairmont Ave., Newark, N. J.

(1) Yes. (2) Yes, provided the primaries and the secondaries are matched up.

* * *

I AM building the 1925 Diamond. (1) Can I use the Peanut N. E. 215 vacuum tubes in this set with success? (2) I have constructed this set, but have obtained no volume. Is this due to the poor quality of the tubes? (3) I wound the coils on tubings 3½" in diameter, using the same number of turns as prescribed in the text. Was the text O. K.? (4) Would you suggest any changes in the amplifying tubes? (5) I cannot get below 290 meters. Please give suggestions. The selectivity of the set is excellent.—

H. Norman Lidster, New Westminster, B. C., Canada.

(1) The volume will be very poor, although the distance reception will be fair. (2) Yes. (3) Yes. (4) Yes, use the 201A or 199 type tubes. (5) Place a .001 mfd. fixed condenser in series with the antenna. If this does not help, place another .001 mfd. condenser in shunt to the one already installed.

* * *

A DIAGRAM of a 1-tube regenerative receiver is requested. I would like to have a switch employed, by which the grid return could be twisted around, that is employ the switch to either connect the grid to the negative side of the A battery or directly to the plate through the tickler lead.—R. Coaxley, New Hampton, Mo.

Fig. 221, shows a diagram as requested. The primary, L1, of the 3-circuit tuner is wound on a tubing 3½" in diameter and 4" high and contains 10 turns. There is no separation and the secondary, L2, is wound. This contains 45 turns. The wire used when winding these coils is of the No. 22 double cotton covered type. The tickler, L3, is wound on a tubing 2½" in diameter and 2" high. There are 35 turns wound. The wire being used is the same as used on the primary and the secondary. The variable condenser, C1, is one having a capacity of .0005 mfd. and usually consists of 23 plates. The grid condenser, C3, is one having a capacity of .00025 mfd. The grid leak is a fixed one and has a resistance of 2 megohms. The resistance of the rheostat is 10 ohms, provided the 201A type tube is used. The condenser, C3, is one having a capacity of .001 mfd. As you will notice this is optional. The voltage placed on the tube is 45. Any other type tube, such as the 199, the WD11 or 12 may be used. The results as far as volume is concerned will be much less with all these tubes.

* * *

THE RADIO and the audio tubes in a Freshman Masterpiece receive no B battery current. (1) What can this be due to? (2) The Crosley AFT are only marked P and S. How shall I differentiate so that I may know which is which, when hooking up the AF amplifier? (3) I would like to make an A battery charger. Would you please give me the wiring for the step-up transformer?—W. L. Bickford, Moscow, Mich.

(1) This can be due to several reasons, viz., the upper and lower terminals of the jack are not making the proper contact; there is an open or short in the primary windings of the AFT; there is a broken lead in the plate coil, either internally or externally; the terminals of the tubes may not be touching the prongs of the socket; there may be a broken lead on the B+ binding post. (2) For the primary winding, it does not matter, which lead is connected to the B+ or P, but for the secondary, connect the post which holds the outside lead of the secondary to the grid post. The other lead goes to the F—. The P leads are the primary leads and the S leads are the secondary leads. If you cannot see the windings, then connect one P post to the plate, and the S post diagonally opposite to the G post on the socket. (3) Such an instrument should be bought. There are too many windings to wind and the type of wire used is very difficult to handle.

* * *

KINDLY ADVISE me if I can employ the Ambassador 3-circuit tuning coil in the 3-tube 3-circuit tuner described by Capt. P. V. O'Rourke in the October 10 issue of RADIO WORLD. (2) Can I use WD12 tubes in the set?—J. Savaese, 152 East 123rd St., New York City.

(1) Yes, very successfully. (2) Yes.

* * *

IN THE June 27th issue of RADIO WORLD there appeared an article on Bernard's 3-circuit tuner that you can log. I would like to use .0005 mfd. variable condensers. Please advise the number of turns to place on the coils.—Arthur L. Fields, South State St., Ripley, N. Y.

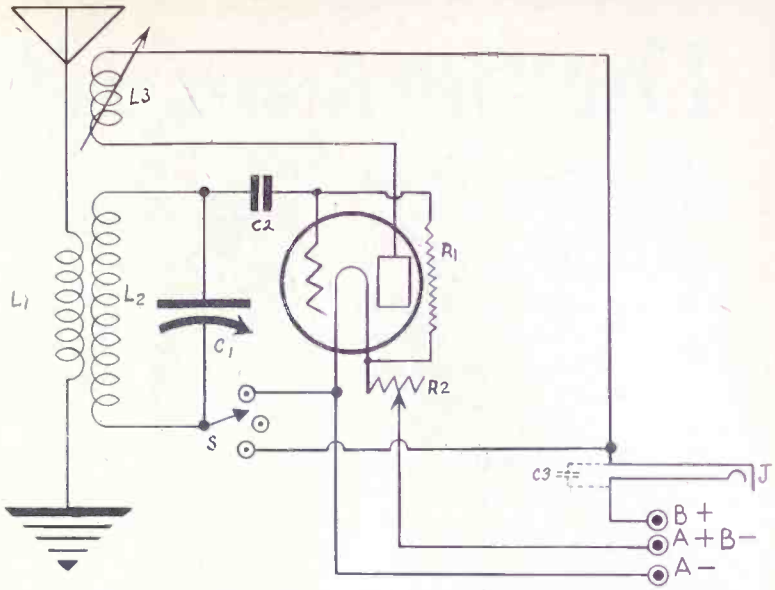


FIG. 221, showing the peculiar diagram requested by Mr. Coaxley.

There are 10 turns on the primary, 45 turns on the secondary. This is wound on a tubing 3½" in diameter and 3½" high. The plate coil is wound on a tubing 3" high and 3" in diameter. It contains 35 turns. Both coils are wound with No. 22 double cotton covered wire.

* * *

WILL YOU please publish a diagram of the 2-tube "Grimes Inverse Duplex?"—E. Lang, 2704 Norwood St., N. S., Pittsburgh, Pa.

In the August 8 issue of RADIO WORLD, such a diagram with complete building data was given. This set can easily be made into a 3-tube affair by inserting an extra audio-stage, the top of the jack which comes from the plate of the first tube, goes to the P post of the AFT and the bottom post going to the B plus post.

* * *

KINDLY LET me know if I can use the Bremer Tully 3-circuit tuner, the radio-frequency transformer, and the variable condenser in the 4-tube Diamond with success?—Chas. Fisher, 337 Second Ave., Garwood, N. J.

Yes.

* * *

I WOULD like to build the Diamond. I have one 90° coupler and one 180° coupler. (1) Which one is advisable to be used? (2) What are the number of turns to place on the secondary of either coupler? (3) How many turns are to be placed on the primary? (4) What space is left between the primary and the secondary? (5) How many turns are placed on the rotor? (6) Will the Acme A-2 transformer be all right for the audio-stages?—Robert Kemey, 85 Magnolia St., Dorchester 25, Mass.

(1) It does not matter which one is used, although the 180° coupler gives a little more variation. (2) There are 10 turns on the primary, the tubing being 3½" in diameter and 4" high. There are 45 turns on the secondary, this being wound on the same tubing. (4) There is no spacing between the primary and the secondary windings. (5) There are 35 turns in the rotor, this usually being called the tickler. The diameter of this tubing is 2½" and the height is 2". (6) Yes.

* * *

I WOULD like to know how many turns I would have to have on a 3-circuit coil which will tune from 200 to 450 meters. Also please state the diameter of the tubing.—Ernest G. Emond, 268 Cornelia St., Brooklyn, N. Y.

There are 8 turns on the primary and 35 turns on the secondary. This is wound on a tubing 3½" in diameter and 4" high. The tickler is wound on a tubing 2½" in diameter and 2" high. There are 25 turns placed on here. No. 22 double cotton covered wire is used for winding all the coils.

If you wish to receive signals on higher wavelengths, i.e., to 550, use a 10-turn primary and a 45-turn secondary. The tickler should have 35 turns in conjunction with the 10-and-45 inductances.

* * *

The Bernard 1-Tube DX Set

Local Stations Are Not Tuned Out By Variation of the Regeneration Control, Which, While Somewhat Sharp for the Very Low Broadcast Waves, Is Not a Bit Critical Over 400 Meters — Feedback Condenser Even Could Be of the Neutralizing Type, Says Author.

By Herman Bernard

Associate, Institute of Radio Engineers

PART I.

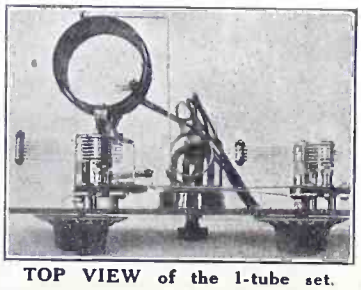
A 1-TUBE set that is readily adaptable to parts that may be lying around the house, and which uses only a single coil, or fixed coupler, is shown in Fig. 1. Its advantages include the simplicity of making the coil, due to the absence of a rotary tickler, which would introduce mechanical difficulties; the use of a variable condenser for feedback, which takes away much of the criticalness present in rotary tickler coil feedback, and the utter simplicity of the construction.

HERMAN BERNARD

The set is capable of getting distance on a par with the rotary tickler type of regenerative circuit, for indeed all the regenerative hookups, where only one tube is employed and crystal or reflex avoided, may be expected to perform about at par. The variations, in point of performance, depend not so much on the hookup as on the parts used and the method of wiring.

The Feedback Condenser

One point about this set is the possibility of the feedback condenser having an effect upon the wavelength tuning condenser, C1, so that compensated tuning may exist to a slight extent. This commonly would denote the use of too large a feedback condenser, C2. Just what capacity this condenser should be will depend largely on the point at which the tap T is taken on the secondary. Where the tap is taken at a point about one-quarter from the low potential end of the coil, granting L2 is tuned by a .00035 mfd. variable, the capacity of C2 should be no more than .00025 mfd., and may be even .0001 mfd. However, it is not so easy to get a .0001 mfd. variable, and few experimenters will have such an instrument handy around the house, ready to put into the set. Therefore, the tap should be taken still nearer the beginning of the coil. Indeed, if the tap were placed much nearer the grid it would be possible to control regeneration with a neutralizing condenser, but the objection to that is, of course, the peril of bypassing (i. e., virtually short-circuiting) the input, in which case you would receive no signals.



TOP VIEW of the 1-tube set.

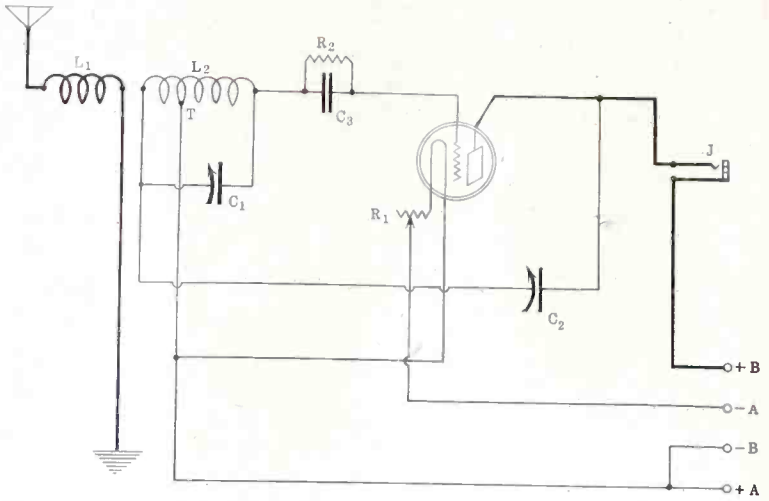


FIG. 1, the electrical wiring diagram of the Bernard 1-tube DX set, shown schematically. The coils are drawn in such fashion as to clarify the manner of connecting their terminals and the tap T. Regeneration is supplied by the Hartley oscillator hookup, the same system as used by Bernard in the Thordarson-Wade 5-tube set. Note that the rotors of both C1 and C2 are connected to the same lead that goes to the beginning of the secondary L2, and this lead connects nowhere else.

Compared With Tuned Plate

However, the regeneration control method here set forth is one that affords fine smoothness and differs from the tuned plate method largely in that the condenser capacity should be much smaller than otherwise and there is no utter dependence on the whimsicalities of the tube. The tuned plate method consists of a coil connected between plate and one of the phone tips, a variable condenser being used across this coil. The inductance is usually about the same as that on the secondary (L2 in this case), and the condenser of the same capacity as the one tuning the secondary. While this enhances the possibility of the regeneration condenser tuning in step with the other, the great difficulty with this form of hookup is that some tubes are not over eager to transfer the plate current back to the grid circuit through the inter-electrode capacity existing inside the tube, between grid and plate. The capacity often is too small to insure success, for an actual condenser exists within the tube, and it is an uncertain factor. One has to depend much on the relative position of grid and plate inside the tube, which the manufacturer alone might have discovered, but which knowledge th epurchaser necessarily must be denied. And even if it were given to him, what good would it be?

To obtain regeneration by the tuned plate method it is commonly necessary to put a fixed bypass condenser, normally .001 mfd., across the phones, or, in an audio amplifying circuit, across the primary of the first audio-frequency transformer. This condenser should not be necessary, but when it is necessary it simply has to be there or you have a set that, for sheer performance, does not outrank a simple crystal set. Of course in an audio amplifying circuit the bypass condenser may become additionally necessary because the radio currents should be kept out of the transformer primary.

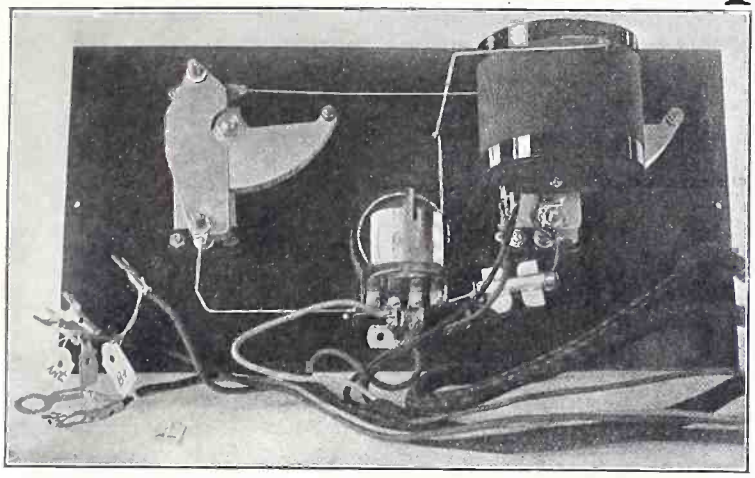
When the tuned plate circuit works well the set is a fine one, but many persons who have built such a set report no great sucess, although a much greater number have succeeded. For general use, therefore, it would see madvisable to have a circuit that is more dependable on a quantity production basis. Such a set is shown in Fig. 1.

The Hartley oscillator system is used for obtaining regeneration. The plate current, instead of being put into the phones exclusively, is separated as to its radio and audio components, the radio component being returned to the grid through the regeneration condenser, while the audio current passes into the phones, actuating them, so that you can hear the broadcast program. As C2 serves also a bypass purpose there is no need for a fixed bypass condenser in the circuit. It is always well to dispense with fixed condensers, where that is possible, most especially when they are used in the radio side of a circuit, for all the care of selection of low-loss instruments and in actual set construction comes to naught when a high-loss fixed condenser is introduced.

An Inexpensive Set

The set I am describing, however, is not intended to be one on which you will spend any real money. I do not think that any one should go to real expense in building a 1-tube set. Rather, it is assumed that there is a receiver in the home that works a speaker, but that the experimenter or the DG hound wants something else,

for Novice and Expert Alike



THE REAR VIEW of the set, showing the tap lead that goes to A+.

Simplicity of Coil Winding, Ease of Regeneration Control, and General Adaptability to Parts Lying Around the House Characterize This Circuit — Hartley Oscillator Method Used for Regeneration Supply — Set Can Be Made to Press Any Values of Variable Condensers Into Use.

LIST OF PARTS

ONE 7x12 PANEL.
ONE RADIO-FREQUENCY TRANSFORMER, I1L2.
ONE .00035 mfd. VARIABLE CONDENSER, C1.
ONE .00025 mfd. VARIABLE CONDENSER, C2.
ONE 30-ohm RHEOSTAT.
TWO 3 DIALS.
TWO DIAL POINTERS.
ONE SINGLE-CIRCUIT JACK.
ONE .00025 mfd. GRID CONDENSER, C3.
ONE 2-megohm FIXED GRID LEAK.
ONE STANDARD NAVY BASE SOCKET
ONE 7x13 BASEBOARD, UNLESS PANEL-MOUNT METHOD IS USED.

which he can use after the folks are gone abed, or when he's alone in the house, and for that purpose will resuscitate parts from the sets and circuits of other days, and from this heap of quasi-discard fish forth the parts with which to appease his experimental desires or appetite for the reception of distant stations. The idea of using spare parts, or very inexpensive ones, if any are to be purchased, was a fundamental one.

The Coil

Take the coil as an example. It may be a neutroformer. This, you know, is the name given to a fixed coupler with a tap on it for neutralizing purposes. Where this tap will be found no one can determine as a certain proposition, but it has been common to put the tap at a point rrepresenting the same equivalent amount of inductance that is in the primary. No matter where the tap may be you can make your own tap for your own purpose by lifting one of the turns 1/8-inch from the form, using a penknife, scraping off the insulation and soldering a flexible insulated lead or other piece of wire to this point.

THE PANEL VIEW of the set, with the engravings designating the instruments.

The location of the tap as near beginning of L2 is clarified by a glance at Fig. 2, which shows the wiring in picture form. As the coil stands upright it will be seen that the aerial is connected to the top terminal of the primary L2. The ground is joined to the bottom end of the primary. Now, instead of the adjoining terminal of the secondary, i. e., top terminal of that winding, going to grid condenser, as is often done in 1-tube hookups, it goes to the rotor plates of both variable condensers, C1 and C2, and is connected to no other part or point. In other words, the whole secondary L2 is tuned by the condenser C1, but the grid input voltage is derived from only that part of the secondary that lies between the tap and the grid end. The small number of turns between the tap and the rotary plate connection (beginning of L1) is really in the plate circuit, as can be seen by following the plate radio output to the stator plates of C2, to the rotor plates of C2 and on to the beginning of L2.

Coil is in Series

Condenser C2, therefore, is in series with the winding between T and the beginning of L2. That is why the inductance in that small part of the secondary L2, i. e., the location of the tap, determines the maximum capacity necessary for C2, or, vice versa, why almost any available capacity variable condenser may be used for C2, simply by shifting the tap point, so that it is farther from the plate end of the coil for smaller capacity condenser and nearer to the plate end for larger capacity condenser. Under no circumstances need a variable condenser larger than .0005 mfd. be used for C2, and this should not be employed unless it happens to be the only one handy. The admonition is not important enough to make any one hesitate about using the .0005 mfd., however, if that it what he has.

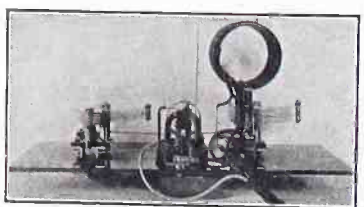
The primary winding, L1, in any case would be the same for a given diameter, no matter what capacity C2 or even C1 might be. Assuming that a .00035 mfd. condenser is to be used for C1, and the tubing or other form is to be 3½" diameter, the wire No. 20 single cotton covered, put on 10 turns for L2, leave ¼" space, wind 60 turns for the secondary, but be sure to tap the secondary. Locate the tap according to the value of C2.

A Variable Factor

Some variations may be expected, even if the following data are observed, nevertheless it is a good general rule to locate the tap at the eighth turn if C2 is to be .00025 mfd. and at the fourth turn if it is to be .00035 mfd. That may seem inordinately low but it proved to be right in several tests that I made. If you have a .0001 mfd. variable condenser, normally seven plates, then locate the tap at the tenth turn.

The tap position, lest I have not made this perfectly clear, in a home-made coil should be at the specified turn from the beginning of the secondary winding. For instance, suppose you are putting on a 60-turn secondary. Suppose C2 is to be .00025 mfd. Then wind eight turns, twist the wire into a small loop, and wind 56 turn more turns, thus completing the secondary. Scrape a little insulation off the tap for connection. The beginning goes to the common rotors, the end to the coil side of the grid condenser, while the tap goes to A plus. If the tap on a commercial coil is near the end of L2, connect rotors to end, beginning to grid condenser, tap to A plus. If a UV200 or Sodion D21 tube is used this tap in either case should go to A minus. The Sodion tube, by the way, is not being manufactured any more by the Connecticut Telephone and Telegraph Company, and is disappearing from the market.

[Part II, the conclusion of this article on how to build the Bernard 1-tube set, will be published next week, issue of October 31.]



BOTTOM VIEW of the receiver, which was made without baseboard, thus necessitating a panel-mount socket.

THE KEY TO THE AIR

KEY

Abbrevations: EST, Eastern Standard Time; CST, Central Standard Time; MST, Mountain Standard Time; PST, Pacific Standard Time;

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

If you are in	*And want a station in*	*Subtract*	*Add*
EST	CST	....	1 hr.
EST	MST	....	2 hrs.
EST	PST	....	3 hrs.
CST	EST	1 hr.	....
CST	MST	....	1 hr.
CST	PST	....	2 hrs.
MST	EST	2 hrs.	....
MST	CST	1 hr.	....
MST	PST	....	1 hr.
PST	EST	3 hrs.	....
PST	CST	2 hrs.	....
PST	DST	1 hr.	....

FRIDAY, OCTOBER 23

WAAM, Newark, N. J., 263 (EST)—11 AM to 12; 7 PM to 10:30.
WAHG, Richmond Hill, N. Y., 316 (EST)—12:30 to 1:05 PM; 7:30 to 11:05 PM.
WAMD, Minneapolis, Minn., 243.8 (CST)—12 to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 to 10 PM.
WBBR, New York City, 272.6 (EST)—8 PM to 10.
WBOQ, Richmond Hill, N. Y., 236 (EST)—7:30 PM to 11:30.
WBZ, Springfiedl, Mass., 333.1 (EST)—6 PM to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 to 4; 5:30 to 10.
WCAE, Pittsburgh, Pa., 461.3 (EST)—12:30 to 1:30 PM; 4:30 to 5:30; 6:30 to 11.
WDAF, Kansas City, Mo., 365.6 (CST)—3:30 to 7 PM; 8 to 10; 11:45 to 1 AM.
WEAF, New York City, 492 (EST)—6:45 AM to 7:45; 11 to 12; 4 PM to 5; 6 to 12.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 8 to 11.
WEAO, Ohio State University, 293.9 (EST)—8 PM to 10.
WEEI, Boston, Mass., 476 (EST)—6:45 AM to 7:45; 2 PM to 3:15; 5:30 to 10.
WEMC, Berrien Springs, Mich., 286 (CST)—9 PM to 11.
WFAA, Dallas, Texas, 475.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30.
WFBH, New York City, 272.6 (EST)—2 PM to 6.
WGBS, New York City, 316 (EST)—10 AM to 11; 1:30 PM to 4; 6 to 7:30.
WGCP, New York City, 252 (EST)—2:30 PM to 5:15; 8 to 11.
WGES, Chicago, Ill., 250 (CST)—7 to 9 PM; 11 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (EST)—12 M to 12:45 PM; 7:30 to 11.
WGY, Schenectady, N. Y., 379.5 (EST)—1 PM to 2; 5:30 to 10:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8:30 to 10.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (EST)—12:30 PM to 1; 2:15 to 5; 7 to 11; 12 to 12:30 AM.
WHO, Des Moines, Iowa, 526 CST)—7 PM to 9; 11 to 12; 12:30 to 1:30; 4:30 to 5:30; 6:30 to 9:30.
WHT, Chicago, Ill., 400 (CST)—11 AM to 2 PM; 7 to 8:30; 8:45 to 10:05; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (EST)—6:45 AM to 7:15; 10 to 11; 1 PM to 2; 3 to 5; 6 to 7.
WJY, New York City, 405 (EST)—7:30 PM to 11:30.
WJZ, New York City, 455 (EST)—10 AM to 11; 1 PM to 2; 4 to 6; 7 to 10:30.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 12:30; 2 to 3; 4:30 to 6; 7:30 to 1 AM.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 12:15; 1:30 to 2:30.
WMCA, New York City, 341 (EST)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (EST)—3:45 PM to 4:45; 6:20 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1; 5:45 to 7:10; 9 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 5:45 to 12.
WOR, Newark, N. J., 405 (EST)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7.
WPAK, Fargo, N. D., 283 (CST)—7:30 PM to 9.
WPG, Atlantic City, N. J., 299.8 (EST)—7 PM to 8:30; 10 to 12.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—9 AM to 10; 12 PM to 1; 5 to 7.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 11.
WRNY, New York City, 258.5 (EST)—11:59 to 2 PM; 7:59 to 9:45.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 7:30 to 10; 12 PM to 1 AM.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30; 3 to 4; 6 to 7; 8 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—6 AM to 7; 9:45 to 12:20 PM; 1:30 to 3:20; 3:30 to 11.
KFAE, State College of Wash., 348.6 (PST)—7:30 PM to 9.
KFDY, Brookings, S. D., 273 (MST)—8 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 10.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 9:30 to 12.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 11.
KGO, Oakland, Cal., 261.2 (PST)—11:10 AM to 1 PM; 1:30 to ; 4 to 7.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 11.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 3:30 PM; 5:30 to 11:30.
KJR, Seattle, Wash., 484.4 (PST)—10:30 AM to 11:30 AM; 1 PM to 6:30; 8:30 to 11.
KNX, Hollywood, Cal., 337 (PST)—11:30 AM to 12:30 PM; 1 to 2; 4 to 5; 6:30 to 12.
KOA, Denver, Col., 322.4 (MST)—11:45 AM to 12:30 PM; 330 to 4:15; 6 to 10.
KOB, State College of New Mexico, 348.6 (MST)—11:55 AM to 12:30 PM; 7:30 to 8:30; 9:55 to 10:10.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 8:45; 11 to 12 M.
KPO, San Francisco, Cal., 429 (PST)—7:30 AM to 8; 10:30 to 12 M; 1 PM to 2; 4:30 to 11.
KSD, St. Louis, Mo., 545.1 (CST)—4 PM to 5.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:20 to 10.
KYW, Chicago, Ill., 536 (CSTDS)—6:30 AM to 7:30; 10:55 to 1 PM; 2:25 to 3:30; 6:02 to 7:20; 9 to 1:30 AM.
CNRA, Moncton, Canada, 313 (EST)—8:30 PM to 10:30.
CNRE, Edmonton, Canada, 516.9 (MST)—8:30 PM to 10:30.
CNRS, Saskatoon, Canada, 400 (MST)—2:30 PM to 3.
CNRT, Toronto, Canada, 357 (EST)—6:30 PM to 11.

SATURDAY, OCTOBER 24

WAAM, Newark, N. J., 263 (EST)—7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (EST)—12:30 PM to 1:05; 12 to 2 AM.
WAMD, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 1 AM.
WBBR, New York City, 272.6 (EST)—8 PM to 9.
WBOQ, Richmond Hill, N. Y., 236 (EST)—3:30 PM to 6:30.
WBZ, Springfield, Mass., 333.1 (EST)—11 AM to 12:30 PM; 7 to 9.
WCAE, Pittsburgh, Pa., 461.3 (EST)—10:45 AM to 12 M; 3 PM to 4; 6:30 to 7:30.
WCBD, Zion, Ill., 344.6 (CST)—8 PM to 10.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12:30 PM; 2:30 to 5; 6 to 10.
WEAF, New York City, 492 (EST)—6:45 AM to 7:45; 4 PM to 5; 6 to 12.
WEEI, Boston, Mass., 476 (EST)—6:45 AM to 7 AM.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 7 to 8.
WEMC, Berrien Springs, Mich., 286 (CST)—11 AM to 12:30 PM; 8:15 to 11.
WFAA, Dallas, Texas, 475.9 (CST)—12:30 PM to 1; 6 to 7; 8:30 to 9:30; 11 to 12:30 AM.
WFBH, New York City, 272.6 (EST)—2 PM to 7:30; 11:30 to 12:30 AM.
WGBS, New York City, 316 (EST)—10 AM to 11; 1:30 PM to 3; 6 to 11.
WGCP, New York City, 252 (EST)—2:30 PM to 5:15.
WGES, Chicago, Ill., 250 (CST)—7 PM to 9; 11 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 2:30 PM; 3 to 5:57; 6 to 11:30.
WGY, Schenectady, N. Y., 379.5 (EST)—7:30 PM to 10.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:30 PM; 4 to 5; 6 to 7:30.
WHAR, Atlantic City, N. J., 275 (EST)—2 PM to 3; 7:30 to 9.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (EST)—2:15 PM to 5; 7:30 to 10.
WHO, Des Moines, Iowa, 526 (CST)—11 AM to 12:30 PM; 4 to 5:30; 7:30 to 8:30.
WHT, Chicago, Ill., 400 (CST)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (EST)—7 AM to 8; 10:20 to 11; 1 PM to 2; 3 to 4; 6 to 11:30.
WJY, New York City, 405 (EST)—2:30 PM to 5; 8 to 10:30.
WJZ, New York City, 455 (EST)—9 AM to 12:30 PM; 2:30 to 4; 7 to 10.
WKRC, Cincinnati, O., 326 (EST)—10 to 12 M.
WLWC, Cincinnati, O., 422.3 (EST)—9:30 AM to 12:30 PM; 7:30 to 10.
WMAK, Lockport, N. Y., 265.5 (EST)—10:25 AM to 12:30 PM.
WMCA, New York City, 341 (EST)—3 to 5 PM; 6:30 to 2.
WNYC, New York City, 526 (EST)—1 to 3 M; 7 to 11.
WOAW, Omaha, Neb., 526 (CST)—10 AM to 1; 2:15 to 4; 9 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 5:45 to 7:10; 9 to 12.
WOO, Philadelphia, Pa., 508.2 (EST)—11 AM to 1 PM; 4:40 to 5; 10:55 to 11:02.
WOR, Newark, N. J., 405 (EST)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7:30; 8 to 11.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 3 AM.
WPG, Atlantic City, N. J., 299.8 (CST)—7 PM to 12.
WRC, Washington, D. C., 469 (EST)—1 PM to 2; 6:45 to 12.
WREO, Lansing, Mich., 285.5 (EST)—10 PM to 12.
WRNY, New York City, 258.5 (EST)—11:59 to 2 PM; 7:59 to 9:30; 12 M to 1 AM.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 3 to 4; 5 to 6; 10:45 to 12.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10; 11:55 to 1:30 PM; 3 to 4.
KDKA, Pittsburgh, Pa., 309 (EST)—10 AM to 12:30 PM; 1:30 to 6:30; 8:45 to 10.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 268 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10:30.
KFOA, Seattle, Wash., 455 (PST)—Silent.
KGO, Oakland, Cal., 361.2 (PST)—11 AM to 12:30 PM; 3:30 to 5:45; 7:30 to 9.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 6 to 7; 10 to 11.
KHJ, Los Angeles, Cal., 405.2 (EST)—7 AM to 7:30; 10 to 1:30 PM; 2:30 to 3:30; 5:30 to 2 AM.
KJR, Seattle, Wash., 484.4 (PST)—1 PM to 2:45; 6 to 6:30; 8:30 to 10.
KNX, Hollywood, Cal., 337 (PST)—1 PM to 2; 6:30 to 2 AM.
KOA, Denver, Colo., 322.4 (MST)—11:30 AM to 1 PM; 7 to 10.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 9.
KPO, San Francisco, Cal., 429 (PST)—8 AM to 12 M; 2 PM to 3; 6 to 10.
KSD, St. Louis, Mo., 545.1 (CST)—7 PM to 8:30.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:30 to 10:30.
KYW, Chicago, Ill., 536 (CST)—11 AM to 12:30 PM; 4 to 5; 7 to 8.
CKAC, Montreal, Canada, 411 (EST)—4:30 PM to 5:30.
CNRO, Ottawa, Ontario, Canada, 435 (EST)—7:30 PM to 10.
PWX, Havana, Cuba, 400 (EST)—8:30 PM to 11:30.

SUNDAY, OCTOBER 25

WBBM, Chicago, Ill., 226 (CST)—4 PM to 6; 8 to 10.
WBBR, New York City, 272.6 (EST)—10 AM to 12 M; 9 PM to 11.
WCCO, St. Paul and Minneapolis, Minn., 416 (CST)—11 AM to 12:30 PM; 4:10 to 5:10; 7:20 to 10.
WDAF, Kansas City, Mo., 365.6 (CST)—4 PM to 5:30.
WEAF, New York City, 492 (EST)—3 PM to 5; 7:20 to 10:15.
WEAR, Cleveland, O., 390 (EST)—3:30 PM to 5; 7 to 8; 9 to 10.
WFBH, New York City, 272.6 (EST)—5 PM to 7.
WGBS, New York City, 316 (EST)—3:30 PM to 4:30; 8 to 10.
WGCP, New York City, 252 (EST)—8 PM to 11.
WGES, Chicago, Ill., 250 (CST)—5 PM to 7; 10:30 to 12 M.
WGN, Chicago, Ill., 370 (CST)—11 AM to 12:45 PM; 2:30 to 5; 9 to 10.
WGR, Buffalo, N. Y., 379.5 (EST)—9:30 AM; 7:15 to 8 PM.
WGY, Schenectady, N. Y., 379.5 (EST)—9:30 AM to 12:30 PM; 2:35 to 3:45; 6:30 to 10:30.
WHAD, Milwaukee, Wis., 275 (CST)—3:15 PM to 4:15.
WHAR, Atlantic City, N. J., 275 (EST)—2:30 PM to 3:45; 7:50 to 10; 11:15 to 12.
WHN, New York City, 360 (EST)—1 PM to 1:30; 3 to 6; 10 to 12.
WHT, Chicago, Ill., 238 (CST)—9:30 AM to 1:15 PM; 5 to 9.
WIP, Philadelphia, Pa., 508.2 (EST)—10:45 AM to 12:30 PM; 4:15 to 5:30.
WJZ, New York City, 455 (EST)—9 AM to 12:30 PM; 2:30 to 4; 7 to 11.
WKRC, Cincinnati, O., 326 (EST)—6:45 PM to 11.
WMCA, New York City, 341 (EST)—11 AM to 12:15 PM; 7 to 7:30.
WNYC, New York City, 526 (EST)—9 PM to 11.
WOCL, Jamestown, N. Y., 275.1 (EST)—9 PM to 11.
WOO, Philadelphia, Pa., 508.2 (EST)—10:45 AM to 12:30 PM; 2:30 to 4.
WPG, Atlantic City, N. J., 209.8 (EST)—3:15 PM to 5; 9 to 11.
WQJ, Chicago, Ill., 448 (CST)—10:30 AM to 12:30 PM; 3 PM to 4; 8 to 10.
WREO, Lansing, Michigan, 285.5 (EST)—10 AM to 11.
WRNY, New York City, 258.5 (EST)—3 PM to 5; 7:59 to 10.
WSBF, St. Louis, Mo., 273 (CST)—9 to 11 PM.
WWJ, Detroit, Mich., 352.7 (EST)—11 AM to 12:30 PM; 2 to 4; 6:20 to 9.
KDKA, Pittsburgh, Pa., 309 (EST)—9:45 AM to 10:30; 11:55 to 12 M; 2:30 PM to 5:30; 7 to 11.
KFNF, Shenandoah, Iowa, 266 (CST)—10:45 AM to 12:30 PM; 2:30 to 4:30; 6:30 to 10.
KOA, Denver, Col., 322.4 (MST)—10:55 AM to 1 PM; 4 PM to 5:30; 7:45 to 10.
KOIL, Council Bluffs, Iowa, 278 (CST)—11 AM to 12:30 PM; 7:30 to 9.
KGW, Portland, Oregon, 491.5 (PST)—10:30 AM to 12:30 PM; 6 to 9.
KHJ, Los Angeles, Cal., 405.2 (EST)—10 AM to 12:30 PM; 6 to 9.
KJR, Seattle, Wash., 384.4 (PST)—11 AM to 12:30 PM 3 to 4:30; 7:15 to 9.
KTHS, Hot Springs, Ark., 374.8 (CST)—11 AM to 12:30 PM; 2:30 to 3:40; 8:40 to 11.

MONDAY, OCTOBER 26

WAAM, Newark, N. J., 263 (EST)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12:30 M to 1:05 PM; 7:30 to 12.
WAMB, Minneapolis, Minn., 243.8 (CST)—10 PM to 12.
WBBM, Chicago, Ill., 226 (CST)—6 PM to 7.
WBBR, New York City, 272.6 (ESTDS)—8 PM to 9.
WBZ, Springfield, Mass., 333.1 (EST)—6 PM 11:30.
WCAE, Pittsburgh, Pa., 461.3 (EST)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 12.
WCBD, Zion, Ill., 344.6 (CST)—8 PM to 10.
WCCO, St. Paul and Minneapolis, Minn., 416 (CST)—9:30 AM to 12 M; 1:30 PM to 6:15.
WDAF, Kansas City, Mo., 365.6 (CST)—3:30 PM to 7; 8 to 10; 11:45 to 1 AM.
WEAF, New York City, 492 (EST)—6:45 AM to 7:45; 4 PM to 5; 6 to 11:30.
WEAR, Cleveland, O., 300 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 7 to 8.
WEEI, Boston, Mass., 476 (EST)—6:45 AM to 8; 3 PM to 4; 5:30 to 10.
WEMC, Berrien Springs, Mich., 286 (CST)—8:15 PM to 11.
WFAA, Dallas, Texas, 475.9 (EST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30.
WFBH, New York City, 272.6 (EST)—2 PM to 6:30.
WGCP, New York City, 252 (EST)—2:30 PM 11; 1:30 to 3:10; 6 to 7:30.
WGES, Chicago, Ill., 250 (CST)—5 PM to 8.
WGCP, New York City, 252 (EST)—2:30 PM to 5:18; 8 to 10:45.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 3:30 to 5:57.
WGR, Buffalo, N. Y., 319 (EST)—12 M to 12:30 PM; 2:30 to 4:30; 7:30 to 11.
WGY, Schenectady, N. Y., 379.5 (EST)—1 PM to 2; 5:30 to 8:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8 to 10.
WHAR, Atlantic City, N. J., 275 (EST)—2 PM to 3; 7:30 to 9.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (EST)—2:15 PM to 5; 6:30 to 12.
WHO, Des Moines, Iowa, 526 (CST)—12:15 PM to 1:30; 7:30 to 9; 11:15 to 12.
WHT, Chicago, Ill., 400 (CST)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (EST)—7 AM to 8; 1 PM to 2; 3 to 8.
WJZ, New York City, 455 (EST)—10 AM to 11; 1 PM to 2; 4 to 5:30; 6 to 6:30; 7 to 11.
WKRC, Cincinnati, O., 326 (EST)—8 PM to 10.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 1; 2 to 3; 4:30 to 6; 7:30 to 11:30.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 12:15 PM; 1:30 to 2:30; 3 to 5; 6 to 10.
WMAK, Lockport, N. Y., 265.5 (EST)—8 PM to 12.
WMCA, New York City, 341 (EST)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (EST)—3:15 PM to 4:15; 6:20 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1:30; 5:45 to 10:30.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 5:45 to 6.
WOO, Philadelphia, Pa., 508.2 (EST)—11 AM to 1 PM; 4:40 to 6; 7:30 to 11.
WOR, Newark, N. J., 405 (EST)—6:45 AM to 7:45; 2:30 to 4; 6:15 to 11:30.
WPAK Fargo, N. D., 283 (CST)—7:30 PM to 9.
WPG, Atlantic City N. J., 299.8 (EST)—7 PM to 11.
WQJ, Chicago, Ill., 488 (CST)—11 AM to 12 M; 3 PM to 4.
WRC, Washington, D. C., 469 (EST)—9 AM to 10; 12 M to 2; 6:15 PM to 6:30.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 11.
WRNY, New York City, 258.5 (EST)—11:59 AM to 2 PM; 7:30 to 11.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 7:30 to 10:30; 12 to 1 AM.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30 PM; 3 to 4; 6 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—6 AM to 7; 9:45 to 12:15 PM; 2:30 to 3:20; 5:30 to 10.
KWSC, State College of Wash., 348.6 (PST)—7:30 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:45 PM to 1:30; 4 to 5:15; 6 to 10.
KGO, Oakland, Cal., 361.2 (PST)—9 AM to 10:30; 11:30 AM to 1 PM; 1:30 to 6; 6:45 to 7; 8 to 1 AM.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30; 5 to 8.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 1:30 PM; 5:30 to 10.
KJR, Seattle, Wash., 384.4 (PST)—1 PM to 2:45; 6 to 6:30; 7 to 11.
KNX, Hollywood, Cal., 337 (PST)—12 M to 1 PM; 4 to 5; 6:30 to 12.
KOB, State College of New Mexico, 348.6 (MST)—11:55 AM to 12:30 PM; 7:30 to 8:30; 9:55 to 10:10.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 10.
KPO, San Francisco, Cal., 428 (PST)—10:30 AM to 12 M; 1 PM to 2; 2:30 to 3:30; 4:30 to 10.
KSD, St. Louis, Mo., 545.1 (CST)—7:30 PM to 10.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:30 to 10.
KYW, Chicago, Ill., 536 (CSTDS)—6:30 AM to 7:30; 10:55 to 1 PM; 2:15 to 3:30; 6:02 to 7.

TUESDAY, OCTOBER 27

WAAM, Newark, N. J., 263 (EST)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (EST)—12 PM to 1:05 AM.
WAMB, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 12.
WBOQ, Richmond Hill, N. Y., 236 (EST)—3:30 PM to 6:30.
WBZ, Springfield, Mass., 333.1 (EST)—6 PM to 11.
WCAE, Pittsburgh, Pa., 461.3 (EST)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 PM to 4; 5:30 to 10.
WDAF, Kansas City, Mo., 365.6 (CST)—3:30 PM to 7; 11:45 to 1 AM.
WEAF, New York City, 492 (EST)—6:45 AM to 7:45; 11 to 12 M; 4 PM to 5; 6 to 11.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 6:45 to 7:45.
WEEI, Boston, Mass., 476 (EST)—6:45 AM to 8; 3 PM to 4; 5:30 to 10.
WEMC, Berrien Spring, Mich., 266 (CST)—8:15 PM to 11.
WFAA, Dallas, Texas, 475.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1.
WFBH, New York City, 270.6 (EST)—2 PM to 7:30; 12 M to 1 AM.
WGCP, New York City, 252 (EST)—2:30 PM to 5:18; 8 to 10.
WGES, Chicago, Ill., 250 (CST)—7 PM to 9; 11 to 1 AM.
WGBS, New York City, 316 (EST)—10 AM to 11 PM; 1:30 to 4; 6 to 7.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (EST)—12 M to 12:45 PM; 2:30 to 4:30; 6:30 to 11.
WGY, Schenectady, N. Y., 379.5 (CST)—5:30 PM to 7:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8 to 10; 11:30 to 12:30 AM.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 368 EST)—2:15 PM to 5:30; 7:30 to 11; 11:30 to 12:30 AM.
WHO, Des Moines, Iowa, 526 (CST)—12:15 PM to 1:30; 6:30 to 12 M.
WHT, Chicago, Ill., 400 (CST)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 568 EST)—7 AM to 8; 10:20 to 11; 1 PM to 2; 3 to 4; 6 to 8.
WJZ, New York City, 455 (EST)—10 AM to 11; 1 PM to 2; 4 to 6; 6 to 11:30.
WKRC, Cincinnati, Ohio, 326 (EST)—8 PM to 10.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 12:30; 2 to 3; 4:30 to 6; 7:30 to 9.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 12:15 PM; 1:30 to 2:30; 3 to 5; 6 to 11.
WMCA, New York City, 341 (EST)—10:45 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (EST)—6:30 PM to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 4 to 7:05; 9 to 11.
WOR, Newark, N. J., 405 (EST)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 12 M.
WPAK, Fargo, N. D., 283 (CST)—7:30 PM to 9.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to ; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—9 AM to 10; 12 M to 2; 6:25 PM to 7.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 11.
WRNY, New York City, 258.5 (EST)—11:59 AM to 2 PM; 7:59 to 9:55.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 7:30 to 9.
WWJ, Detroit, Mich., 352.7 (EST)—6 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30 PM; 3 to 4; 6 to 7; 8 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—6 AM to 7; 9:45 to 12:15 PM; 2:30 to 3:20; 5:30 to 11.
KFAE, State College of Wash., 348.6 (PST)—7:30 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30 AM.
KFMQ, Fayettville, Ark., 299.8 (CST)—7:30 PM to 9.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 10.
KGO, Oakland, Cal., 361.2 (PST)—11:30 AM to 1 PM; 1:30 to 2:30; 3 to 6:45.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 10.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 1:30 PM; 5:30 to 12.
KJR, Seattle, Wash., 484.4 (PST)—9 AM to 1 AM.
KNX, Hollywood, Cal., 337 (PST)—1 PM to 2; 7 to 12.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 9; 11 to 12 M.
KPO, San Francisco, Cal., 429 (PST)—7 AM to 7:45; 10 to 12 M; 1 PM to 2; 3:30 to 11.
KSD, St. Louis, Mo., 541.1 (CST)—6 PM to 7.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:30 to 10:30.
KYW, Chicago, Ill., 536 (CST)—6:30 AM to 7:30; 10:30 to 1 PM; 2:15 to 4; 6:02 to 11:30.
CNRA, Moncton, New Brunswick, Canada, 313 (EST)—9:30 PM to 11.
CNRR, Regina, Saskatchewan, Canada—8 PM to 11.
CNRO, Ottawa, Ontario, Canada, 435 (EST)—7 PM to 11.

WEDNESDAY, OCTOBER 28

WAAM, Newark, N. J., 263 (EST)—12:30 PM to 1:05; 7:30 to 11:05.
WAHG, Richmond Hill, N. Y., 316 (EST)—12 M to 1:05 PM; 8 to 12.
WAMB, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 10.
WBZ, Springfield, Mass., 333.1 (EST)—6 PM to 11.
WCAE, Pittsburgh, Pa., 461.3 (EST)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 PM to 4; 5:30 to 7:45.
WDAF, Kansas City, Mo., 365.6 (CST)—3:30 PM to 7; 8 to 9:15; 11:45 to 1 AM.
WEAF, New York City, 492 (EST)—6:45 AM to 7:45; 11 to 12 M; 4 PM to 5; 6 to 12.
WEAO, Ohio State University, 293.9 (EST)—8 PM to 10.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 6:45 to 7:45.
WEEI, Boston, Mass., 476 (EST)—6:45 AM to 8; 3 PM to 4; 5:30 to 10.
WEMC, Berrien Spring, Mich., 266 (CST)—8:15 PM to 11.
WFAA, Dallas, Texas, 475.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1.
WFBH, New York City, 270.6 (EST)—2 PM to 7:30; 12 M to 1 AM.
WGCP, New York City, 252 (EST)—2:30 PM to 5:18; 8 to 10.
WGES, Chicago, Ill., 250 (CST)—7 PM to 9; 11 to 1 AM.
WGBS, New York City, 316 (EST)—10 AM to 11 PM; 1:30 to 4; 6 to 7.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (EST)—12 M to 12:45 PM; 2:30 to 4:30; 6:30 to 11.
WGY, Schenectady, N. Y., 379.5 (CST)—5:30 PM to 7:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8 to 10; 11:30 to 12:30 AM.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 368 EST)—2:15 PM to 5:30; 7:30 to 11; 11:30 to 12:30 AM.
WHO, Des Moines, Iowa, 526 (CST)—12:15 PM to 1:30; 6:30 to 12 M.
WHT, Chicago, Ill., 400 (CST)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 568 EST)—7 AM to 8; 10:20 to 11; 1 PM to 2; 3 to 4; 6 to 8.
WJZ, New York City, 455 (EST)—10 AM to 11; 1 PM to 2; 4 to 6; 6 to 11:30.
WKRC, Cincinnati, Ohio, 326 (EST)—8 PM to 10.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 12:30; 2 to 3; 4:30 to 6; 7:30 to 9.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 12:15 PM; 1:30 to 2:30; 3 to 5; 6 to 11.
WMCA, New York City, 341 (EST)—10:45 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (EST)—6:30 PM to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 4 to 7:05; 9 to 11.
WOR, Newark, N. J., 405 (EST)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 12 M.
WPAK, Fargo, N. D., 283 (CST)—7:30 PM to 9.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to ; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—9 AM to 10; 12 M to 2; 6:25 PM to 7.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 11.
WRNY, New York City, 258.5 (EST)—11:59 AM to 2 PM; 7:59 to 9:55.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 7:30 to 9.
WWJ, Detroit, Mich., 352.7 (EST)—6 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30 PM; 3 to 4; 6 to 7; 8 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—6 AM to 7; 9:45 to 12:15 PM; 2:30 to 3:20; 5:30 to 11.
KFAE, State College of Wash., 348.6 (PST)—7:30 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30 AM.
KFMQ, Fayettville, Ark., 299.8 (CST)—7:30 PM to 9.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 10.
KGO, Oakland, Cal., 361.2 (PST)—11:30 AM to 1 PM; 1:30 to 2:30; 3 to 6:45.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 10.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 1:30 PM; 5:30 to 12.
KJR, Seattle, Wash., 484.4 (PST)—9 AM to 1 AM.
KNX, Hollywood, Cal., 337 (PST)—1 PM to 2; 7 to 12.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 9; 11 to 12 M.
KPO, San Francisco, Cal., 429 (PST)—7 AM to 7:45; 10 to 12 M; 1 PM to 2; 3:30 to 11.
KSD, St. Louis, Mo., 541.1 (CST)—6 PM to 7.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:30 to 10:30.
KYW, Chicago, Ill., 536 (CST)—6:30 AM to 7:30; 10:30 to 1 PM; 2:15 to 4; 6:02 to 11:30.
CNRA, Moncton, New Brunswick, Canada, 313 (EST)—9:30 PM to 11.
CNRR, Regina, Saskatchewan, Canada—8 PM to 11.
CNRO, Ottawa, Ontario, Canada, 435 (EST)—7 PM to 11.

THURSDAY, OCTOBER 29

WAAM, Newark, N. J., 263 (EST)—11 AM to 12 M; 7 PM to 11
WAHG, Richmond Hill N. Y., 316 (EST)—12:30 PM to 1:05

(Concluded on page 23)

A THOUGHT FOR THE WEEK

Apparent impossibilities in radio today often become accomplished facts tomorrow. Research is better than theory.

RADIO WORLD

Trade Mark U. S. Pat. Off.

The Link Connecting Radio Fan, Dealer, Jobber, Distributor and Manufacturer

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

TELEPHONES: BRYANT 0558, 0559
PUBLISHED EVERY WEDNESDAY
(Dated Saturday of same week)
FROM PUBLICATION OFFICE
HENNESSY RADIO PUBLICATIONS CORPORATION
ROLAND BURKE HENNESSY, President
M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
145 WEST 45th STREET, NEW YORK, N. Y.
(Between Broadway and Sixth Ave.)
European Representatives: The International News Co. Breams Bldgs., Chancery Lane, London, Eng.
Paris, France: Brentano's, 37 Avenue de l'Opera.
Chicago Representatives, A. T. Sears & Son, Peoples Gas Bldg.
Cincinnati Office: Radio World, 304 Provident Bk. Bldg., 7th and Vine Sts. Telephone, Canal 753 and 379.
San Francisco, Lloyd B. Chappell, 656 O'Farrell St.

EDITOR, Roland Burke Hennessy
MANAGING EDITOR, Herman Bernard

SUBSCRIPTION RATES

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

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

ADVERTISING RATES

General Advertising

1 Page, 7¼"x11"	462 lines	$300.00
½ Page, 7¼"x5⅝"	231 lines	150.00
¼ Page, 4⅛" D. C.	115 lines	75.00
1 Column, 2¼"x11"	154 lines	100.00
1 Inch		10.00
Per Agate line		.75

Times Discount

52 consecutive issues	30%
26 times consecutively or R. O. W. one year	15%
4 consecutive issues	10%

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

CLASSIFIED ADVERTISEMENTS

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

Entered as second-class matter, March 23, 1923, at the Post Office at New York, N. Y., under the act of March 3, 1879.

OCTOBER 24, 1925

Pure Thorium Made Practical for Tubes to Replace Mixture

The Westinghouse Lamp Company, 150 Broadway, New York City, announced that after long investigation its research laboratories had added a new metal to the world's technical resources in the form of pure metallic ductile thorium. The statement was issued by Dr. H. C. Rentschler, head of the company's research department, and Dr. J. W. Marden.

Thorium, it was said, was of particular interest to the radio enthusiasts because it was the active constituent of practically all radio tube filaments. It can now be produced commercially in filamentary form as contrasted with the minute admixture with tungsten now used. In addition to its use in radio tubes, this metal is said to be of great importance to the medical profession as a target material for X-ray tubes, being more efficient than the tungsten now in use.

The Mission of A Municipal Radio Station

What's going to happen when every enterprising community puts up a broadcasting station to invite a travel-hungry world to come and bask in the glow of the rainbow's end, sample the pot of gold and bathe in the fountain of youth?

That question probably has occurred to most of us who have watched and listened through the period of experimentation with radio as a medium for community advertising.

What about the answer?

The Invitation

The question will never have to be answered because that condition of affairs never will quite come to pass. We may get pretty close to it before the full lesson is learned, but long before the time when the perspective pleasure-seeker, the would-be home-seeker, and the yearning health-seeker would be carted off kicking and screaming to the nearest asylum, the community radio broadcasting outfits will have awakened to a true appreciation of their earlier indiscretions.

Then, instead of being puzzled and bored and harassed about where lies our future health and happiness, profit and pleasure, we'll begin to be really entertained, amused and informed through the medium of the municipal radio broadcasting station.

When it comes to advertising, radio is being employed with skill and science. Programs entertain, amuse and inform people—tell them what they want to know, present to them sounds and sights and sensations that are pleasant. Radio is properly used as a good-will builder rather than a direct sales medium.

The Case of Jacksonville

The school of municipal radio broadcasting is beginning also to learn this valuable lesson. Witness, for instance, the case of Jacksonville, Florida. Here is a city that is erecting a broadcasting station as a project of the city government to entertain, amuse and educate its own people and those within hearing of the station.

Of course Jacksonville expects this radio station to help advertise Jacksonville. As a matter of fact it expects the station to play a very substantial part in the program of telling the world things it will be pleased to know about Jacksonville and her opportunities and advantages as a port, an industrial center, a distributing point in one of the most rapidly growing consuming centers of the country, the center of a famous agricultural territory and a resort city of unusual advantages and facilities.

But the methods by which the municipal radio broadcasting station will accomplish its part of the program of advertising Jacksonville to the outside world, will be the most improved, the most up-to-date methods. It will be painless. Nay, more, it will be really pleasurable. For Jacksonville is determined that her municipal broadcasting venture shall reap for her a harvest of friends, visitors, and new citizens.

Civic Music Planned

A municipal orchestra, now being formed with the best local talent and trained by really high class musicians and instructors, will be the nucleus for the musical treats that will be part of daily programs to be broadcast from Jacksonville. These musical offerings will be among the best to be heard in the country.

If Jacksonville has a story to tell over her radio broadcasting station, she will make certain before the telling that it is a story which is interesting and instructive to the millions of owners of radio receiving sets who will hear it. It must be something that the people of Jacksonville and the outside world really want to hear and will be grateful for having heard.

Coolidge Broadcasts

PRESIDENT COOLIDGE addressing members of the American Legion at the National Convention at Omaha, Neb. This speech was broadcast. Note the microphone at the right near Commander Drain of the American Legion.

Even the Dying Heard Schipa and Journet

The greatest volume of mail ever received at KGO from a single broadcast poured into the station as a result of the recent concert of Victor Artists, during which Tito Schipa and Marcel Journet, grand opera singers, and an orchestra selected from the personnel of the San Francisco Symphony, under the direction of Joseph Pasternack, gave an hour of music.

Before the concert was over telegrams from all over the United States, Canada, Alaska, Hawaii and Mexico were received. Letters at the rate of several hundred daily followed.

A Variegated Audience

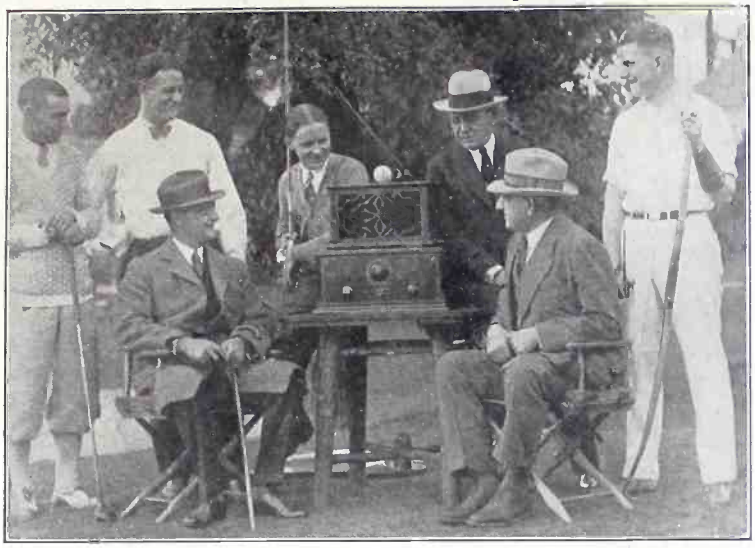
Never before in western musical history did so diverse a crowd listen to grand opera music as is shown in the mail. Thousands of sick, many of them for the last time, heard the golden voice of Schipa. Miners in the high Sierras, with their feet comfortably placed on ramshackle stoves, ranchers in the valleys, men, women and children of San Francisco Chinatown, and in five other great western centers of Chinese population; all listened to the epochal broadcast. Campers, forest rangers, lighthouse keepers, firemen in the boiler rooms of trans-Pacific liners, cannibals in islands of the South Seas, Eskimos in Alaska, all heard; and many are doing their best to applaud by mail now received daily.

Theatre Crowded

The San Francisco Municipal auditorium seating almost 7,000 people, was packed, and it is estimated that 3,000 were turned away, from the concert arranged to be heard over giant power radio loud speakers, the tone from two of which filled the monster building and brought forth storms of applause. The audience, seated in the darkness listening, and seeing nothing, was nevertheless conscious of the great heart of the artist, Schipa, when he sang "O Solo Mio," said a prominent San Francisco musician.

Hundreds of music stores, radio shops, garages and private homes up and down the Pacific Coast were packed with people, listening to the broadcast from speakers.

Radio Entertains Sportsmen



POPULAR sportsmen enjoy listening to the radio, before the golf game, it being played in an unusual style. That is each man used his own "weapon" and not a golf stick. The people in photo from left to right are: Leo Diegel (champion pro-golfer); Lou Gehrig (Yankee 1st baseman); Edw. Harkins (boy champion plug and surf caster); E. Blackman (judge and president of club), and Dr. Crouch (American archery champion). Seated front: Ralph Pulitzer and Dr. C. Simon (Deputy N. Y. Police Commissioner). (Foto Topics).

Song Publishers' Victory Upheld by Highest Court

The Supreme Court of the United States refused to review the decision in favor of Jerome H. Remick & Co., New York music publishers, against WLW, Cincinnati, wherein the publishers won a victory over the broadcasting of copyright music. The Supreme Court's action is tantamount to sustaining the decision of the lower appellate court.

The stake involved is the payment of royalties to the American Society of Composers, Authors and Publishers.

The Court of Appeals in Cincinnati had reversed the ruling of a lower Federal Court judge who had decided that broadcasting did not constitute a public performance and that, therefore, stations engaged in sending out music did not violate the copyright laws. The reversal by the first appellate court confirmed previous decisions won in the East by the society, which was able to prevent Bamberger & Co. in Newark and the General Electric Company from broadcasting without royalty payments.

The Court of Appeals, however, stayed its mandate against the Crosley corporation pending application to the United State Supreme Court, whose action will terminate the stay.

The society, as a result of a conference held last Summer and attended by Representative Sol Bloom, chairman of the House Committee on Patents, will present a new copyright bill at the next session of Congress which convenes in December. The Radio Manufacturers' Association, at its last convention, appointed a committee to attempt to iron out differences between the two groups over the proposed legislation.

The radio men may possibly effect some compromise with the society before Congress meets, but all other mechanical reproduction companies, with the exception of the Victor Talking Machine Co., have served notice that they intend to fight the bill.

The society, in the legislation it proposes, goes much farther than the mere insistence of payment for use, a right which was established by the Supreme Court's ruling. They now insist upon the composer's and author's right to bargain individually with all reproducing organizations.

Under the present copyright law a composer who has bargained with and sold to one reproducing company is then required to sell to all others at a certain fixed rate.

McCormack Eager to Sing For Radio Again—at Price

The much-repeated rumor that John McCormack, the tenor, would sing no more before the microphone was denied by him on his recent return from Europe. He is ready, willing and even eager to sing—for a price. "I am a business man," he said.

As he stepped off the gangplank of the Mauretania he told a RADIO WORLD reporter:

"I'm a business man. I never said that I would not sing over the radio. I will sing when they come to me with a business proposition."

Regarding the Atwater-Kent series of Sunday night operatic concerts from WEAF and allied stations, where even artists under contract with the Victor and Brunswick companies broadcast, as well as Metropolitan Opera House singers, he said:

"That's a step in the right direction."

McCormack said he was so delighted with the experience of singing in the first operatic concert broadcast last New Year's night over WEAF in conjunction with the Victor Company that he would be glad to sing again to a radio audience.

McCormack suggested that American broadcasting companies follow the British in obtaining revenue with which to pay the artists. He said that a tax was placed on every receiving set to raise the fund for talent broadcast. In that way the radio audience was asked to pay for its entertainment.

He remarked he was 50 and had no intention of retiring until he was 60.

Steinway Swells Ranks of Great Radio Concerts

Three great artistic broadcasting features are to run through the better part of the winter. Besides the Atwater-Kent hour every Sunday night from WEAF and allied stations, and the promised operatic and concert programs from WJZ, WGY and WRC, there will be a series through WJZ, etc., by Steinway & Sons. Josef Hofmann, pianist; Walter Damrosch, conductor, Mme. Ernestine Schumann-Heink, contralto, and Willem Mengelberg, conductor, will be heard. On October 27 (Tuesday). On that occasion Mengelberg, guest conductor of the Philharmonic Orchestra, will conduct the program. Hofmann will give a recital. A special festival hymn, composed by Mr. Mengelberg for orchestra and baritone solo, will be rendered for the first time in America. Fraser Gange will be the soloist.

Sunday night, Nov. 8, Walter Damrosch will be the pianist-conductor in a performance of the "Kreutzer Sonata" for piano and violin. Paul Kochanski will play the violin part.

Friday, December 4, Madame Schumann-Heink will be featured in a song recital.

In addition there will be interspersed during this period other concerts and recitals to be broadcast.

TOSCHA SEIDEL

On Sunday night, October 11, Toscha Seidel, violinist, was the feature of the Kent program at WEAF.

Broadcaster Sends S O S for a Change

WASHINGTON.

Generally when S. O. S. calls (signals of distress) are heard on the air, they come from ships at sea and broadcasting stations are required to keep silent. The situation was reversed one night recently when an S. O. S. call was sent out by WGBU, Fulford, Fla.

Fire of unknown origin broke out and the Alabama Hotel at Fulford was destroyed by fire. The only telephone in Fulford was enveloped in flames. A messenger rushed word to WGBU where Announcer Harold McCray sent out four appeals to radio fans to phone the fire department in Miami.

THE RADIO TRADE

Colin B. Kennedy Heads the Voice of St. Louis

ST. LOUIS.

Colin B. Kennedy, president of the Colin B. Kennedy Corporation, was elected president of the Voice of St. Louis, Inc., at a meeting of the stockholders of that organization, which has been formed to develop the new community radiocasting project. E. Lansing Ray, president of the "Globe-Democrat," was elected chairman of the Board of Directors, comprising Mr. Kennedy, Clifford Corneli, manager of the Schisler-Cornel Seed Company and representative of the Merchants Exchange; Spyros P. Skouras, president of Skouras Bros.' enterprises, and A. G. White, advertising manager of the Brown Shoe Company. Thomas P. Convey was named managing director.

COLIN B. KENNEDY

Kennedy, who was one of the original organizers of the new broadcasting project, has been identified with the radio industry for several years, not only as a manufacturer but also through his affiliation with national radio bodies. He is president of the St. Louis Radio Trades Association.

Corneli, as chairman of the special Radio Committee of the Merchants' Exchange of St. Louis, has been active in identifying that organization with The Voice of St. Louis project, in which the plan of broadcasting market reports has been one of the prime considerations.

Skouras represents the Skouras Bros.' enterprises and the permanent studio of the new project will be located in the New Ambassador Theatre Building when that structure is completed next year. The temporary studio will be located in the Mayfair Hotel.

White has been active in advertising work and civic affairs in St. Louis for several years.

Convey, who is general manager of the St. Louis Radio Trades Association, has been in charge of the development of the Voice of St. Louis organization, with offices at 737 Frisco Building.

Powerola a Batteryless 5-Tube Receiver

Powerola is electric radio without any batteries or chemicals whatever. It can be used universally, operating directly from the standard AC or DC lighting circuits in the home, office or place of business. By plugging into the house lighting socket, the tubes in the receiver are lit and the set is ready for tuning. It becomes another electric necessity like an electric iron, toaster, or other electrical device.

For alternating current, two rectifying bulbs (2 ampere), in connection with a transformer, condensers and choke in these circuits, enables the receiver to obliterate all power-line hums and noises, and to deliver the required voltages and watt power. For direct current a simple but practical arrangement is employed in connection with a choke, some condensers and resistances, and with the filaments of the tubes in series, which also smoothes out all generator hums and noises, and produces the needed constants and potentials.

There are no additional controls added on the rectifier or set to compensate a variation in voltage on the 110-volt supply, AC or DC. Powerola is designed for AC 100-115 volts, 40-60 cycles, and for DC 110-1120 volts.

Five standard tubes, such as the five or six volt 201A or 301A, and standard phones and loud speakers are employed.

The Terminal Electric Company is the manufacturer.

A Free Booklet

The Amsco Products, Inc., Broome and Lafayette Sts., N. Y. City, offer free to RADIO WORLD readers their booklet entitled "The Heart of the Hooking," discussing designs of great interest to radio experimenters.

Every article is discussed thoroughly, both electrically and mechanically. These discussions are presented in an interesting and simple manner and any novice can fully understand all that is printed.

MOHAWKS NOW DISTINGUISHED

To avoid any confusion between the business of Earl B. Rollinson conducted nuder the name of Mohawk Electric Mfg. Co., at 15 Kirk Place, Newark, N. J., and its own business, located at Diversey at Logan Boulevard, Chicago, the corporate name of the Mohawk Electric Corp. (Chicago) has been changed to Mohawk Corporation of Illinois.

Coming Events

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

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

OCT. 26 to 31—First Annual Rochester Times-Union Radio Exposition, Convention Hall, Rochester, N. Y. Write Howard H. Smith, care Times-Union.

NOV. 2 to 7—Radio Show, Toronto, Can., Canadian Expos. Co.

NOV. 3 to 8—Radio Trade Association Exposition, Arena Gardens, Detroit. Write Robt. J. Kirschner, chairman.

NOV. 7 to 14—Second Columbus Radio Show and Electrical Exposition. Write Lewis Hill, Dispatch, Columbus, O.

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

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

NEW CORPORATIONS

Rusonite Condenser Corp., N. Y. City, general merchandise, 200 common, no par; T. H. Foley, W. W. Hoover, M. E. Sparrow. (Atty., P. Freeman, 1482 Broadway, N. Y. City).

Duolone Radio Corp., Wilmington, Del., $150,000. (The Corp. of Wilmington, Del.).

I. H. Greene Hardware Co., N. Y. City, radio, $25,000; I. H. Greene and A. L. Orbach. (Atty's, Benjamin & Sholes, 159 Remsen St., Brooklyn, N. Y.).

Pine Tree Radio Corp., Brooklyn, N. Y., $10,000; J. Engler, H. H. Jackson, L. Ranko. (Atty., P. Jones, 38 Park Row, N. Y. City).

Tillman Radio Products Corp., Del., $300,000; Morris Goldberg, Max Loentahl, Brooklyn; Harry Sands, New York. (American Guaranty Trust Co.).

Solex Electric Co., N. Y. City, $20,000; A. Konoff, H. H. Reider, S. G. Lipschitz. (Atty., L. A. Jacobs, 805 Broadway, N. Y. City).

Commodore Radio Corp., N. Y. City, $5,000; S. Kasindorf, A. G. Sidelle, I. E. Kaplan. (Atty.,

Literature Wanted

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

Trade Service Editor,
RADIO WORLD,
145 West 45th St., N. Y. City.

I desire to receive radio literature.

Name .....

City or town.....

State .....

Are you a dealer?.....

If not who is your dealer?

His Name .....

His Address .....

Ralph Tuttle, 418-4th St., Clarkson, Wash. (Dealer.)
Ray Turley, Willow Lake, S. D. (Dealer.)
Mrs. A. C. Nelson, 804 Dewey St., Boulder, Col.
A. E. Mougey, 1001 N. Main St., Sidney, O. (Dealer.)
Turnell Radio Shop, 4242 Cottage Grove Ave., Chicago, Ill. (Dealer.)
O. R. Gorgenson, Bellingham, Wash.
Paul Truog, Kintnersville, Pa.
A. M. Forster, 992 Jefferson Ave., Buffalo, N. Y. (Dealer.)
J. Reynolds Gunn, Pittsburgh, Tex. (Dealer.)
Crescent Studio, Louisville, Ky. (Dealer.)
A. J. Smith, Jr., Anson, Tex. (Dealer.)
Frank E. Earley, Oklahoma City, Okla. (Dealer.)
Allen Whitmore, 340 W. 46th St., Los Angeles, Cal.
A. J. Buechl, Buffalo, N. Y. (Dealer.)
Fred Clode, Motor Route A, Millville, N. Y.
Gold Seal Radio Co., Cedar Rapids, Ia. (Dealers.)
P. Gillispie, 6011 Calumet Ave., Chicago, Ill.
G. Dislumback, W. Frankfort, Ill.
L. F. Bolbecker, Erhaut, Pa. (Dealer.)
Wells Motor and Radio Supply Co., 429 East 6th St., Tucson, Ariz. (Dealer.)
John J. Zimmerman, 405 Davis Ave., Arlington, N. J.
Harry A. Poling, Route 1, Sheffield, Ala.
Abery Radio, Hartford, Conn. (Dealer.)
Ivan Reaton, Oberlin, Kan.
William Hehemann, 1647 Cliff Ave., Cincinnati, Ohio.
W. L. Bickford, 116 Appleton St., Boston, Mass.
J. C. Dennis, Jr., 1065 Kossuth St., Bridgeport, Conn.

CLEAR, SIMPLE LANGUAGE DELIGHTS AMESBURY FAN

I have purchased at different times a copy of nearly every radio magazine I have seen on the newsstands. The trouble I find with most of them is that after a fan reads them (if he will) his mind is so muddled he is disgusted with radio. But with RADIO WORLD it is different. The language you use is so simple that it can be easily understood. I think it is the best magazine for a fan.

W. J. Mullally,
Amesbury, Mass.

Business Opportunities Radio and Electrical

10 cents a word. $1.00 Minimum.

RADIO PANEL ENGRAVING PLANT for sale; fully equipped; low rent; good location; $2,500 required. 237 Greenwich St., N. Y. C.

MACHINE SHOP, fully equipped, in Long Island City, with considerable idle machinery, would like to connect with buyer of small metal parts for filler work at cost. Will pay broker to connect. Box 10, RADIO WORLD.

RADIO PARTS manufacturing concern; great opportunity for man; $5,000; established customers of the entire United States and Canada; large profits; season starting. Box 100, RADIO WORLD.

RADIO

Wanted—Partner with $5,000 to join me in taking over plant fully equipped manufacturing radio sets, transformers, A and B battery eliminator and other parts; opportunity lifetime for any one waiting get into radio. Box 200, RADIO WORLD.

THE KEY TO THE AIR

(Continued from page 19)

WAMB, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12 M.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 10.
WBOQ, Richmond Hill, N. Y., 236 (EST)—3:30 PM to 6:30.
WBZ, Springfield, Mass., 333.1 (EST)—6 PM to 11:45.
WCAE, Pittsburgh, Pa., 461.3 (CST)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 11.
WCBD, Zion, Ill., 344.6 (CST)—8 PM to 10.
WCCO, St. Paul and Minneapolis, Minn., 416.4. (CST)—9:30 AM to 12 M; 1:30 PM to 4; 5:50 to 10.
WEAF, New York City, 492 (EST)—6:45 AM to 7:45; 11 to 12 M; 4 PM to 5; 6 to 12
WEAR, Cleveland, O., 390 (EST)—10:30 AM to 12:10 PM; 3:30 to 4:15; 7 to 11.
WEEI, Boston, Mass., 467 (EST)—6:45 AM to 7:45; 1 PM to 2; 2:30 to 10.
WFAA, Dallas, Texas, 475.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30; 11 to 1 AM.
WFBH, New York City, 272.6 (EST)—2 PM to 7:30.
WGBS, New York City, 316 (EST)—10 AM to 11; 1:30 PM to 4; 6 to 10:30.
WGCP, New York City, 316 (EST)—2:30 PM to 5:15.
WGES, Chicago, Ill., 250 (CST)—5 PM to 8; 10:30 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 11:30; 6 PM to 7:15; 8:30 to 11.
WGR, Buffalo, N. Y., 319 (EST)—12 M to 12:45 PM; 2 to 4; 7:30 to 11.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8 to 10.
WHAR, Atlantic City, N. J., 275 (EST)—2 PM to 3; 7:30 to 10.
WHAS, Louisville, Ky., 399.6 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (EST)—2:15 PM to 5; 7:30 to 11; 11:30 to 12:30 AM.
WHO, Des Moines, Iowa, 526 (CST)—7:30 PM to 9; 11 to 12.
WHT, Chicago, Ill., 400 (CST)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WJY, New York City, 405 (EST)—7:30 PM to 11:30.
WJZ, New York City, 455 (EST)—10 AM to 11; 1 PM to 2; 4 to 6; 7 to 12 M.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 12:30; 2 to 3; 4:30 to 6; 8:30 to 9.
WLW, Cincinnati, O., 422.3 (EST)—10:40 AM to 12:15 PM; 1:30 to 5; 6 to 8; 10 to 11.
WMAK, Lockport, N. Y., 265.5 (EST)—11 PM to 1 AM.
WMCA, New York City, 341 (EST)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (EST)—3:15 PM to 4:15; 6:50 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1:30; 5:45 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 AM to 2 PM; 3 to 3:30; 4 to 7:10; 8 to 9.
WOR, Newark, N. J., 405 (EST)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7.
WPG, Atlantic City, N. J., 299.8 (EST)—7 PM to 11.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—1 PM to 2; 4 to 6:30.
WREO, Lansing, Michigan, 285.5 (EST)—8:15 PM to 9:45; 10 to 11.
WRNY, New York City, 258.5 (EST)—11:59 AM to 2 PM; 7:39 to 10.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 8 to 9.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30; 3 to 4; 6 to 7; 8 to 9.
KDKA, Pittsburgh, Pa., 309 (EST)—9:45 AM to 12:15 PM; 2:30 to 3:30; 5:30 to 10:15.
KFAE, State College of Washington, 348.6 (PST)—7:30 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 to 1:15 PM; 3 to 4; 6:30 to 10.
KGO, Oakland, Cal., 361.2 (PST)—11:30 AM to 1 PM; 1:30 to 3; 4 to 6:45; 7:15 to 10.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 11.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 3:20; 5:30 to 11:30.
KJR, Seattle, Wash., 484.4 (PST)—9 AM to 1 AM.
KNX, Hollywood, Cal., 337 (PST)—11 AM to 12:05 PM; 4 to 5; 6 to 12.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 9.
KPO, San Francisco, Cal., 429 (PST)—7 AM to 8; 10:30 to 12 M; 1 PM to 2; 3:30 to 11.
KSD, St. Louis, Mo., 595.1 (CST)—7:30 PM to 9.
CNRA, Calgary, Alberta, Canada, 435.8 (MST)—9 PM to 11.

DX Work on Diamond Praised by Jerseyite

DIAMOND EDITOR:

Having had the opportunity and likewise the pleasure of speaking to your Mr. Bernard in person while at the radio show in the Grand Central Palace I mentioned that I received two Chicago stations on the loud speaker on his Diamond of the Air.

After I reached home again I tried to tune in those Chicago stations, and to my surprise in spite of the terrible static they came in on the loud speaker again.

I then tried for more stations, and just think, besides the two stations WBBM and WOK, mentioned before, I succeeded in getting also WENR, WEBH and WIBO on the speaker.

There was also a station whose call letters I could not get right on account of the static (it sounded to me like WHB or something similar), also Chicago, which has a wavelength a little less than WOR, and which at times was very loud and then faded away.

PHILIP WELLHAUSEN,
346 Livingston St.,
Elizabeth, N. J.

Fixed Condenser Mistakes Pointed Out by Andersen

(*Continued from page* 11)

But this is done without regard for quality. The reason a by-pass condenser connected across an audio-frequency device should not be any larger than absolutely necessary is that it not only by-passes the high frequency it is intended to do, but also the higher frequencies in the audio signal. This introduces distortion, and if the condenser is too large the distortion becomes serious. The effect is a general lowering of the tone of the signal, and particularly it makes it difficult to distinguish between such sounds as s, z, v, f, and other sibilants and fricatives in the sound as reproduced in the speaker. It does not matter where in the circuit a condenser is, so long as it is across an audio-frequency device the effect will be the same, and it is cumulative. The more by-pass condensers the greater will be the effect. A practical result of this distortion is that one often fails to understand a speaker without a great deal of straining. It may not affect music to the same extent because those frequencies lie above the fundamental frequencies of even the highest pitched sounds occurring in music, yet it does affect the overtones and hence the timbre of the music.

A Double Purpose

Fixed condensers across batteries, if used at all, should be as large as practicable. The greater their capacity the better they perform their work. They are used for two purposes, namely, to prevent any alternating current from entering the batteries and to prevent any irregularities in the battery voltage to be transmitted to the tubes. The first is merely to reduce the common impedance of all the circuits, since a condenser of large capacity has a much lower impedance than the resistance of the batteries The second is to minimize as far as possible the noise which will result from irregular voltage supply. This refers with particular emphasis to the plate battery. Condenser C1, Fig. 4, illustrates the use of a large by-pass condenser across the plate battery.

Filter Condensers

Fixed condensers are also used in intermediate frequency filter transformers as illustrated in Fig. 4, by the condensers across the secondaries of transformers T1 and T2 and by C3. These are essentially tuning condensers and should, therefore, be of a good grade. Their capacity of course depends on the desired intermediate frequency and on the inductances across which they are connected. The values are determined in the same manner as the required maximum capacity of a tuning condenser in the tuner for a given coil.

Neutralizing Condensers

Fixed condensers of very small capacity are also used in circuits employing some form of capacity neutralization, as for instance the neutrodyne (Fig. 5). These condensers must be very small, since they must be of the same order of magnitude as the capacity between the grid and the plate of the tube. This is about 10 micro-microfarads. The correct value of course also depends on the manner in which it is connected. If it is connected between the grid and to a point on the secondary of the transformer following the tube which makes the inductance of the primary and that part of the secondary which

is below the point, then the neutralizing condenser should be the same size as the capacity between the grid and the plate. Of course it can only be found by experiment. A neutralizing condenser having an air dielectric is the best, but most of those that are obtainable have glass for a dielectric.

Nothing Equals Diamond, Fan's Verdict After Tests

DIAMOND EDITOR:

I have just completed the Diamond and have not heard anything that will equal it. I have built several sets, including the Superdyne, but none of them came up to the Diamond. The tonal quality, volume and selectivity are exceptionally good.

The first night I tried it I tuned in eighteen stations: WHAT, WBBM, KOIL, WMBB, WHT, WOS, KDKA, WLS, WCCO, WTAS, KOA, WEBH, WHO, WHAD, KTHS, WJJD, WCEE and WSAI. I have had dozens of them since that. All these stations come in on the speaker regardless of static. I am using home-made coils, basket weave tickler and diamond-weave RFT with a variable primary. The audio circuit consists of three stages of resistance coupled amplification using 96 volts. 120 on plate of last tube. The volume from this combination is tremendous.

I am pleased with this circuit and thank Hermand Bernard for this masterpiece. Will send pictures as soon as I get my cabinet dressed up. I am a constant reader of RADIO WORLD.

ROY J. SMITH,
925 Eighth Ave., So.,
St. Cloud, Minn.

Surprise of His Life Enjoyed by Engineer

DIAMOND EDITOR:

I promised myself not to be surprised at anything in radio. I've built twenty-seven sets of various kinds and out of curiosity hooked up The Diamond and I received the surprise of my life. I wasn't expecting very much, because it was hastily thrown together just to get an idea of what it would do in selectivity, distance and quality. I got all three. WTAM was on during this "fishing" test and this is a powerful station about 15 miles away. I got through them for Troy, which is only 10 meters apart, and that without interference.

Following is a list of stations received on loud speaker between 9 and 11 p. m. one night: WBZ, Boston; WEAF, New York; KDKA, Pittsburgh; WTAM, Cleveland; WJR, (WCX) Detroit; WSB, Atlanta; WSMB, New Orleans; WHAD, Milwaukee; WPG, Atlantic City; WTAS, Elgin; WJRC, Cincinnati; WCAE, Pittsburgh; WCAP, Washington; WREO, Lansing; KFKX, Hastings; WSAI, Cincinnati; WHAZ, Troy; WLW, Cincinnati; WOS, Jefferson City; WCBD, Zion City.

While this is not a new circuit I am sure your magazine, which I read religiously, deserves a great deal of credit for bringing it to public notice in such an effective way.

I appreciate having a set that has real DX powers, selectivity and excellent quality.

E. A. FISHER,
City Engineer,
City of Lakewood, O.

Diver on North Sea Floor Broadcasts What He Sees

HELIGOLAND, GERMANY.

The recent experience of WIP, Philadelphia, broadcasting from under water at Atlantic City, was repeated by a German station with fine success. A diver, on the floor of the North Sea, spoke into a microphone and thousands listened.

All Hamburg, 100 miles away, listened to the diver's description of the sea floor.

NEW MAIL ORDER DEPARTMENT

The Rix Radio Supply House, 5505 Fourth Avenue, Brooklyn, N. Y., has added a mail order department for the benefit of their out-of-town customers. They will carry only standard parts, supplies and sets and will cheerfully refund on any unsatisfactory transaction. They make it a practice to fill orders the same day they are received.

How to Make the Coils for the 3-in-1 Receiver

(*Continued from page 4*)

that way. The diametrical opposition facilitates connections later.

The primaries consist of 15 turns each and are put on in the same fashion, not in the center of the form but nearer one end, and with terminals on the same axial the inside, so that the head will stick plane.

See that all windings are in the same direction.

THE PANEL VIEW of the 3-in-1 RF Receiver.

The Insertion Process

Now take a secondary form. Drill a 3/16" hole, or one about that size, ½" away from the nearer pinhole of a secondary terminal. Insert a 3/16" screw, about ⅜" long, round or flathead, with lug next to head and with the head on into the air space inside the form, known as the core. Pick up the wire terminal that is close by, scrape off all the insulation for ½" lengths, wind two turns of the wire around the screw, tighten the wire with tension applied by pliers, and screw down a hexagonal nut firmly against the lug. Snip off the excess wire, that is, the slight length dangling on the screw. Repeat the aforesaid operations for the other terminal of the secondary. Then solder each of the two joints separately (not together, of course). The soldering will be very important, for it will insure excellent electrical contact for screw, nut, lug and wire. Try to do the soldering so that the four elements are united. This is harder than it sounds. It is safe to omit attempting to solder to the screw itself, as the contact it makes with the nut is an excellent pressure one, and soldering scarcely can improve it.

Primary Distinctions

As for the primary, a little different procedure is necessary, as follows: (1) two holes are drilled for the screw insertion 1" apart, ⅜" from the circumference, at that line nearer the winding; (2) the screws are inserted in opposite fashion than that employed on the secondary, i.e., with heads on the outside and shanks, nuts and lugs in the core; (3) one of the holes will be ½" from the beginning of the winding, and the other hole will be determined by its position respect to the previous one, regardless of where the other primary wire terminal is.

The wire having been threaded through the pinholes it is turned through one hole

"HOW TO MAKE—"

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

Sept. 27— A 1-Tube No Crystal Reflex.

Dec. 13—The World's Simplest Tube Set, by Lieut. P. V. O'Rourke.

Dec. 20—A 1-Tube DX Wonder, Rich in Tone, by Herman Bernard. An Interchangeable Detector, by Chas. M. White.

Dec. 27—A 2-Tube Variometer Set, by Lieut. P. V. O'Rourke. Gelula's Super Flex.

Jan. 3, 1925—A 3-Tube Portable That Needs No Outdoor Aerial, by Abner J. Gelula.

Jan. 17—A $25 1-Tube DX Wonder, by Abner J. Gelula.

Jan. 24—A Selective $15 Crystal Set, by Brewster Lee. A Variometer-Tuned Reflex, by Abner J. Gelula. An $18 1-Tube DX Circuit for the Beginner, by Feodor Rofpatkin.

Jan. 31—A Regenerative Neutrodyne for More DX, by Abner J. Gelula. A Transcontinental 2-Tube Set, by H. E. Wright. An Experimental Reflex, by Lieut. P. V. O'Rourke.

Feb. 21—A 1-Tube Reflex for the Novice, by Feodor Rofpatkin. A Set for Professional Folk, by Lieut. P. V. O'Rourke. A Honeycomb Crystal Receiver, by Raymond B. Welles.

Feb. 28—A Set That Does the Most Possible, With 6 Tubes, by Thomas W. Benson. Three Resistance Stages of AF on the 3-Circuit Tuner, by Albert Edwin Sonn.

March 14—The Reflexed 3-Circuit Tuner That You Can Log, by Herman Bernard. The Right Way to Put Coils and Condensers in a Set, by Byrt C. Caldwell.

March 21—A Variable Leak, by Herbert E. Hayden. A 4-Tube, 3-Control Set That Gets the Most DX, by Lieut. P. V. O'Rourke.

April 18—The Diamond of the Air (Part 2), by Herman Bernard. The 7-Tube Pressley Super-Heterodyne (Part 1), by Thomas W. Benson. An Easy D Coil, by Jack Norwood.

May 2—The Twinplex, by J. E. Anderson.

May 9—A Set to Cut Static, by Feodor Rofpatkin. Toroid Circuit with Resistance AF, by E. I. Sidney. A Push-Pull AF Amplifier, by Lt. Peter V. O'Rourke.

June 6—The Smokestack Portable, by Neal Fitzalan. A and B Battery Eliminators, Using DC (Part 1), by P. E. Edelman. A Wavemeter, by Lewis Winner. Full List Broadcasting Stations.

June 13—Simple Short-Wave Circuits, by Herbert E. Hayden. A Simple Push-Pull Rheostat, by A. C. G. Force. A and B Battery Eliminators, Using AC (Part 2), by P. E. Edelman. A Portable Super-Heterodyne, by Wainwright Astor.

June 20—The Diamond as a Reflex, by Herman Bernard. A 2-Tube Portable Reflex, by Herbert E. Hayden. A Reflex for 99 Type Tubes, by L. H. Barbley.

June 27—The Pocketbook Portable, by Burton Lindheim. The Power House Set, by John L. Munson. Lesson on Learning the Code.

July 4—The Handsome Portable, by Herbert E. Hayden. The Freedom Reflex, by Capt. P. V. O'Rourke. 8-Tube Super-Heterodyne, by Abner J. Gelula.

July 11—The Baby "Super," by J. E. Anderson. A 1-Dial Portable Receiver, by Capt. P. V. O'Rourke.

July 18—Anderson's 6-Tube Super-Heterodyne. The 3-Tube Marconi Receiver, by Percy Warren. A Good Battery Connector, by Herbert E. Hayden.

Aug. 1—Enormous Volume on DX Stations, by Sidney E. Finkelstein. The Metropolitan Local Set, by J. E. Anderson. 4-Tube DX Divided Circuit, by Herbert E. Hayden. Series and Parallel Effects, by Herman Bernard.

Aug. 8—The Evolution Reflex, by Capt. P. V. O'Rourke. The Midget—A 3-Tube Set in Sewing Machine Cabinet, by Herbert E. Hayden. How to Build Your First Set, by Herman Bernard. 2-Year-Old Wins DX Stake, by Lewis Winner.

Aug. 15—A 2-Tube Speaker Reflex, by Brewster Lee. Capt. P. V. O'Rourke's Favorite Audio Amplifier. A Set That Takes Ingenuity, by Lewis Winner. The Loop Jack in The Diamond, by Herman Bernard.

Aug. 22—The 5-Tube Diamond, by Sidney E. Finkelstein. A Home-Made Toroidal Coil, by George B. Hostetter. The Electrostatic Regenerator, by Percy Warren. Crystal Sets That You Can Log, by Herman Bernard.

Aug. 29—The 1-Dial Powertone, by Herman Bernard. A Set a Baby Can Build, by Herbert E. Hayden. A Fine Meter Switchboard, by Lewis Winner. A Powerful 1-Tube Set, by Percy Warren.

Sept. 5—The Loop Model Powertone, by Herman Bernard. A 5-Tube Geared Receiver, by Lewis Winner. The UX120 Model Diamond, by Capt. P. V. O'Rourke.

Sept. 12—The 1926 Model Diamond of the Air, (Part 1), by Herman Bernard. An Oscillating Wavemeter, by J. E. Anderson. A 25-to-110 Meter Receiver, by Sidney E. Finkelstein.

Sept. 19—Diamond of the Air (Part 2), by Herman Bernard. A 1-Dial, 2-Tube Speaker Set, by Percy Warren. A Tube B Battery Eliminator, by Lewis Winner. A Home-Made Volume Control, by Herbert E. Hayden.

Sept. 26—The 8-Tube Super-Heterodyne, by Sidney E. Finkelstein. Diamond of the Air (Part 3), by Herman Bernard. The 5-Tube Browning-Drake, by Capt. P. V. O'Rourke. A 1-Control Regenerative Set, by Percy Warren.

Oct. 3—The Thordarson-Wade Set (Part 1), by Herman Bernard. A Fixed Grid Leak, by Herbert E. Hayden. Trouble Shooting for Diamond of the Air.

Oct. 10—Hookups for the Short Waves, by Percy Warren. The 3-Tube, 3-Circuit Tuner, by Capt. P. V. O'Rourke. The DX Set That Thrilled Jack, by Lewis Winner. The Thordarson-Wade Set (Part 2), by Herman Bernard.

Oct. 17—The Thoroughbred (1-Tube DX Set), by Herbert Hayden. O'Rourke's Favorite SW Set, by Capt. Peter V. O'Rourke. The Thordarson-Wade Set (Part 3), by Herman Bernard. Trouble Shooting Article.

Any copy, 15c. Any 7 copies, $1.00. All these 34 copies for $4.75, or start subscription with any issue. Radio World, 145 West 45th Street, New York City.

once again to come out through the core, is carried to the screw, twisted around, the nut is tightened over the wrapped wire, and the soldering is done. The photographs confirm these directions.

The Directional Goal

It is important to insert the primary inside the secondary so that the windings are in the same direction, because the polarity question as affecting winding terminals is based on the assumption of unidirectional winding.

You may wind two coils in the same direction, but if you put them in inductive relationship so that the beginning of one is nearer the end of the other, then the same effect is obtained as if the two windings were in opposite directions. It is very easy to determine the direction, even if you have put aside one coil just wound, and made another without any attention to how the previous winding was made. Even if by mistake you wound them in opposite directions, by correctly placing one coil inside the other the same effect exactly may be gained by the method of insertion. Take any given coil. Take either terminal thereof. See the direction in which it points. Call that the beginning. Look at the other terminal. That necessarily points in the opposite direction on the same perpendicular plane. To clarify discerning this, regard the end of the wire as the point of an arrow. Now take either terminal and consider that the beginning, the other the end. If you take a terminal of the other coil, so that that points in the same direction as the beginning of the first coil, and insert the second coil inside the first one, so that both unidirectional terminals are near each other, you will achieve the desired goal.

Point of Possible Confusion

One point of possible confusion arises because the secondary has a fractional turn. Diametrically opposite terminals point in the same physical direction, but let your imagination carry the wire around the extra half turn and you will be guided right.

The Mounting Hole

Now, the primary inserted in the secondary, drill a hole through both forms, 3/8" from the circumference, opposite where the primary lugs stick out. Regard these lugs as one side and determine the position for the single hole through both forms by putting it on the diameter would leave the primary nut holes on the right-hand side, say, the new hole on the central diameter, with the right-hand side unidentified. This new hole, through both forms, is for another screw and nut, which will be used to fasten an angle iron to the subpanel.

As all three coils, L1L2, L3L4 and L5L6, must be made alike, be careful to count the turns. Confirm this by checking and rechecking.

[Part II, the conclusion of Sidney E. Finkelstein's article on the construction of the 3-in-1 RF Receiver, will be published in next week's issue of RADIO WORLD, *dated October 31.]*

RECENT BACK NUMBERS of RADIO WORLD, 15c each. RADIO WORLD, 145 West 45th Street, New York City.

FILL OUT AND MAIL NOW

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD *145 West 45th St., New York City*

Please send me RADIO WORLD for.....months, for which please find enclosed $.....

SUBSCRIPTION RATES:
Single Copy.....$ .15
Three Months..... 1.50
Six Months..... 3.00
One Year, 52 Issues..... 6.00
Add $1.00 a Year for Foreign Postage; 50c for Canadian Postage.

RESULTS EDITOR:

The writer, who has been buying your magazine regularly from the newsstand for at least a year, has noted the correspondence you have had with different subscribers concerning the "Reflex for the Novice" (Feb. 21 issue).

Might say that I have been experimenting and building sets for the past four or five years from Crystal sets to Super-Hets and in fact have built three of the Reflex sets referred to. I am going to go on record whether it means anything or not to you by saying that this Reflex is about the sweetest set that I have ever built. Stations all over the country come in with a bang and I have no difficulty whatsoever in separating and bringing in anything within 1,000 miles.

I had practically the same result with two other sets made from the same circuit. The fellow who has the courage to knock the circuit, in my opinion, had better go back about six years and try and build a crystal set

I subscribe to four radio magazines and purchase practically every issue of every magazine that is published and I frankly state that I consider your magazine the best that is put before the public.

H. A. WOODCOCK, Sec'y.,
Arthur F. Houts & Co., Inc.,
80 Maiden Lane, N. Y. C.

* * *

RESULTS EDITOR:

One day I got your magazine. I read it from A to Z, inquired from some advertisers which duly answered me and also sent me their goods.

Then I built a set you described and after a few days I was hearing WOC. Certainly that Davenport station came in fine and clear, full of dreamy music, and with volume enough to fill up all the room. The distance is 2,600 miles and across the sea of static that divides our countries. It was through your Superdyne, a picture of which I am enclosing herewith.

I am now a subscriber to your magazine.

AMANDO CESPEDES MARIN,
Heredia, Costa Rica, A. C.

* * *

RESULTS EDITOR:

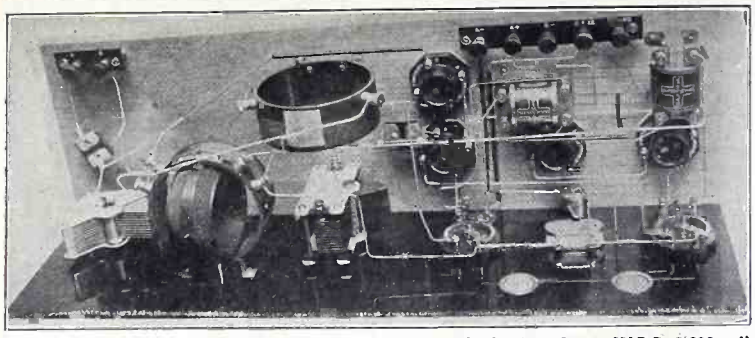
I just completed the Midget (August 8 issue) and added one more stage of transformer-coupled amplification and DX and selectivity is great. I get WWJ, WGY, WSAI, WGN, CNRO and all stations on the speaker within 1,000 miles loud enough to hear it a block away. I am very much satisfied with my set.

In closing, I wish to extend my congratulations to Herbert E. Hayden and to RADIO WORLD.

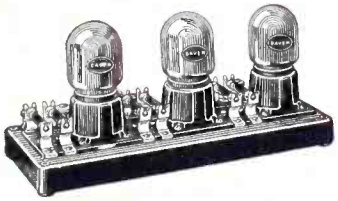
HAROLD FRIEDMAN, 812 Market St.
Chattanooga, Tenn.

RESULTS

Readers report on their experiences with sets built from hookups published in RADIO WORLD. *Address Results Editor,* RADIO WORLD, 145 *West 45th Street, New York City, and send photographs of sets, if possible.*



THE SET A. C. Marin, of Costa Rica, built, and which brought in WOC, 2,600 miles away, on the speaker. See his letter on opposite page.



Listeners Hear Plane As WNYC Rebroadcasts

Successful rebroadcasting between an airplane and a radio land station was put on the air by army bomber AB-6 and WNYC, the municipal broadcasting station, New York City.

The broadcasting station established an outpost at the Mall, Central Park, where a special receiving set and remote control microphone were installed. The bomber, escorted by four others flying in formation, left Mitchel Field at 7 o'clock and its radio signals were immediately picked up by the operators at the Park. At 7:35 P. M., the appointed hour for the demonstration, WNYC called the plane, and Lieutenant Wolff, the observer, replied immediately on wavelength of 430 meters.

Thomas H. Cowan, broadcasting supervisor of WNYC, was heard as he spoke to Lieutenant Wolff and replies from the plane were picked up at the Park and also broadcast from the land station, thus permitting all listeners to hear both sides of the conversation on the same wavelength.

Station WFLA to Open in Florida Nov. 1

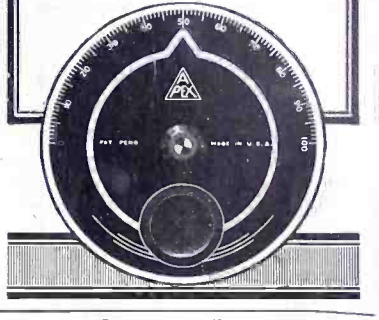
November 1 will see the advent of one of the largest broadcasting stations in the South, erected at Boca Raton, Florida, by the Mizner Development Corporation. The station is being built under the supervision of George Sheffield of New York. Its call letters will be WFLA.

Broadcasting with an output power between 1,000 and 2,500 watts, its broadcast feature will be outstanding events from Palm Beach and other towns nearby.

MORE POWER TO WLS

WASHINGTON.

The Department of Commerce has authorized WLS, Sears Rosebuck Company, Chicago, to increase its power from 500 to 1,500 watts.



Removes Horn From Set; Gets Music Just the Same

WASHINGTON.

Another queer freak in radio has been reported from Paterson, N. J. William Botbyl, an engineer, was trying out a new speaker recently. In adjusting it he detached the horn from the set. To his amazement, the music continued. The horn was removed to the next room, but still the music continued. Experts of the neighborhood were called in, but no explanation could be offered. The set was a home-made affair.

Five New Stations

WASHINGTON.

Five new class A stations have just been licensed by the Department of Commerce, while one station has been transferred from class A to B. The transferred station was WGHP, owned by George Harrison Phelps, Inc., of Detroit. WGHP will continue to operate on 270 meters but has increased its power from 500 to 1500 watts.

The new class A stations follow:

Station	Owner	Location	M.	W.
KFXY	Mary M. Costigan,	Flagstaff, Ariz.	205.4	50
WJBK	Ernest F. Goodwin,	Ypsilanti, Mich.	233	10
KFJZ	Southwestern Baptist Theological Seminary,	Fort Worth, Texas	254	50
WJBN	St. John's Ev. Lutheran Church,	Sycamore, Ill.	256	10
WTAG	Worcester Telegram Publishing Co.,	Worcester, Mass.	268	500

TRANSFER FROM CLASS A TO CLASS B

WGHP	George Harrison	Phelps, Inc., Detroit, Mich.	270	1500

1925 BACK NUMBERS OF RADIO WORLD WANTED: Mail us copies of any of the following 1925 issues of RADIO WORLD, and we will send you a copy of a current issue for every copy sent us: January 10, February 7, March 21, 28; April 4, 11; May 30, 1925.

LISTEN IN every Friday at 7 P. M. and hear Herman Bernard, managing editor of RADIO WORLD, discuss "Your Radio Problem," from WGBS, Gimbel Bros., New York City, 315.6 meters.

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS.

10 CENTS A WORD. 10 WORDS MINIMUM.

3 TRIPLE TESTED SILVERED DETECTOR Amplifier WW-201-A Tubes, with Standard Base, for $4.25, or $1.50 each. Guaranteed. Williams Distributing Co., 4301 Third St., Louisville, Ky.

DINING AND SLEEPING CAR CONDUCTORS (White). Exp. unnecessary. We train you. Send for book of Rules and application. Supt. Railway Exchange, Sta. C, Los Angeles.

PATENTS—Write for free Guide Books and "Record of Invention Blank" before disclosing inventions. Send model or sketch of your invention for our Inspection and Instructions Free. Terms reasonable. Radio, Chemical, Mechanical, Electrical and Trademark experts. Victor J. Evans & Co., 924 Ninth, Washington, D. C.

HOOK-UPS—A lot of them, some of which are sure to suit your purpose, appeared in RADIO WORLD dated August 15. 15c a copy, or start your subscription with that number. RADIO WORLD, 145 West 45th St., N. Y. City.

HOW TO BECOME AN AMATEUR OPERATOR—A comprehensive, illustrated article appeared in issue of June 27, 1925. 15c per copy, or start your subscription with this number RADIO WORLD, 145 West 45th St., N. Y. C.

"LIBERTY AFLAME" and other patriotic verses. By Roland Burke Hennessy. In cloth, $1.00. Columbia Print, 145 West 45th St., N. Y. C.

HAVE YOU ANYTHING TO SELL OR EXCHANGE? Use RADIO WORLD'S Classified Department and get great results. 10c a word. RADIO WORLD, 145 West 45th St., N. Y.

A 1-CONTROL PORTABLE, by Capt. P. V. O'Rourke; A Baby Super-Heterodyne, only 4 Tubes, by J. E. Anderson; A More Powerful Diamond, Still only 4 Tubes, by Herman Bernard. Other features in RADIO WORLD, dated July 11, 1925, 15c a copy, or start your subscription with that number. RADIO WORLD, 145 West 45th St., N. Y. C.

HOW TO BUILD THE POWERTONE, 1 dial, 5 tubes, described in RADIO WORLD, issues of Aug. 29 and Sept. 5. Powertone Trouble-shooting, Sept. 12. Send 45c for all three. Special diagrams and "blueprint in black" included among the many illustrations. RADIO WORLD, 145 West 45th St., N. Y. C.

HOOK-UPS!—A lot of them, some of which are sure to suit your purpose, appeared in RADIO WORLD dated Aug. 15. 15c a copy, or start your subscription with that number. RADIO WORLD, 145 West 45th St., N. Y. C.

PULLMAN CONDUCTORS, PORTERS. Men wishing such positions can easily qualify, information free. Supt., 123C, Railway Exchange, Kansas City.

COMPLETE LIST OF BROADCASTING STATIONS appeared in RADIO WORLD dated Oct. 3, 1925. 15c per copy, or start your subscription with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

HAVE YOU BEEN AWAY?—Have you missed any of the summer copies of RADIO WORLD. We can supply you with any copies of RADIO WORLD published during the summer at our regular price of 15c per copy, or any seven copies for $1.00, or start your subscription with any number. NEWSDEALERS: We will fill your orders for back numbers at regular wholesale price. RADIO WORLD, 145 West 45th St., N. Y. City.

ANDERSON'S 6-TUBE SUPER-HETERODYNE, by J. E. Anderson; the 3-Tube Marconi Broadcast Receiver, by Percy Warren; How to Make a Good Battery Connector; other features in RADIO WORLD, July 18, 1925. 15c a copy, or start your subscription with that number. RADIO WORLD, 145 West 45th St., N. Y. C.

Coast to Coast

The North American Bretwood Co.,
New York City

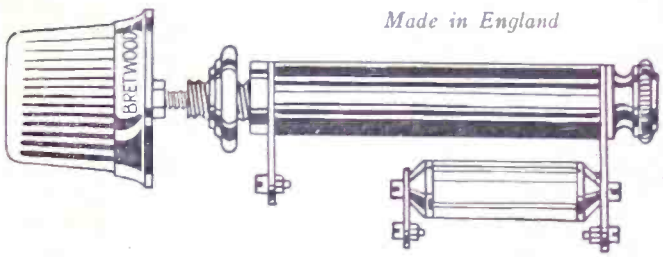
Gentlemen:

I have purchased the Bretwood Variable Grid Leak and it brings in all the West Coast Stations on my Pressley. No other leak has made this accomplishment possible.

(Signed) J. C. Salzgiver
Harrisburg, Penna.

For Bretwood Variable Grid Leak Alone. Send 50c extra if Condenser-Leak Unit is desired.

Made in England



Guaranteed Precision Range, ⅛ to 10 meg.

IF distance is your goal the Bretwood Variable Grid Leak is the Magic Means of Achieving it. And the Bretwood Low-Loss Grid Condenser—50c extra—increases the detector tube's sensitivity.

North American Bretwood Co., 145 W. 45th St., New York City:—Enclosed find $2.00. Send one Bretwood Variable Grid Leak-Condenser Unit, prepaid, on 10-day money-back guarantee.

Name .....

Street .....

City ..... State.....

North American Bretwood Co.

Telephone: Bryant 0558

145 West 45th Street New York City

Members of the Trade, Write for Particulars.

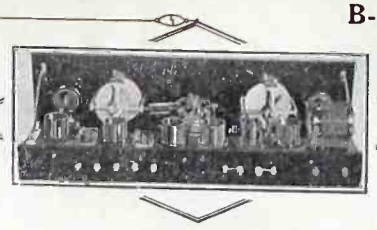
B-C-L

Herman Bernard

Build the 1926 Model Diamond of the Air

Using parts certified by Herman Bernard, who described the construction of this wonderful set in RADIO WORLD.

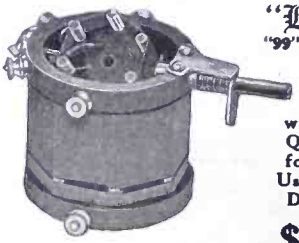
B-C-L



Complete Kit, including Drilled and Engraved Panel, Bretwood Variable Grid Leak, Bruno Coils, and General Instrument (G-I) Variable Condensers.

$37.50

Same Kit, but with Bruno Condensers $39.50



"Bruno"
"99" 3-circuit tuner

wound on Quartzite for .0005. Used in the Diamond.

$5.50

"Bruno"
"55"

Matched radio-frequency coil for use with the "99." Wound on Quartzite for tuning with a .0005 mfd. condenser.

Strictly low-loss and typifying highest efficiency **$3.00**

"Bruno"
"77" 3-circuit tuner with pancake tickler. For .0005.

$5.50

General Instrument (G-1) No-Loss Variable Condensers, Pyrex or Isolantite, all capacities **$2.95**
Geared Vernier, with dial, $1 extra

COMPLETE KIT for Herman Bernard's 1-Tube DX Set with SLF Condensers **$7.75**

Betts & Betts Loop, Collapsible Type. Very selective. Wound with stranded wire **$2.25**

The Weekly Catalogue of Guaranteed Parts and Kits

COMPLETE KITS

Haydee's Thoroughbred (without cabinet)	$7.50
8-Tube Raola Reflex	24.80
"Bruno 77" 3-Tube DX	19.80
Ambassador 8-Tube	17.80
Roberts' Knockout	33.50
Browning-Drake	32.45
Bernard Audio Amplifier	10.50
Freshman Kit, coils and condensers	7.50
Thordarson-Wade	41.50

VARIABLE CONDENSERS

Bruno 8-section (three .00025 tuned by one motion)	$5.95
.0005 mfd. Preferred	1.75
Hammarland, 43 pl. vernier	2.95
Manhattan low-loss, .0005 vern.	2.75
U. S. Tool .00025, .0005, .0005, all vernier	1.95
Wade .0005, $8; .00025	7.75
Amsco Allocating SLF .00035	3.75
Amsco Allocating SLF .0005	3.95
Heath Radiant, vernier, all cap.	1.95
King Cardwell, all cap.	2.95
Sleeve Type Neutralizing Condenser	.25
Continental Midget	1.00

SOCKETS

5-Gang Shelf for 1926 Model	$2.50
4-Gang Shelf	2.00
3-Gang Shelf	1.50
Panel Mount, Triple	75c
Federal	65c
Bell, Standard Navy and 99	45c
UX Adapters (Na-ald)	35c

AUDIO TRANSFORMERS

Thordarson Autoformer	$4.25
Federal 65, 65A	3.75
Erla 3-to-1, 6-to-1	3.50
Thordarson 2-to-1	3.50
Thordarson 6-to-1	3.10
Thordarson 3-to-1	2.95
Jeffersen Star 6-to-1	2.10
Jeffersen Star 3-to-1	1.85
Rauland Lyrle	6.95
Crescent 6-to-1, 3-to-1	2.25
Acme 4½-to-1, A2	2.50
All-American 10-to-1	3.75
Amertran 5-to-1 and 3-to-1	3.85
DeForest 5-to-1	3.95

COILS

"Bruno 66" 3-circuit Tuner	$2.25
"Bruno" Filter	2.25
Claretuner	3.50
Erla Balloon Ciroleid (toroid)	3.65
Bruno Coils for Roberts' Knockout	9.00
Yankee 3-circuit	1.65

FIXED CONDENSERS

Dubilier 2.0 mfd.	$1.45
Dubilier 1.0 mfd.	1.00
Dubilier 0.25 mfd.	75c
Dubilier .006 mfd.	55c
General Instrument .001, .0005, .00025	45c
Grid Condenser .00025, with clips	50c
Grid Condenser .00025, with clips, and 2-meg. leak	80c

SPEAKERS

Amplion Type	$4.50
Crosley Musicone	13.50

RHEOSTATS

"Bruno" 6, 10, 20, 30 ohms	50c
Parent, all sizes	59c
Cutler-Hammer 6 ohm	45c
Amsco 6, 20 or 30 ohms	69c
Kiesner vernier, 6 ohm	59c
Kiesner plain, 6 ohm	45c
Bradleystat	$1.39
Fada 6 or 30 ohm	39c
Frost 6 ohm	40c
Federal 6 ohm	59c

JACKS

Firth SC or DC	30c
Jones SC, 35c; DC	45c
Federal SC, 40c; DC	50c

FIXED CRYSTALS

Carborundum	$1.50
Raola	95c

DIALS

Apex vernier	$1.45
Marco hairline vernier	1.95
Venus 4" vernier	95c
Kurz Kasch Bakelite 4"	50c
Univernier	95c
B. M. S. vernier	1.10
Pathe 2, 3, 4"	25c
Accuratune	50c

TUBES

Venus Voltron 201A, 99 types	2.75
R. C. A. Tubes UV201A, UV199, WD12, UX120	$1.45
DeForest DV2, DV3, DV3A, DV5	2.25

LEAKS

Bradleyleak	2.50
Fixed Leaks, all values	$1.39

BALLASTS

Veby, ¾ amp.	50c
Amperite, for all tubes (specify your tubes)	95c

HARD RUBBER PANELS

7x10	.80c	7x18	$1.00
7x12	.70c	7x21	1.25
7x14	.80c	7x24	1.80
7x26	$1.65		
For 1926 Diamond, 7x24" drilled and engraved			2.65
For Powertone, 7x18" drilled and engraved			2.50
For 3-Tube Ambassador, drilled and engraved			1.45

MISCELLANEOUS

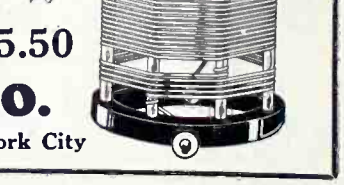
Clarostat	$1.95
Dubilier Duratran (fixed RF transformer)	2.25
Crosley Pup	9.50
5-lead Battery Cable	45c
Prempto A Battery Switch	22c
Columbia 8-Hexeysamb Coil Mount, geared	95c
Short-wave RF Choke Coil	1.25
Amrad Variometer (new type)	1.25
Freshman B Eliminator (AC)	20.00
Freshman Rectifying AC Tube	2.50
Freshman B Eliminator (DC), needs no tube	17.50
Centralab 500,000-ohm pot	1.65
Baseboard 6½x17"	25c
"Bruno" Brackets, per pair	1.00
Globe 45-volt B Battery	1.85
1" Bezels	10c
Pyrex Insulator	35c
Composition Insulator	10c
100 ft. 7 Strand Aerial	40c
50 ft. No. 14 Icecil. Leadin	50c
Ground Clamp	10c
Keystone Arrester	1.10
"Bruno" Binding Posts, dozen	40c
Pacent Plugs	25c
Phone or Speaker Cords, tipped	45c
Engravings for Panels	15c
Powertone Socket Shelf, Sockets, Resistor and Leak Mounts (unit)	2.75
"Bruno" 14 pt. Tap Switch	49c
$1.00 Hydrometer	45c
Busbar, round or square, 3 for	5c
Spaghetti, length	10c
Balkite Charger	12.50
5-amp. Westinghouse Noiseless; with bulb	14.50
Eureka DPDT Panel Switch	65c
Towers Scientific Earphones	1.95

Bretwood Leaks

Bretwood Variable Grid Leak, $1.50. With Bretwood Low-Loss Grid Condenser Attached. $2.00.

"Bruno"
Short-Wave Coil. Wound with rolled aluminum primary and rolled copper secondary. Strictly low-loss. Used with a .00025 mfd. variable condenser, it tunes from 25 to 110 meters, getting both WGY and KDKA short-wave programs.

$5.50



B-C-L RADIO SERVICE CO.

223 Fulton Street Dept. W New York City