MAY 22 1926 15 Cents

RADIO WORLD

Reg. U. S. Pat Off.

Vol. 9. No. 9. ILLUSTRATED Every Week

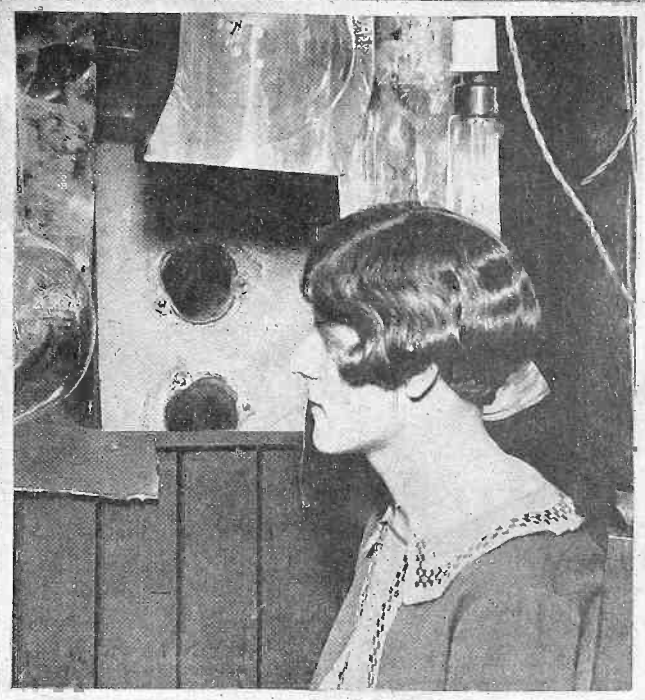
185-217

HOW TO BUILD SPEAKER IN SET

TIPS TO NOVICES ON READING DIAGRAMS

SUPER-HETERODYNE BUG TELLS EXPLOITS

TELEVISION *Demonstrated!*



(Wide World)

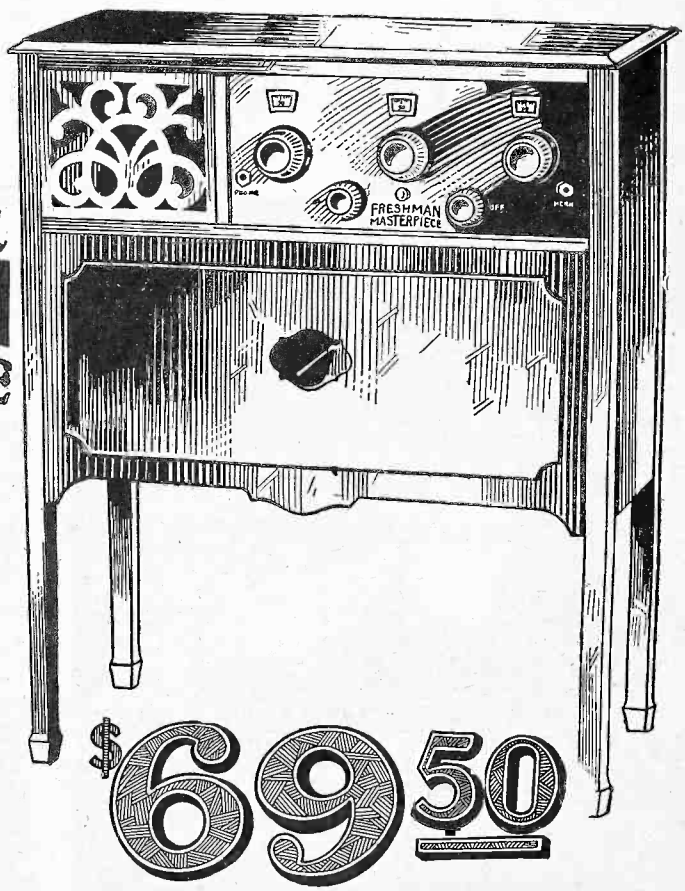
Girl broadcasting (above), while her voice and features are received in another room.

TELEVISION demonstrated to the public. See article on page 26.

Here Is FRESHMAN'S Greatest Accomplishment—

This BEAUTIFUL CONSOLE

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



New and Improved FRESHMAN MASTERPIECE

MODEL 6-F-3

A handsome piece of furniture made of carefully selected genuine five-ply mahogany. A radio receiver with the finest of built-in loud speakers, in a console model which provides ample room for all batteries, chargers, eliminators and everything else that could possibly be used in connection with a radio set. Not a single wire visible to mar the appearance of the room.

$69.50

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Now on display by all authorized Freshman dealers who will install and service them

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CHAS. FRESHMAN CO. Inc., Freshman Building, New York

Vol. IX
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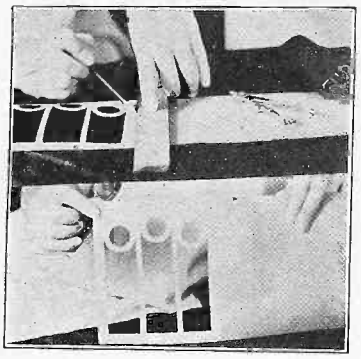
Phones: BRYant 0558 and 0559

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

A Built-in Speaker Set



FIGS. 1 and 2
(Top to bottom).

By Herbert E. Hayden
Photographs by the Author

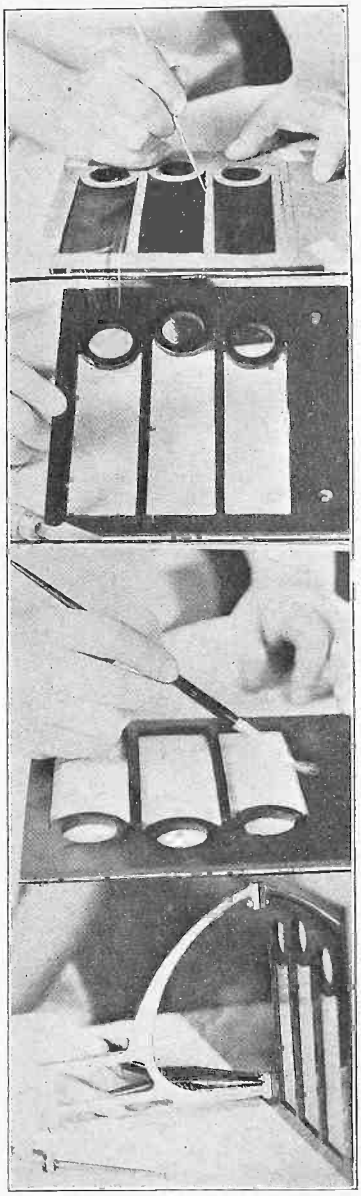
ENCLOSED speakers improve appearance. With the aid of a few household tools, cardboard, screws, nuts, etc., a speaker can be built in.

Many sets are built within a 7x24" panel. If such be the case, the parts will have to be rearranged so they can be placed in a 7x18" portion, the 6" being necessary for the speaker. If a 7x18" panel is used, the set will have to be rearranged so that it will fit into a 7x12" space, etc. However, let us consider the 7x24" panel, with its 6" cutout.

A piece of cardboard, having the same dimenisons as the panel proper, is obtained. Six inches from one edge it is marked off. Now the grill is cut out. One-half inch from the left and right hand side, draw a line. Now 1½" from the right and the left hand lines draw two more lines. One-quarter inch from the left and the right hand sides of these lines draw lines. This will give you three spaces. Three inches from one top portion, draw a line across. Draw center lines through the vertical spaces in this space.

Describe ½" circles, centered from the top, on the right and the left hand portions, in the small horizontal space. Now about ⅛" higher, in the center, make another circle, ½" in diameter. Now cut out the three vertical spaces and circles. This is shown clearly in Figs. 1, 2 and 3. Lay this template over the panel, using adhesive tape to hold it down securely.

Using a scriber or hatpin, scratch a line lightly around the lines that you cut out from the template. The design shown in the photographs may be followed. Cut out the sections on the panel, with a scroll saw. Finish off with a file as shown in Fig. 4. At this point it is well to drill the holes for the brackets. This is done by drilling four holes, two on top and two on the bottom, right and left hand of 7x18" portion. Fasten the brackets to the panel with 1" screws (6/32). Fig. 6, it will be noted, looks as if the grill were an individual piece, shown in Fig. 5. Silk about 6" square, can now be applied to the cut-out grill, by painting the rear of the cut-out panel, with ordinary glue or Ambroid Cement and then cementing the silk to this, Fig. 5. Any surplus silk can be snipped off, with a pair of small scissors, after the glue or cement is hardened. Fig. 7, shows the rear view of the completed panel. Fig. 8 shows how the loud speaker and complete receiver would look.



FIGS. 3, 4, 5 and 6.

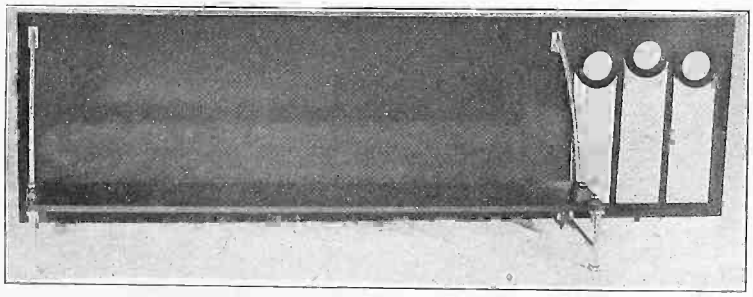


FIG. 7.
The back view of panel only.

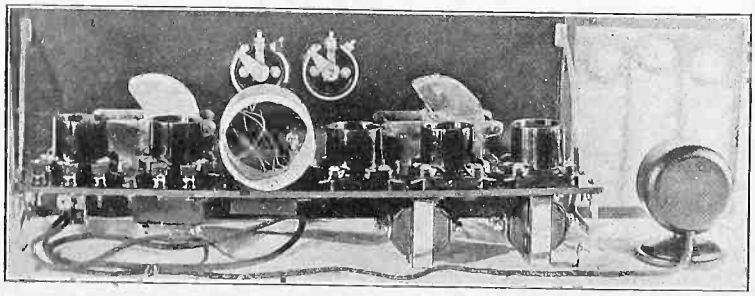


FIG. 8.
The back view with loud speaker installed.

FIG. 9.

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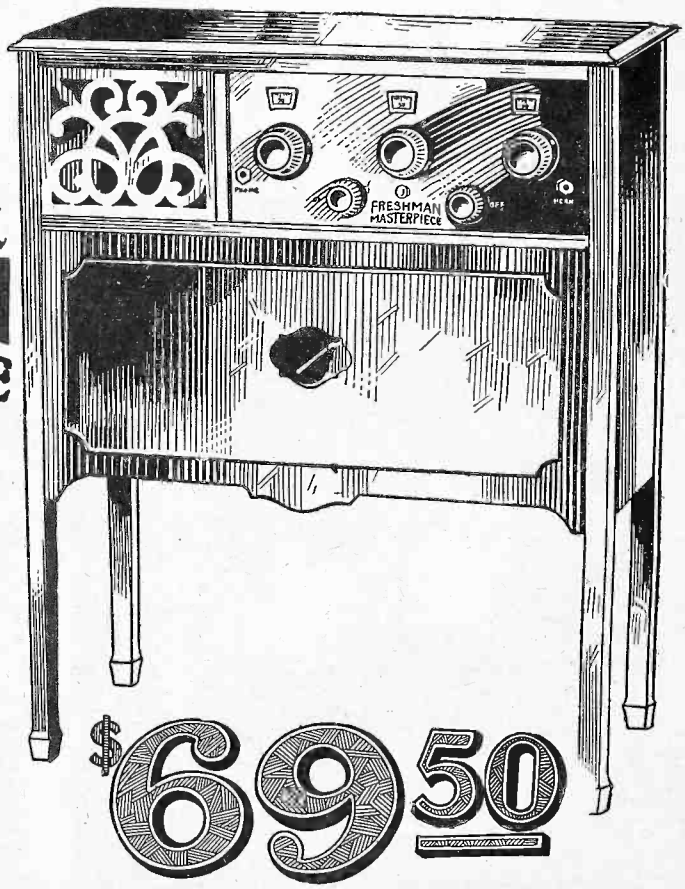

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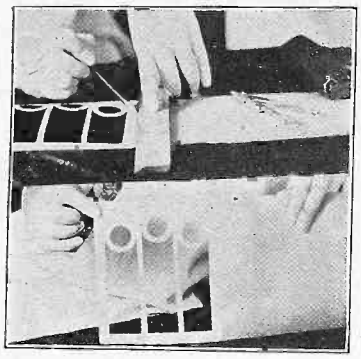

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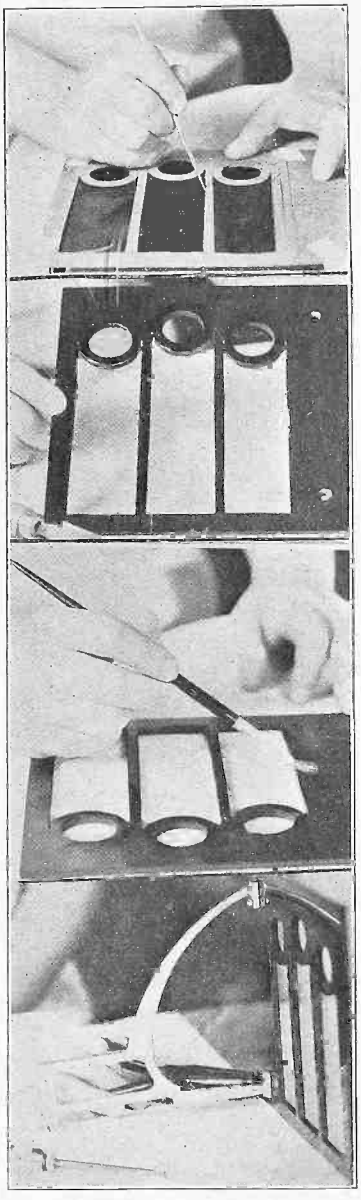

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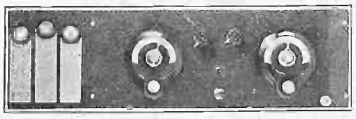
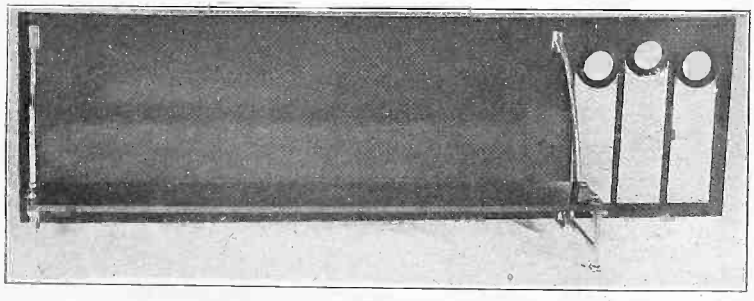


FIG. 9.



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The back view of panel only.

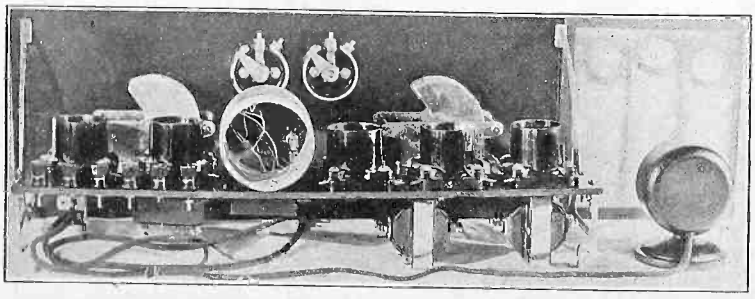


FIG. 8.
The back view with loud speaker installed.

Powertone in Operation

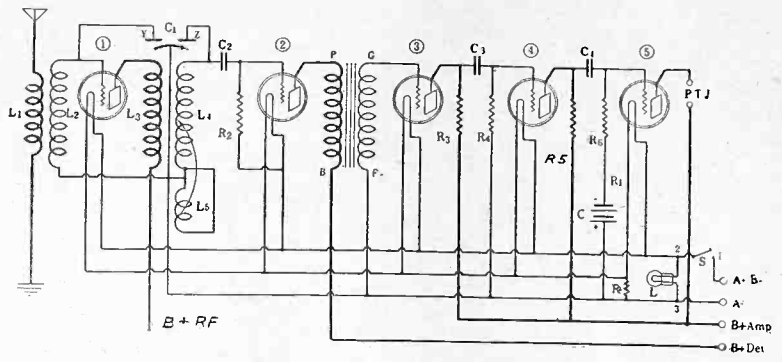


FIG. 1

The wiring diagram of the Powertone, a single tuning control set, embodying a novel connection of a rotary coil, L5. This coil stabilizes the set, serves as a volume control and also may be used as a vernier to establish resonance in the two circuits tuned by the double condenser, C1. The respective sections of this condenser are Y and Z, which are individual stators, the rotor being a single one common to both stators.

By Capt. P. V. O'Rourke

THE Powertone principle of a rotary coil, metallically short-circuited, but functioning inductively to give the benefit of absorption effects, permits a tremendous amount of energy to come through the receiver without the usual difficulties of keeping the set in a state of balance to permit operation. This coil is shown as L5 in Fig. 1 and is a so-called tickler coil. Obviously it is not used to create the regenerative condition, but to suppress it. It serves a double purpose, therefore enabling one to check the over-oscillatory tendency of the set and also to control volume.

The tendency of any set to break into uncontrollable oscillations depends on a variety of conditions, important among which are the degree of coupling and the plate voltage. Where there is a radio-frequency amplification, as here, the tendency most likely would develop in that part of the circuit, rather than in the detector tube. A separate B plus lead is provided so that one may use whatever positive potential the plate of the RF tube will handle best, and this most likely will be about 67½ volts. However, if 45 volts works well, by all means use that.

The Inductance Important

Hand in hand with the plate voltage goes the inductance of the primary of the interstage coupler, L3 in Fig. 1.

It is safe to remove turns from this coil until even only 5 or 6 turns remain, if conditions compel this, because the radio-frequency voltage is higher than in most sets, tube for tube, and the reduced amplification on the higher wavelengths, resulting from diminished primary, does not cut down the volume to any degree requiring a word of caution. Therefore, in constructing the set, one may use commercial coils as he finds them, and only after a reduction of plate voltage on the RF tube does not give a satisfactory solution would it be necessary to consider removal of turns from L3.

If the set, after construction, has a tendency toward instability, due to insufficient check on oscillations, this tendency is likely to prove very pronounced, and the solution is readily at hand by the process of removal of turns from L3. One turn should be removed at a time, for the point will be reached rather suddenly when the utterly satisfactory condition sets in.

The reduction of the number of turns on L3 also increases selectivity, hence if any one lives close to broadcasting stations and finds that more selectivity is necessary, turns may be removed for that purpose, and also the plate voltage on the RF tube may be increased, if desired, to just below the point where instability sets in. It is therefore a question of balancing the number of turns of L3 against the plate voltage on the RF tube. The fewer the number of turns the greater the plate voltage may be, although there never will be any necessity for increasing this voltage beyond 90.

The reason why the plate voltage is allied with the inductance is that the voltage is supplied through L3, the very coil under discussion, and this coil is in the RF plate circuit, hence its inductance, if increased, brings up the natural period to which the plate circuit is most responsive, and this is where it will begin to show signs of over-oscillation. When that period or fundamental wavelength is below the lowest broadcast wavelength, then the set enjoys stability over the entire broadcast band, since the higher the wavelength the less the amplification, broadly speaking.

The Tickler Inductance

The tickler coil, L5, used here for non-regenerative purposes, need not have as many turns as ticklers have that are used for regenerative objects in the plate circuit of a tube. Here the coil is in the grid circuit, since it is inductively coupled to the secondary, L4, which is a grid coil exclusively.

A tickler coil normally has about one-third the number of turns of the secondary, granting the smaller diameter, to facilitate the rotary coil turning inside the other, but in the present instance so few as 6 or 8 turns may be used to advantage. The set should work satisfactorily without modification of the tickler.

The circuit uses a multiple condenser having two sections, each .0005 mfd., and the secondaries, L2 and L4, should have the same number of turns on the same size diameters. Synchronization may be accomplished by properly setting the rotary coil.

The primary in the antenna circuit need not be touched, if a commercial coil is used. The coil data were published in the article describing the construction of the Powertone (April 17 issue of RADIO WORLD).

Condenser Trouble Remedied

It is not always easy to get an inexpensive double condenser that has the same capacity setting for each section at all points in the angle of rotation, but some degree of compensation may be achieved by bending the end plate, if the condenser is one that affords such opportunity. You may wire up the set and, if volume declines severely on some stations, without turning the knob actuating L5, the rotary coil, you may find out which section has too much capacity in it, and bend the end plate out at this point.

Connect another variable condenser, of any capacity, even a midget condenser will do, so that rotor plate is wired to rotor plate of the double condenser. This may be done with flexible wire, temporarily connected, soldering not being necessary, of course. Now the external condenser should have a flexible wire attached to its stator plates. Connect this lead first to the grid binding post of one stator of C1, for instance the point Y in Fig. 1, and, with the external condenser at minimum capacity, slowly turn it. If the volume comes in stronger, then finally reaches maximum, you know that the radio-frequency tube circuit had too little capacity in it, hence the detector input had too little, and the end rotor plate of the detector stage section of C1, e.g., Z, should be bent out. If the external condenser did not bring up volume, disconnect the flexible lead from the stator Y and connect it to stator Z, and if volume swells, then bend out the rotor plate at the opposite side of C1. When actually trying these things the facts will elucidate themselves.

The Checking-up Process

After the experimenting has been conducted to this point the work of checking up still remains, and the set should be tuned to the whole wavelength band, and the condenser fixed up properly, to represent equal or nearly equal capacity in both sections, at any given setting. However, if one does not desire to do this he may rely upon the tickler coil to establish the balance, only the coil will have to be slightly adjusted at each point of dissonance, to produce resonance. Such a use would constitute L5 an inductive vernier.

The grid leak, it will be noticed, is connected direct from the grid of the detector tube to A plus, the most convenient point being the F plus post of the detector or the radio-frequency socket.

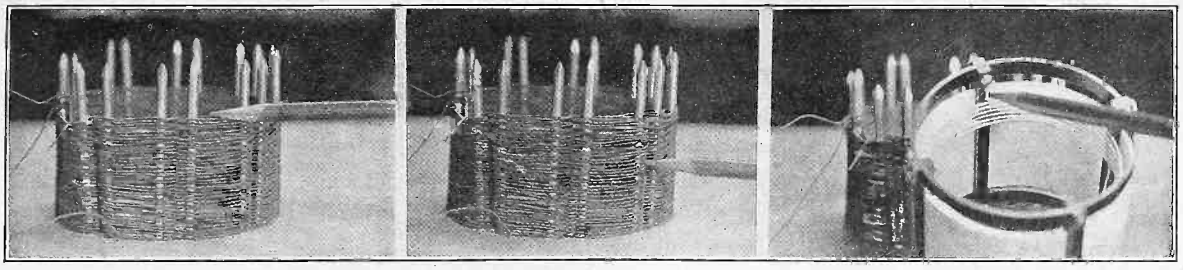
The set uses one ballast to control all five tubes, and if the —01A tubes are used throughout, then the ballast R should be the 1¼ ampere type. If a 112 power tube is used in the last stage a 1½ ampere ballast should be employed.

If —99 tubes are to be used it is best to have R a 6-ohm rheostat, mounted on the subpanel or baseboard, and set once and for all. A voltmeter may be used to determine the correct voltage, which is 3, or one may operate the set to determine at what setting R gives most practical results.

The Light Switch

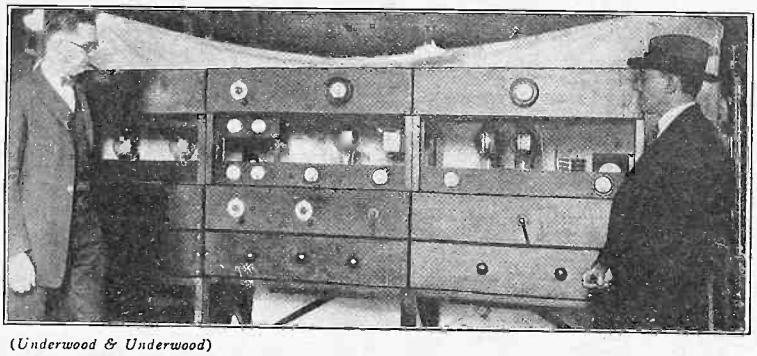
LS is a Bruno light switch, panel mounted. When the red window is turned to the left the switch is "on" and the set in operation. When you press the window the switch is "off" and so is the set. By installing a flashlight bulb, which costs only a few cents, one sees a red light glow on the panel when the set is on, and this is a fascinating attraction. The switch has three connecting points (1), direct to A plus, (2), the same lead on the switch itself, established when the contact is made by turning the window, and (3) A minus.

Degree of Coil Coupling Depends on Primary Location



THE energy transferred from the primary to the secondary of any coil, particularly a radio-frequency transformer, depends not only on the number of turns on the primary but also on the relative position of the primary in respect to the secondary. In the photo at left the pencil points to the position where the primary is most commonly placed, the primary being wound adjacent to the secondary, with about ¼" separation between the respective coils. The pencil indicates the filament end, where the primary should go. This affords medium coupling. Critical coupling results when the primary is midway between the center of the coil and the filament end (center photo). Lesser coupling results if the primary is inside the secondary, as shown at right, but this is again affected by relative position in respect to the plane of the secondary. The effects of coupling were diagnosed by John F. Rider in a series of remarkable experiments from which these facts were obtained.

Crystal Keeps Powerful Wave at 47 Meters



(Underwood & Underwood)

C. J. BURNSIDE (left), radio engineer and C. W. Horn, superintendent of radio operations, Westinghouse Electric & Mfg. Co., at the new crystal-controlled high power transmitter at Newark, N. J., which will be used to maintain telegraph communication with East Pittsburgh on a wavelength of 47 meters. The crystal control feature fixes the wavelength of the transmitter, so that there is no variation from the government assignment.

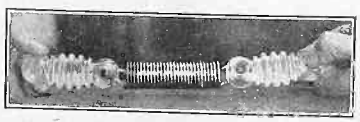
Grid Leaks of .1 to .5 Meg. Best Compromise for AF

Fans too frequently overlook the fact that the grid leaks in impedance or resistance coupled audio amplifiers function as volume control devices and as factors governing distortion. The usual consequence is the adaptation of some other method of volume control which has possibilities of distortion, although distortion may result from the use of incorrect leak value. Hence one cannot take for granted that a set of leaks specified for a certain arrangement is applicable to all conditions.

In the first place, the value of the grid leak governs the potential applied to the grid of the amplifying tube, since it is in shunt with the grid-filament circuit of the tube and thereby manifests an effect upon the impedance of that circuit. If this impedance is very low very little of the voltage obtained from the preceding tube would be applied to the grid. Hence it is essential that the correct leak be used so that very little of the energy of a weak signal is lost.

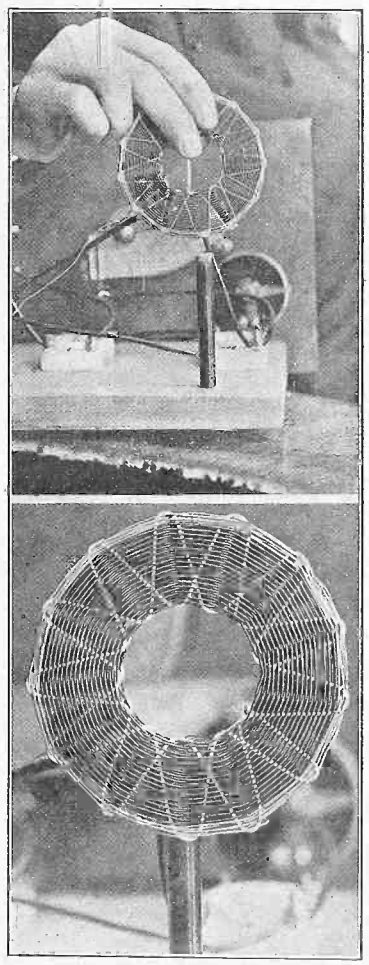
On the other hand the use of an excessively high resistance results in the accumulation of a charge upon the grid, until the plate current for that tube is reduced to zero, at which time the tube would become inoperative. This is the consideration of importance insofar as distortion is concerned. If the leaks are of such value as to permit the greatest amplification of weak signals, they may be too high when receiving strong signals emanating from a local broadcaster. The result is a slight blocking of the tube, which while not sufficient to disrupt operation completely, is sufficient to mar the quality of the amplified signal. Due to the preponderance of local broadcasters in the various cities it has been found that the correct leaks range between .1 and .5 meg.

Aerial Tension Spring



No matter how much you pull your antenna wire, there is always enough slack left to cause the wire to swing, causing poor DX reception, distortion and fading signals. Of course, the worst trouble is encountered during a storm or a windy day, etc. All this mental agitation can be killed by simply installing a pair of tension springs, as shown in photo, at both ends of the wire, with insulators.

Diamond Coil Mount



EXCELLENT security is afforded if one desires to mount a diamond weave coil on a baseboard, simply by fastening a dowel at right angles to the board, and having the other end of the dowel penetrate an aperture in the winding of the coil. These apertures are radial. The top photo shows the support, which is secured to the baseboard by a wood screw, the head of which is on the under side of the board, the thread entering the dowel. The lower photo shows the mounted coil.

Confessions of a Super Bug

By James H. Carroll

LIKE the ancient Greek, who with lighted lantern pursued his search for an honest man in bright sunlight, the radio Diogenes still hies forth with the lamp of enthusiasm (slightly dimmed by the blazing orb of radio progress), ever seeking the best circuit for all around results—selectivity through powerful locals, consistent DX, unfailing performance and perfect tone. A real rara avis, yet achieved by many. This achievement, however, in many cases has been a costly proposition, and there is a great class who would like to obtain these ends, but who, while the spirit is willing, find that the pocketbook is weak, so to speak. Many good radio fans are constantly making sacrifices for their hobby. A large circle of friends has been after me to get them up the best that can be had—some say regardless of price, others at the price they can afford to pay. Here, then, is the result of experiments and research.

Not unlike the fellow who vowed he would not fall in love unless with a beautiful heiress, and then eloped with a 240-pound penniless widow, who had seventeen children, when I "fell" for radio I flopped hard. Though working in it twelve to fourteen hours a day I am never fed up with it. Recreatory and leisure hours are also given up to this fascinating pursuit.

The First Set

First experiments were with a crystal and the first effort was a crystal set built in a portable typewriter case, using a vario-coupler and condenser in the circuit. This could separate stations beautifully and achieved as far as KDKA and WGY with consequent thrills. The beauty and clarity of tone were remarkable. Imagine sitting all evening with the earphones clamped tightly on (which suggests a new cure for jutting ears), when today all we have to do is to plug in the speaker, even on the humblest kind of a tube set.

Then, in order, came the 3-circuit tuner, with its attendant squeals and howls; the reflex, with two, three and more tube combinations which yielded many fascinating experiments, much DX and many startling results; then the Neutrodyne with pleasing tone achievements and which captivated me; then tuned radio frequency with its many interesting by-paths and, finally, the triumphant step into the realm of the Super-Heterodyne, the most interesting kingdom in the fairyland of radio. This Pilgrim's Progress being made through a constant digression of experimentation with tubes, coils, condensers, loops, speakers, resistance and impedance coupling three and four stages of transformer coupling and what not.

First Super Whistled

The first super was a bird—in more respects than one—the chirps, whistles and even yodels that set produced could not be exceeded by Barnum's steam calliope, and then some. And it had a little of everything added to the Super-Heterodyne principle. Fourteen tubes furnished the motor power (a somewhat ambitious effort for beginner) and one could read fine print by the illuminatory by-product. Controls! The panel was just covered with them. I added a few extra of my own fancy to balance her up and to give a more scientific aspect, and will wager that the locomotive of the Twentieth Century had no more. Still, she got DX aplenty and on the loud speaker, too, with pep enough to rattle the old diaphragm therein. Yes, sir, we were proud of that baby!

The sum total of our experiments now was that a perfectly good radio fan was transmogrified into a ravening Super-Heterodyne crank. The conclusion was reached that the Super was the ultimate set—nothing else could touch it for performance. Of course, that is my personal opinion. Many will disagree with me. But the fact remains the Super can do everything that any other set can and do it better; and aside from that, it can perform functions beyond other sets.

The Problem

Then arose the problem—which is the best Super for easy operation? The consensus among experts is that the Super is no set for the layman. However, the effort was continued to find one and every circuit that came out was played with to the limit. Then came the Pressley—and that was a wonder. Compact, in a 7x18" cabinet; power unlimited, selectivity and tone excellent, it proved a blessing. Completed on a snowy night in February, it tuned in close to 200 stations in one night, all on a loop! All this time I had been working with 199 tubes. Starting with 12s I finally turned over to the 3-volt tubes as I made the discovery that they were wonderful in RF and imagined (against the advice of all our expert friends and co-workers, numbered among whom were some crackajack tube men) that I could make them work all along the line. So, all advice was disregarded although I was called "all wet" and some other choice terms. And I haven't done so badly with the little fellows, after all.

The next step was with the Gerald M. Best Super which was built with the characteristics of these tubes provided for and which functioned beautifully with the 199s. This, was, and is today, one of the best sets of this type that one can build. However, I was still far from completely satisfied, as I had a somewhat hazy idea that I could build a super in which all types of tubes could be interchanged and which would work with fairly good results with 12s, 99s or A's (more sneers from esteemed contemporaries).

The Hunt Goes On

Again a triumph, to a certain extent, and satisfaction with what was accomplished, which brings me down to the layout for those who want the best along these lines—reasonably, or de-luxe. An old-time successful circuit as brought out anew with new coils, all air-core and peaked most accurately. When I saw the blue print I liked it, for it was a straight-out, honest-to-goodness circuit. There were no kinks or tricks in it and I liked the idea of the air-core transformers so closely matched as to peak, for air cores have many advantages over iron core, although each has its virtues. Then I liked the idea of the built-in antenna coupler making it practically the only circuit that could be switched from antenna to loop instantly.

So, I got a kit—yes, you guessed it first time—for the Victoreen, built the set step by step, adhering exactly to the blue print, and found it worked beyond fondest expectations. Then, to make it into our rara avis, which was done. For my own job I built it on a sub-panel, as I favor a chassis for many reasons, although the set is equally effective on a baseboard and can be built at less cost that way. I made many long experiments with various parts and finally settled on Amsco condensers for the variables. These tuned the Victoreen coils beautifully, giving evenly spaced stations all over the National Vernier Dials, with variable vernier governing the speed of tuning, giving the epitome of fine tuning and making it a delight—plenty of room above KSD at 96 and plenty of room below WFRL (205 meters)at 11 on the oscillator dial.

Benjamin Universal sockets were used, having the advantage of the spring mounting which takes up any jar and which allows the use of any type of tube except the UV and those can be used with adapters. I used this set with fine results on X, WD12s, 199s and 201As, as it is lots of fun to play with different tubes and voltages, and I had to find out the results for the fellows who wanted to use these different tubes. One 120-ampere-hour 6-volt battery gave the three ranges, by tapping off the three component cells. This has to be carefully done by any who try it, with respect to finding the right plus and minus.

Then came the question of output and the problem of tone quality. Trials of transformer coupled, resistance and impedance were made through many long hours; finally resulting in the adoption of three stages of Meloformers which worked like a charm—beautiful, full-rounded tone. These, with a throw-switch so that two or three stages could be used at will, provided versatility. The filament is wired so that with the plug in the first stage jack, the last two audio tubes are out. The speaker chosen by test to bring out the full richness of tone was the Acme Free Edge Cone, K1.

Working this outfit with 6-volt tubes with only 90 volts on the plate the volume is equal to three mu stages with a power tube in the last stage and about 300 volts on the plate operating a 36-inch Cone—this by actual comparison. With Van Horne 3VB 199 tubes, the volume fills a 7-room apartment. No power tubes are needed. Sangamo fixed and by-pass condensers were used throughout and only four volts of C battery are needed. Working my own outfit permanently at home with 199 tubes, I found that a set of nine Van Horne 3VBs of the X type gave fine satisfaction on all points. These tubes proved highly efficient oscillators, wonderful as detectors RF amplifiers of the highest degree; on the audio end they gave excellent amplification and the impedance matched both the Meloformers and the Acme speaker.

In the final assembly a best quality, polished black bakelite panel was used with two Sterling meters giving the utmost efficiency in tuning and operation and adding a de luxe effect. Victoreen rheostats and potentiometer gave fine control with all classes of tubes. Using an outside aerial, only fifty feet brought in everything on the air. Then because I am a crank on loops, believing that no Super is worthy of the name of one has to fall back on the antenna, came the loop quest. A special loop was wound, besides tests with many varieties of manufactured loops. Some were great on capacity, others excelled in inductance. Some brought in the low waves with a bang, but did not go high enough and vice versa.

Finally, a Mathesien-Sandberg Console Grand was found to fill the bill. Volume as great as on the aerial and all wavelengths from 175 to 600 meters. And every station brought in on the antenna was duplicated with even greater clarity. The loop also neat and compact, taking little space and matching the beauty of the set. So, here, we believe, is the ideal outfit

(*Concluded on page* 23)

THE NOVICE'S NOOK

By James B. Scully

Radio Supervisor, W. T. Grant Co.

THE difference in symbols used in representing radio circuits sometimes causes confusion to the novice, although for the most part the system is sufficiently standard to be understood by the beginner. Where there are differences it is well to know them in advance, lest one be misled, and thus wrongly connect some leads, with perhaps disastrous results to the tubes.

JAMES B. SCULLY

An example of standard symbols may be found in the antenna and ground representations, and the coil in the aerial circuit. These are shown at left in the blackboard drawings reproduced on this page. The antenna sometimes is shown as a triangle with a bisecting line, as at top, sometimes as a triangle without the bisector, but this difference is so slight that it would not cause confusion.

Two Condenser Plates

The coil is represented by the series of loops of wire, this being the design immediately beneath the plain triangle figure of the aerial. The ground is represented by horizontal parallel lines that taper, hence are formed in a triangle, also. The aerial and ground, it is well to recall here, constitute a capacity, the aerial being one plate of this physically large but electrically small condenser, and the ground being the other plate.

When it comes to the question of whether two lines represent a connection or a skipover, it would be easy for the novice to get mixed up. In the column of figures second from left on the blackboard the three different systems are shown.

First, the pair at top gives a generally accepted method, whereby the absence of a metallic connection between wires that cross on a diagram is shown by the U-shaped interruption of the straight line at the point that otherwise seemingly would represent a connection. To distinguish between the skipover and the connection, the U-shaped design is omitted where there is to be a metallic connection.

Points of Distinction

Now take the next pair, the designs in the column second from left and third and fourth from top. Here is where easy confusion arises. Where there is no metallic connection the lines simply cross. There is no U-shaped hump. Note that this is the same symbolization used in the previous pair to designate just the opposite, e.g., a physical connection. The distinction is made in the system embodied in the second pair by putting a dot at the intersecting point to designate a metallic connection. This method is used largely among engineers who are graduates of technical schools or who had experience in laboratories where the plan is greatly favored. However, popular radio publications lean toward the first system, with the hump to designate the skipover.

Perhaps a better and easier way to make matters perfectly clear is to combine the advantages of both previous methods, as shown in the lower pair on the blackboard. Here the hump is used for representing the skipover, and lest there be any mistake, a dot is added to the joint where it is desired to show metallic connection is to be made.

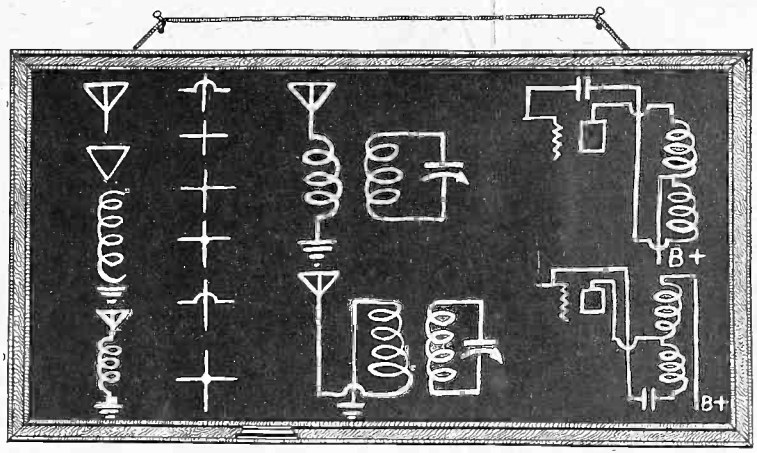
In the first column the aerial, the ground and a coil were shown separately, then combined in a diagram. The mere combination of the symbols in such fashion suffices to establish that there is metallic connection, since in point of fact there is only one line, and when that state exists, the metallic connection may be taken for granted.

Now take the third column from left. We see the aerial and ground connected to a coil, which is the primary coil. The other coil is the secondary. Nearly always the secondary has more turns of wire on it than has the primary. This causes the voltage to be increased or stepped up, the ratio being that of the number of primary turns to the number of secondary turns. Thus, if there are 10 turns on the primary and 50 turns on the secondary, the ratio is 1 to 5, and the secondary voltage is five times that of the primary voltage. Notice that the secondary is tuned by a variable condenser, in the lower diagram in the third column, where the aerial is introduced at the bottom of the primary coil and the ground at the top.

In the right-hand column are two attempts to show the same thing, a pair of coils, one connected in reverse fashion. In the top diagram a single winding in the plate circuit of a tube has a tap taken for the B plus connection, usually a mid-tap. Any winding is tapped when the insulation is scraped off and a metallic connection is made to that point to complete a circuit.

The tap in this instance is connected to B plus, while the beginning of the coil goes to plate and the end to one side of a small condenser. This is in fact a neutralizing condenser, and is variable, but as once its setting is fixed it is not molested, it is customary to represent it as a fixed condenser.

The fact that reversed connection is intended here is shown by any analysis of the action. The B plus connection establishes what may be called the zero radio frequency voltage point of the coil, so that from the "high voltage" point represented by the plate the voltage declines until it reaches zero at the tap. Radio



BLACKBOARD DIAGRAMS showing component symbols of an aerial circuit, and also combined in one figure; likewise various methods of distinguishing skipovers from metallic wired connections. Reversed windings or connections are at right.

So far we have not discussed the order of connection. Obviously, as there are four terminals, two on the primary coil and two on the secondary coil, the connections may be made in two different electrical ways, that is, obversely or conversely, or aiding or opposing. Many diagrams do not take into account this difference of the manner of connection, relying on textual explanations, or reference to designations on commercial coils, to convey this information.

If one will assume the radio-frequency transformer, as the combination of primary and secondary is called, to be wound with the primary adjoining the secondary, at one end of the secondary, then if the aerial is connected to the outside primary terminal, the ground to inside terminal, and the secondary connected with inside terminal to grid and outside to A minus, the two coils will be so connected that their fields aid. Both windings are in the same direction. If the connections of either coil are reversed, then the fields oppose. The fields consist of magnetic lines of force, or flux, constituting an electrical phenomenon that surrounds the coils when voltage is fed thereto. If both primary and secondary terminals are reversed, then the same condition exists as if neither was reversed.

So if it is desired to designate reversed connections, this may be done as shown

frequency voltage is meant, not direct current voltage, so the B battery connection need not prove misleading.

If the tap is zero, then the voltage from that point down should be less than zero, reading downward on the diagram. This is called negative. To achieve this the lower coil in the top diagram must be reverse wound. If a pair of phones were connected at plate and the very bottom part of the winding, no signal would be heard, for the voltage across the phones would be zero. If the voltage in the upper half is represented by El, that in the lower half would be minus El, hence zero voltage difference would result.

The B plus connection need not be made to the mid-tap to accomplish the same result. The coils may be wound in the same direction and B plus connected to one terminal of the winding, the plate going to the mid-tap. This is shown at lower right and actually represents reversed method of connection.

It makes no difference whether coils are wound in the same direction, and connected reversely, or whether the windings are in opposite directions, and the connections made obversely. There is a reverse field in either case. It would be necessary, therefore, to bring out the reverse feature at upper right, and to do so one might embody the plan shown in lower center.

RADIO WORLD'S

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Reports for the Guidance of Its Readers

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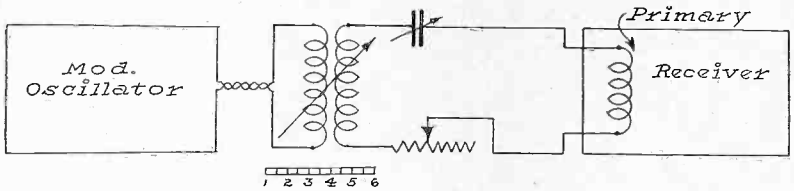

FIG. 1
The local oscillator or personal broadcasting station, used for receiver comparisons.

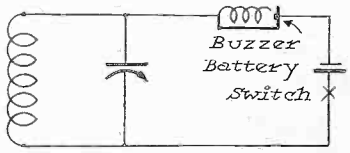

FIG. 2
Instead of a modulated local oscillator a damped wave generator, with buzzer, may be employed.

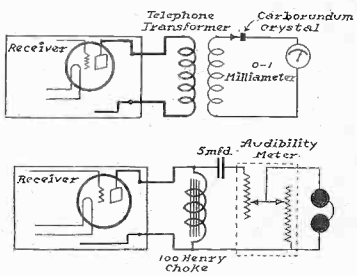

FIG. 3
The methods of applying crystal microammeter or calibrated audibility meter methods of measurements. A is at top, B at bottom.

How Best to Assay Receivers—Hookups That Enable You to Do This—How to Make and Use a Vacuum Tube Voltmeter.

THE problem of comparison of radio receivers, unless correctly attacked, may result in very confusing results. Receivers may be compared in two ways. The first is by being placed on the air, that is, connected to an aerial and normally operated. The second way is by placing it theoretically on the air in the laboratory or at home and making it responsive to signals generated there. Of these two methods the one embodying theoretical broadcasting far the more satisfactory as to sensitivity and amplification tests.

The receiver actually placed on the air for test is susceptible to overloading of the various tubes in the receiver when tuned to local broadcasters. To cut down the volume within the confines of the receiver is quite a problem, for the same decrease in "gain" must be made in all the receivers being tested, a problem more intricate than one is wont to imagine. Second, if to preclude overloading, tests are made with distant signals, the factor of attenuation of the signal due to distance and momentary atmospheric variations must be given due consideration, another item more easily said than done. That one cannot feel sure of constant signal intensity from a distant broadcaster can be attested by every distance fan, and if tests are made upon two receivers and the test signal emanates from a distant broadcaster, one cannot take into account any increase or decrease in received signal intensity due to fading or change in the power output of the broadcaster. The third reason is that of variations in the signal to static ratio, insofar as variations in the interference level are concerned.

The Local Oscillator Better

But if the receivers are placed theoretically on the air and are tuned to the signal frequency of a miniature broadcaster located in the same room with the receivers, all of these hazards are removed. Overloading of the tubes in the receiver is precluded, for the power of the broadcaster is within control, and all the receivers can be tested "wide open." To test the response on weak signals, the transmitter output may be reduced to the proper value, so that the received signal is of the intensity obtained from a distant broadcaster. All this is possible without fear of momentary attentuation of the signal, since the distance between this local broadcasting outfit and the receiver is negligible. Spasmodic disturbances from strays and other static interferences also are eliminated, since no external aerial or pick-up device is used.

Determinations made by test in the laboratory are absolutely indicative of the future operation of the respective receivers. If one of a number of receivers proves most sensitive in the laboratory it will prove most sensitive when these same receivers are tested actually "on the air."

Method of Evaluation

The arrangement of the various parts is shown in Fig. 1. The coupling between the modulated oscillator and the pickup coil of the phantom aerial should be calibrated in arbitary values to make possible a ratio for the various receivers. The greater the sensitivity of the receiver when a unity output is to be obtained, the greater will be the separation between the pickup coil of the dummy antenna and the output coil of the oscillator. If a modulated oscillator is not handy a damped wave generator using a buzzer may be used. This arrangement is illustrated in Fig. 2.

Now for the method of determining and indicating the output values. The one arrangement the AC voltage in the plate circuit is measured across the loud speaker terminals, by means of a vacuum tube voltmeter. In another the output is attenuated by the insertion of an audibility meter calibrated directly in miles of standard cable. The greater the miles of standard cable required to attentuate the signal to a certain value, the greater the output and amplification. In a third arrangement, a crystal microammeter arrangement is coupled to the plate circuit of the output tube, so that the AC component in the plate circuit is passed through the crystal and the rectified current causes a deflection of the microammeter needle. The greater the deflection the greater the input to the crystal. The fourth method utilizes an audiblity meter calibrated in arbitrary values of audibility.

The Preferred Methods

Of these four methods the crystal microammeter and the audibility calibration are most satisfactory for use in the average laboratory. They are comparatively inexpensive, do not require much technical knowledge for their operation, and the determinations are very easily comprehended and interpreted. Furthermore, the use of both these systems permits of volume determinations at a constant frequency of a variable frequency signal. The method of applying them to receivers is shown in Figs. 3A and 3B. The crystal microammeter arrangement is shown at A and the audibility meter method at B. The galvanometer indicating method is superior where the frequency of the input signal is maintained constant and where the amplitude is constant for a certain input. This supremacy holds true irrespective of the frequency of the signal, even though the frequency amplifying characteristic of the telephone transformer may be such as to be deficient on certain frequencies. This deficiency is immaterial in this line of work, but would be of extreme importance where frequency amplifying characteristics of audio amplifying devices were being considered.

On the other hand the audibility meter permits of determination of constantly varying frequency signals, since the human ear is the responsive device, and the meter in conjunction with the ear provides arbitrary values for comparison purposes.

Connections Different

It should be observed that the method of connection of the audibility meter differs from the conventional method of connecting the loud speaker or phones, and also differs from the crystal connection, because the audibility factor is obtained by shunting the loud speaker or phones with a resistance and the lower the value of this shunt resistance consistent with an audible signal the greater the original current flow in the phones. But is it essential that the impedance of the circuit be kept constant while the shunt resistance is being applied, and for that reason here is provided another series resistance which keeps the plate circuit impedance constant, irrespective of the value of the shunt across the phones. Through the use of this choke-shunt loud speaker arrangement the plate voltage applied to the tube is maintained constant, since the DC resistance of the choke remains unchanged, irrespective of the position of the audibility meter switch lever.

Now, while the construction of the crystal-microammeter unit is simple, once the telephone transformer has been acquired, the same cannot be said of the audibility meter, and it is recommended that this unit be purchased. The meter usually is

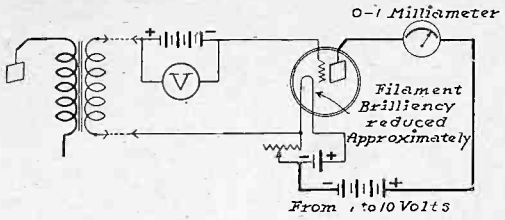

FIG. 4

The schematic diagram of a vacuum tube voltmeter for measuring amplifying characteristics of audio transformers, likewise radio-frequency voltages.

calibrated directly in arbitrary values of audibility, from 1 to 2,000.

How System Works

The higher the value on the meter consistent with any one input signal, the greater the audibility of the signal, since the design of the unit is such that the shunt across the phones is gradually decreased in ohmic value as the lever is shifted to the higher figures. And since the lower the resistance value of the shunt, the greater will be the portion of total current flowing through the shunt, rather than the phones. Hence it stands to reason that a louder signal will permit of a smaller shunt resistance and still permit the required current flow through the phones.

A great amount of interest is evinced in the amplifying characteristics of audio frequency coupling devices, insofar as the frequency amplification is concerned. Fans are desirous of ascertaining how any one amplifying device will amplify signals of various frequencies and desire to plot these characteristics as frequency against amplitude or amplification. Unfortunately, neither the crystal-microammeter or the audibility meter arrangements is satisfactory for this type of work.

Where Accuracy is Prevented

The frequency amplifying characteristics of the telephone transformer coupling the indicating circuit to the output circuit of the output tube would conflict with the coupling device under observation, and an accurate determination of the amplifying characteristics of the unit under test would be impossible. The deficiency of the audibility meter lies in the fact that the ear is the responsive device, and since the ear itself is very deficient, being unresponsive to variations of less than 25% in signal intensity, a frequency-amplification curve plotted according to the data obtained via the human ear would be very inaccurate. The most practical arrangement for tests of this nature is the use of a vacuum tube voltmeter.

Without a doubt many fans have never heard of a vacuum tube voltmeter. In substance, it is nothing more than a calibrated detector unit with the grid condenser omitted. Its salient feature lies in the fact that it operates independent of frequency and requires negligible power from the source under observation for its operation. The schematic wiring diagram for a vacuum tube voltmeter is shown in Fig. 4. This arrangement is adaptable to the measurement of the amplifying characteristics of audio-frequency transformers and that shown in Fig. 5 is adaptable to measurements of resistance and impedance coupling units. The unit in Fig. 4 also is suitable for measurements of radio-frequency voltages, but in view of the extreme care necessary in operation it will not be discussed now.

Audio Measurement Easier

The operation when measuring audio-frequency voltages is much simpler. The tube voltmeter is connected to the unit to be measured, for example the secondary of the transformer as illustrated in Fig. 4. The C battery bias is reduced to zero, as indicated on the voltmeter. Of course the primary of this transformer is connected to a preceding tube into which is being fed the audio-frequency currents from an oscillator. When calibrating the tube voltmeter the oscillator is disconnected. The plate current reading on the milliammeter in the tube voltmeter plate circuit is noted. The filament voltage at the filament terminals now is reduced until the plate current reading is almost zero.

A notation of the plate current value in microamperes is now made. Then the signal voltage is applied. The plate current reading will now advance to a new value. Then the grid bias voltage from the C battery is applied until the plate current value is reduced to the normal figure. The peak AC voltage is therefore equivalent to the DC voltage shown on the C battery voltmeter, since this value of potential was required to counteract the effects of the incoming AC voltage.

A Simplified System

When making measurements of audio-frequency coupling units it is necessary to maintain an even input into the first tube on all frequencies or at least to know accurately the input voltage, so that the ratio between the output and the input voltages may be known, since this value is the voltage amplification factor of the tube—and the coupling device combination. This necessitates continual shifting of the voltmeter from the input to the output circuits, a tedious procedure. To overcome this annoyance, use the system shown in Fig. 6, whereby the necessity for measuring the input voltage is reduced to only one measurement at only one frequency. This system has been instituted in RADIO WORLD's laboratories and functions very satisfactorily.

A 0-to-500 microammeter is placed in the grid circuit as shown, and the vacuum tube voltmeter is connected to the output circuit. The oscillator is set into operation, and with zero grid bias on the first tube, note the grid current. It is best if the lowest frequency is selected first, since the output of the oscillator increases with the increase in frequency. Let us say that the grid current is 20 microamperes.

Now the voltage is measured with the tube voltmeter. This means shifting the tube voltmeter connection from the output to the input circuit. We will assume that this voltage value is .06. And since the grid current and operation of the tube are independent of frequency, especially when within the audio frequency spectrum, with constant values of plate voltage, filament voltage and similar constant grid bias, a grid current of 20 microamps always would indicate an applied AC potential of .06 volts, irrespective of the frequency. Hence, it is only necessary to maintain the grid current at 20 microamps before the grid bias is applied, to assure constant potential input at the various frequencies. And if the potential value is once ascertained, the ratio between the output voltage, as obtained with the vacuum tube voltmeter, and the input, may be very easily determined, without necessitating shifting of the tube voltmeter to the input circuit each time the frequency is altered. Of course, when measuring the output voltage it is essential to reduce the grid current to zero by means of the grid bias. Eliminating the grid current does not diminish the input voltage, but permits correct operation of the tube.

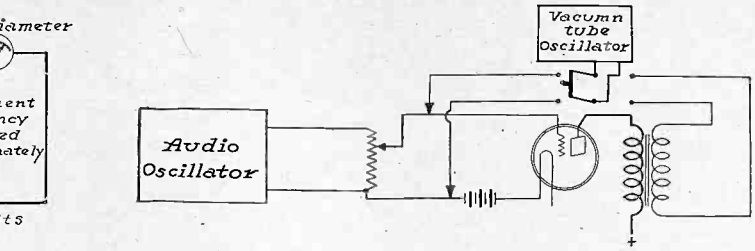

FIG. 7

Arrangement for switching the vacuum tube voltmeter from input to output circuits.

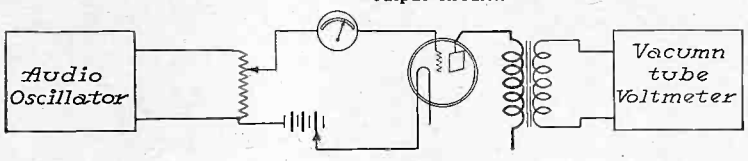

FIG. 6

A method of making convenient measurements, used in RADIO WORLD'S laboratories.

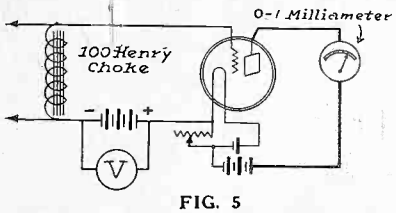

FIG. 5

Resistance and impedance coupled units may be measured by this circuit.

Communication Museum Displays Historic Sets

The U. S. National Museum in Washington is planning to portray the history of communication from the spoken word to the latest radio developments. However, it has not yet completed the accession of material for such an exhibit and it is expected that this may take at least two years time.

The radio exhibits now on display comprise military apparatus used during the World War by the A. E. F., French, and German armies.

Farley Is Appointed Fada's Ad. Manager

Francis Brooke Farley has been appointed advertising manager of F. A. D. Andrea, Inc. Mr. Farley succeeds K. H. Stark, who has resigned after having been associated with the company for several years. Mr. Farley is in full charge of advertising and publicity work.

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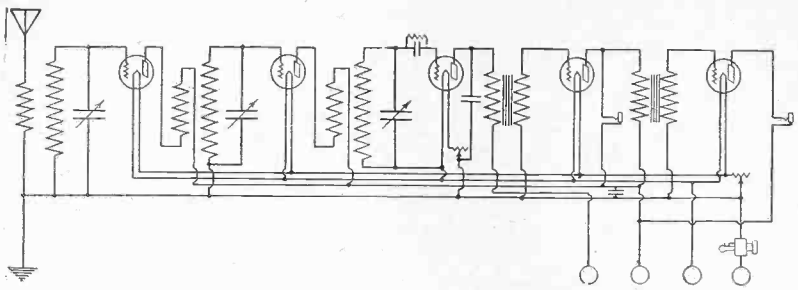


FIG. 337—The diagram of the receiver requested by Jack Brevers.

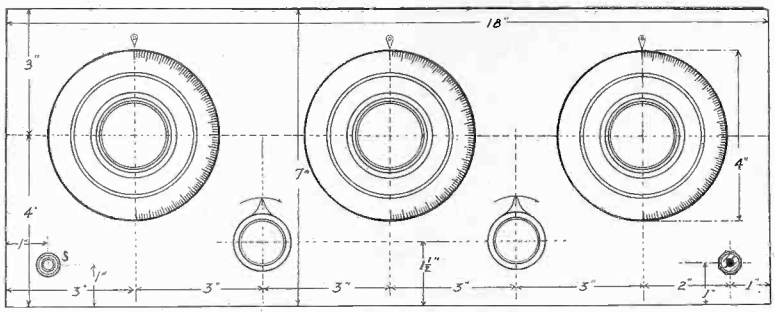


FIG. 338—The panel layout for the set shown in Fig. 337

IN THE April 24 issue of RADIO WORLD there appeared on page 23 an electrical diagram of a 1-tube regenerative receiver, employing a 3-circuit tuner with secondary, so tapped that the low waves could be tuned in with greater volume, etc. (1)—How many turns should be placed on a form 3" in diameter to constitute the primary and the secondary windings? (2)—What size wire should be used? (3)—At what point should the secondary winding be tapped? (4)—How many turns should be placed on a tubing 2½" in diameter, to constitute the tickler? (5)—What size wire should be used here? (6)—What capacity variable condenser shunts the secondary winding? (7)—Can a WD12 tube be used with satisfaction? (8)—Please state the other constants.—Charles B. Rickler, 209 Commonwealth Ave., Springfield, Mass.

(1)—The primary consists of 10 turns. The secondary consists of 45 turns. (2)—No. 22 double cotton covered wire is used. (3)—At the 15th turn from the beginning of the winding. This means, that the tap will be made at the 15th turn from the filament end of the winding. (4)—36. (5)—No. 26 single silk covered. (6)—.0005 mfd. (7)—Yes. (8)—C2 is a .00025 mfd. grid condenser. R2 is a 2 megohm grid leak. R1 is a 10 ohm rheostat. A —01A type tube is used. The plate supply should be 45 volts. The .001 mfd. fixed condenser is an experimental part.

* * *

I WOULD like to have the wiring diagram of a 5-tube receiver employing two stages of tuned radio frequency amplification, a non-regenerative detector and two stages of transformer coupled audio frequency amplification. The filaments of the RF and the AF tubes should be controlled by one rheostat, while the filament of the detector should be controlled by a rheostat. For testing purposes, I would like to have a jack inserted in the output of the first audio tube. The wiring directions of this set, with data on the coils, condensers, etc., and a panel layout using a 7x18" panel would be very much appreciated.—Jack Brevers, Derrick, N. Y.

Fig. 337 shows the electrical diagram of the receiver, while Fig. 338 shows the panel layout. The primaries should be considered as L1, L3 and L5; the secondaries as L2, L4 and L6; the rheostat controlling the RF and the AF tubes as R1; the rheostat controlling the detector tube as R2; the grid condenser as C1; the variable condensers shunting the secondaries of the RFT as C2, C3 and C4; the grid leak as R3; the fixed condenser, by-passing the RF current in the detector tube, as C5; the first audio frequency transformer as AFT1; the second audio frequency transformer as AFT2; the by-pass condenser across the A battery as C6 and the switch as S1. The primaries consist of 10 turns. The secondaries consist of 62 turns. These are wound on a tubing 3" in diameter, using No. 22 ouble cotton covered wire. C2, C3 and C4 are all .00035 mfd. straight line frequency condensers. C1 is a .00025 mfd. fixed condenser. R3 is a 2 megohm leak. C5 is a .001 mfd. fixed condenser. C6 is a .25 mfd. fixed condenser. The jacks on both the first and the second audio outputs are of the single circuit type. Now as to the wiring. Follow the diagram and the text carefully. The beginning of the primary winding, L1, goes to the antenna post. The end of this winding goes to the ground post, to the beginning of the secondary winding L2 and to the rotary plates of C2. The end of the secondary winding, L2, goes to the stationary plates of C2 and to the G post on the first socket. The beginning of L3 goes to the P post on this same socket. The end of this winding goes to the B plus amplifier post, or to the end of the primary winding, L3, to the B plus post on the second AFT and to the bottom terminals of the single circuit jacks. The beginning of the secondary winding, L4, goes to the rotary plates of C3, to the arm of the rheostat, R1, to one terminal of C6, to the F minus posts of the AFT, to the arm of the rheostat, R2, and to one terminal of the switch, S1. The other terminal of this switch goes to the A minus post. All the F plus posts are connected together, then to the A plus battery post. The F minus posts of two RF and the AF tubes are connected to the resistance terminal of R1. The end of L4 goes to the the G post on the second socket and to the stationary plates of C3. The beginning of the primary, L5, goes to the P post on the second socket. The end of this winding goes to the B plus amplifier post. The beginning of the secondary winding, L6, goes to the F plus post on the third socket and to the rotary plates of C4. The end of this winding goes to the stationary plates of C4 and to one terminal of C1 and R3. The other terminal of this combination goes to the G post on the third socket. The P post on the third socket goes to one terminal of C5. The other terminal of this condenser goes to the arm of R2. The P post of the third socket also goes to the P post on AFT1. The G post on this AFT goes to the G post on the fourth socket. The P post on this socket goes to the P post on AFT2 and to the top terminal of one single circuit jack. The G post on this AFT goes to the G post of the last socket. The P post on this socket goes to the top terminal of the other single circuit jack. As to the panel layout. Four inch dials are used. R1 is placed between the dial on the shaft of C1 and the dial on the shaft of C2. R2 is placed between the other two dials. The knobs on the shafts of the rheostats should be

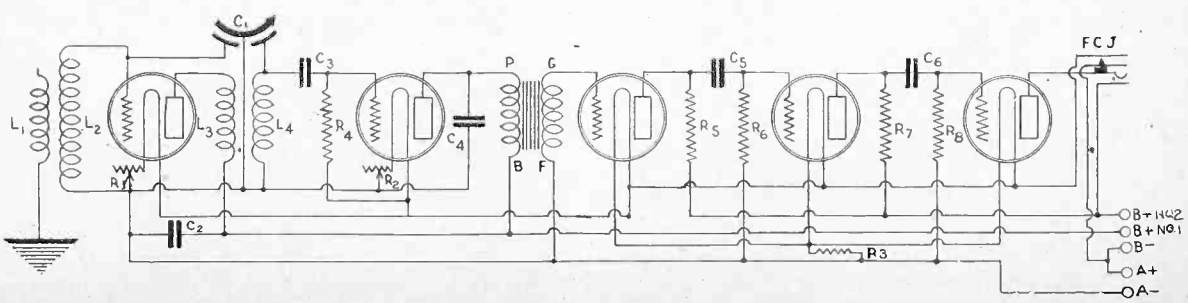


FIG. 339—The electrical diagram of a 1-control, 5-tube receiver.

1¾" in diameter. It will be noted that there is no provision made for the single circuit jack on the first audio output. This being experimental, it should be placed in an upright position, mounted on an angle iron, on the baseboard. The switch is indicated by S. The coils may be mounted directly on the end plates of the variable condenser, in such position that the stray-coupling effect will be as nearly nil as possible, e. g., the middle RFT, L2L4, perfectly erect, L1L3 with its winding turning away from L2L4 and L5L6 mounted in the opposite direction. This method is used in the BST-6, described in the April 24, 1926, issue of RADIO WORLD. Both the transformers used should be of the low ratio type, e. g., 3 to 1. No C battery is used. If desired, this may be installed on the last tube, it being not necessary on the first audio tube. This is done by breaking the F minus lead of the last AFT and running it to the C minus post, the plus post of this battery running to the A minus post.

* * *

I HAVE a double variable condenser, having a total capacity of .001 mfd. I would like to use this in a 5-tube receiver, wherein this condenser shunts the secondaries of an RFT in the RF stage and an RFT in the detector stage. I wish to use a stage of transformer and two stages of resistance coupling audio frequency amplification. The electrical diagram of such a receiver, coil and condenser data, etc., is desired.—Henry P. Jones, Haverhill, O.

Such a receiver is shown in schematic form in Fig. 339. The primaries L1 and L3, consist of 10 turns. The secondaries, L2 and L4, consist of 45 turns, wound on a tubing 3¼" in diameter. No. 22 double cotton covered wire is used. There is a ⅛" space left between the primary and the secondary windings. C1 is the double condenser. Each section has a capacity of .0005 mfd. C3 is the grid condenser. This has a capacity of .00025 mfd. R4 is the grid leak, which has a resistance of 2 megohms. C2 and C4 are both .001 mfd. fixed condensers, both of which serve as by-pass condensers. R1 and R2 10 ohm rheostats. R5, R6 and R7 are .1 megohm resistors of the fixed type. R8 is, however, a .5 megohm resistor. C5 and C6 are .25 mfd. fixed condensers. R3 is a ¾ ampere ballast resistor. FCJ is a single circuit, filament control jack. When the plug is inserted, the plus posts of the sockets holding the AF tubes are connected with the A plus post. The plates of the three AF tubes receive at least 135 volts. The plates of the RF and the detector tubes receive 45 volts. If it is found that the detector tube oscillates beyond control, break the common B plus lead and place a special voltage here, about 22½. If it is found that the signals are distorted, bring the bottom terminal of the jack to a separate post, where the 90 or 112 volt post from the B batteries should be connected. The terminal of R8 that goes to the A minus terminal can be brought to a C minus terminal of a 4.5 or 9 volt C battery, depending upon the B voltage as another method of preventing distortion.

* * *

I AM an amateur and very much interested in short wave reception. I have heard that the A. H. Grebe Co., of Richmond Hill, N. Y., have put out a receiver type CR-18, which has a wavelength range with a special plug in system used, from 8.5 to 216 meters. An electrical diagram of this receiver with the coil and condenser date, etc., would be greatly appreciated.—Clifton Stagg, Preston, Cal.

Fig. 340, shows the diagram of this receiver. L is the adjustable antenna or primary coil, consisting of 8 turns wound on a 3" diameter, using No. 16 single cotton covered wire. This 3" diameter form is not the common type of bakelite or hard rubber. It is a special air wound coil, with a special method of mounting. The secondary, L2 and L3, are wound on a form exactly the same as that of the antenna coil, with the same type of wire. The following table gives the winding data for these coils. The coils are numbered as it will be noted from the table.

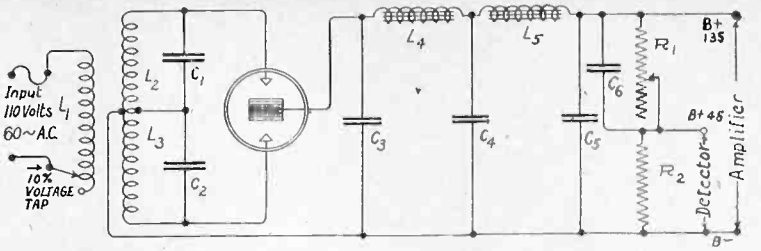
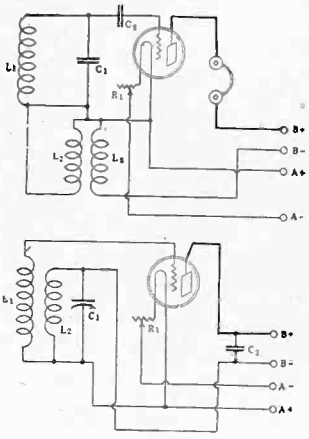


FIG. 341—The electrical diagram of the Raytheon B eliminator unit.



FIGS. 342 AND 343—(Top to bottom.)

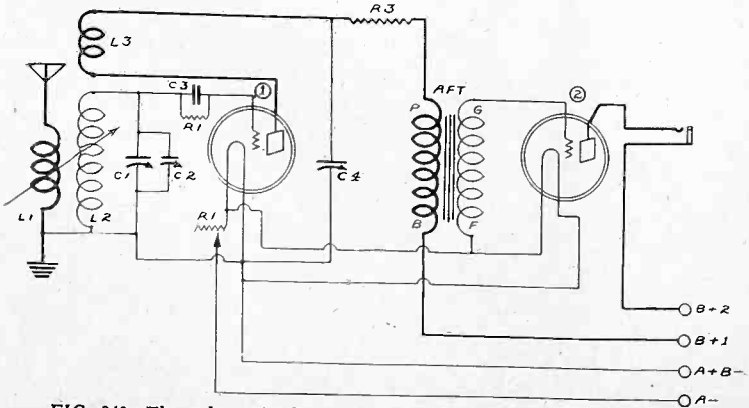


FIG. 340—The schematic diagram of the Grebe short wave receiver.

Coil No.	Wavelength Range in Meters	L2	Space	L3	Frequency Range Mega-Cycles
1	8.5 to 18	1	1	2	16.6 to 35
2	15.8 to 31	3	1	2	9.7 to 19
3	29 to 62	8	1	4	4.85 to 10.3
4	56 to 112	18	2	6	2.68 to 5.35
5	107 to 216	49	1	18	1.38 to 2.8

All coils are wound 10 turns to the inch. Where 1 is present underneath the space column, a 1/10" space is left, etc. C1 is a .00013 mfd. variable condenser. C2 is a .000003 mfd. C4 is a .00022 mfd. variable condenser. R1 is a 7 megohm grid leak. C3 is a .0004 mfd. fixed condenser. R1 is approximately a 10 rheostat. R3 is a 25,000 ohm resistance.

* * *

THE SCHEMATIC diagram of a B eliminator employing the Raytheon tube is requested. The data on the transformers, chokes, condensers, wiring, operation, etc., are also desired.—Charles Legere, Royalton, Ill.

Fig 341, shows the electrical diagram of this eliminator. The core, or that upon which the wire is wound, consists of 128 laminations, ¾" high and 1" wide. The primary, L1, consists of 1,200 turns of No. 26 enameled wire. The tap (90% tap) is made at the 1,000th turn. The secondary, L2L3, consists of 4,400 turns of No. 31 enameled wire. The tap is taken at the 2,200th turn. Both choke coils L4 and L5, consist of 5,950 turns of No. 31 enameled wire, wound upon the same type of core as that of the transformer, just described. Over the primary, a few layers of .014" thick manila paper are placed. The beginning of some No. 18 double cotton covered wire is brought directly to the core. This wire is then brought to ⅛" from the edge and turns are wound until, ⅛" from the opposite edge. This end of the wire is left open. This is known as the static shield. Over this wire, a few more layers of .014" thick paper are placed. See the Dec. 19, 1925 issue of RADIO WORLD for complete data, as how to make the core, etc. C1 and C2 are both 0.1 mfd. fixed condensers. C3 and C4 are 2 mfd. fixed condensers. C5 is an 8 mfd. fixed condenser. C6 is a .5 mfd. fixed condenser. R1 is the variable resistance, being variable from zero to 5 megohms. R2 is a 20,000 ohm resistor. The two taps on L1, are brought to two switch points. The switch arm is then brought to a terminal going to the AC line. The other terminal of L1, which has no taps, is brought to a terminal of a fuse. The other terminal of this fuse is brought to a terminal of a switch, not shown in the diagram. The other terminal of the switch is brought to the other terminal going to the AC line. One end of the secondary winding, L2, is connected to one terminal of C1 and to the anode of the tube. The tapped portion of this secondary winding is brought to the other terminal of C1 and a terminal of C2. The other terminal of C2 is connected to the other anode and the other terminal of the secondary winding. The cathode of the tube is brought to one terminal of C3 and L4. The other terminal of L4 is connected to a terminal of L5 and C4. The other terminal of L5 is con-

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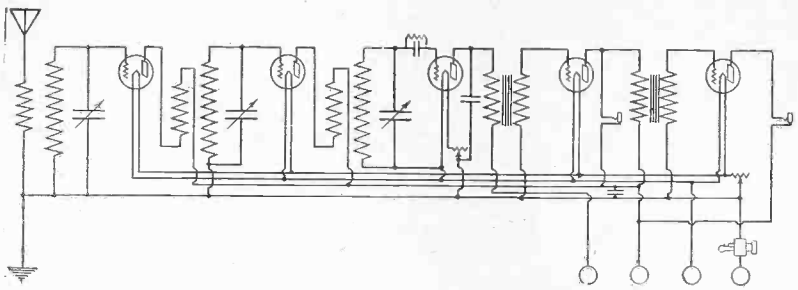

FIG. 337—The diagram of the receiver requested by Jack Brevers.

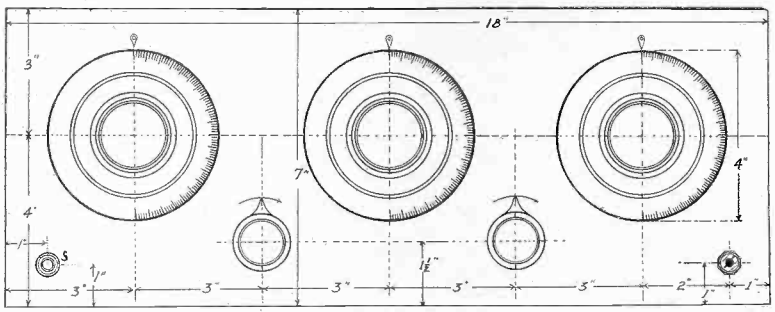

FIG. 338—The panel layout for the set shown in Fig. 337

IN THE April 24 issue of RADIO WORLD there appeared on page 23 an electrical diagram of a 1-tube regenerative receiver, employing a 3-circuit tuner with secondary, so tapped that the low waves could be tuned in with greater volume, etc. (1)—How many turns should be placed on a form 3" in diameter to constitute the primary and the secondary windings? (2)—What size wire should be used? (3)—At what point should the secondary winding be tapped? (4)—How many turns should be placed on a tubing 2½" in diameter, to constitute the tickler? (5)—What size wire should be used here? (6)—What capacity variable condenser shunts the secondary winding? (7)—Can a WD12 tube be used with satisfaction? (8)—Please state the other constants.—Charles B. Rickler, 209 Commonwealth Ave., Springfield, Mass.

(1)—The primary consists of 10 turns. The secondary consists of 45 turns. (2)—No. 22 double cotton covered wire is used. (3)—At the 15th turn from the beginning of the winding. This means, that the tap will be made at the 15th turn from the filament end of the winding. (4)—36. (5)—No. 26 single silk covered. (6)—.0005 mfd. (7)—Yes. (8)—C2 is a .00025 mfd. grid condenser. R2 is a 2 megohm grid leak. R1 is a 10 ohm rheostat. A —01A type tube is used. The plate supply should be 45 volts. The .001 mfd. fixed condenser is an experimental part.

* * *

I WOULD like to have the wiring diagram of a 5-tube receiver employing two stages of tuned radio frequency amplification, a non-regenerative detector and two stages of transformer coupled audio frequency amplification. The filaments of the RF and the AF tubes should be controlled by one rheostat, while the filament of the detector should be controlled by a rheostat. For testing purposes, I would like to have a jack inserted in the output of the first audio tube. The wiring directions of this set, with data on the coils, condensers, etc., and a panel layout using a 7x18" panel would be very much appreciated.—Jack Brevers, Derrick, N. Y.

Fig. 337 shows the electrical diagram of the receiver, while Fig. 338 shows the panel layout. The primaries should be considered as L1, L3 and L5; the secondaries as L2, L4 and L6; the rheostat controlling the RF and the AF tubes as R1; the rheostat controlling the detector tube as R2; the grid condenser as C1; the variable condensers shunting the secondaries of the RFT as C2, C3 and C4; the grid leak as R3; the fixed condenser, by-passing the RF current in the detector tube, as C5; the first audio frequency transformer as AFT1; the second audio frequency transformer as AFT2; the by-pass condenser across the A battery as C6 and the switch as S1. The primaries consist of 10 turns. The secondaries consist of 62 turns. These are wound on a tubing 3" in diameter, using No. 22 ouble cotton covered wire. C2, C3 and C4 are all .00035 mfd. straight line frequency condensers. C1 is a .00025 mfd. fixed condenser. R3 is a 2 megohm leak. C5 is a .001 mfd. fixed condenser. C6 is a .25 mfd. fixed condenser. The jacks on both the first and the second audio outputs are of the single circuit type. Now as to the wiring. Follow the diagram and the text carefully. The beginning of the primary winding, L1, goes to the antenna post. The end of this winding goes to the ground post, to the beginning of the secondary winding L2 and to the rotary plates of C2. The end of the secondary winding, L2, goes to the stationary plates of C2 and to the G post on the first socket. The beginning of L3 goes to the P post on this same socket. The end of this winding goes to the B plus amplifier post, or to the end of the primary winding, L3, to the B plus post on the second AFT and to the bottom terminals of the single circuit jacks. The beginning of the secondary winding, L4, goes to the rotary plates of C3, to the arm of the rheostat, R1, to one terminal of C6, to the F minus posts of the AFT, to the arm of the rheostat, R2, and to one terminal of the switch, S1. The other terminal of this switch goes to the A minus post. All the F plus posts are connected together, then to the A plus battery post. The F minus posts of two RF and the AF tubes are connected to the resistance terminal of R1. The end of L4 goes to the G post on the second socket and to the stationary plates of C3. The beginning of the primary, L5, goes to the P post on the second socket. The end of this winding goes to the B plus amplifier post. The beginning of the secondary winding, L6, goes to the F plus post on the third socket and to the rotary plates of C4. The end of this winding goes to the stationary plates of C4 and to one terminal of C1 and R3. The other terminal of this combination goes to the G post on the third socket. The P post on the third socket goes to one terminal of C5. The other terminal of this condenser goes to the arm of R2. The P post of the third socket also goes to the P post on AFT1. The G post on this AFT goes to the G post on the fourth socket. The P post on this socket goes to the P post on AFT2 and to the top terminal of one single circuit jack. The G post on this AFT goes to the G post of the last socket. The P post on this socket goes to the top terminal of the other single circuit jack. As to the panel layout. Four inch dials are used. R1 is placed between the dial on the shaft of C1 and the dial on the shaft of C2. R2 is placed between the other two dials. The knobs on the shafts of the rheostats should be

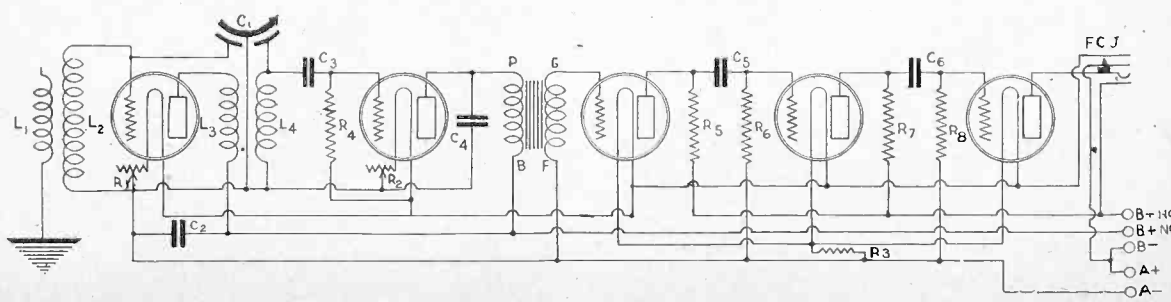

FIG. 339—The electrical diagram of a 1-control, 5-tube receiver.

1¾" in diameter. It will be noted that there is no provision made for the single circuit jack on the first audio output. This being experimental, it should be placed in an upright position, mounted on an angle iron, on the baseboard. The switch is indicated by S. The coils may be mounted directly on the end plates of the variable condenser, in such position that the stray-coupling effect will be as nearly nil as possible, e. g., the middle RFT, L2L4, perfectly erect, L1L3 with its winding turning away from L2L4 and L5L6 mounted in the opposite direction. This method is used in the BST-6, described in the April 24, 1926, issue of RADIO WORLD. Both the transformers used should be of the low ratio type, e. g., 3 to 1. No C battery is used. If desired, this may be installed on the last tube, it being not necessary on the first audio tube. This is done by breaking the F minus lead of the last AFT and running it to the C minus post, the plus post of this battery running to the A minus post.

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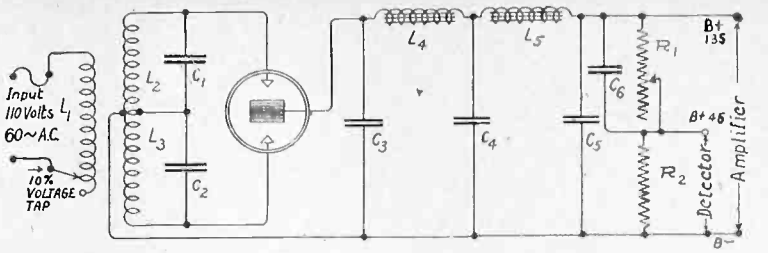

FIG. 341—The electrical diagram of the Raytheon B eliminator unit.

* * *

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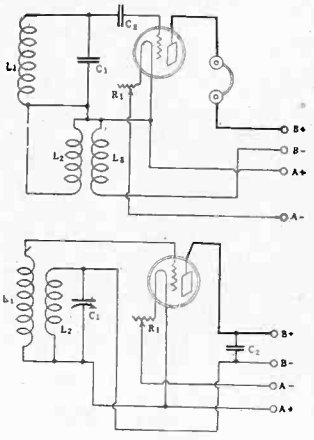

FIGS. 342 AND 343—(Top to bottom.)

with a special plug in system used, from 8.5 to 216 meters. An electrical diagram of this receiver with the coil and condenser date, etc., would be greatly appreciated.—Clifton Stagg, Preston, Cal.

Fig. 340, shows the diagram of this receiver. L is the adjustable antenna or primary coil, consisting of 8 turns wound on a 3" diameter, using No. 16 single cotton covered wire. This 3" diameter form is not the common type of bakelite or hard rubber. It is a special air wound coil, with a special method of mounting. The secondary, L2 and L3, are wound on a form exactly the same as that of the antenna coil, with the same type of wire. The following table gives the winding data for these coils. The coils are numbered as it will be noted from the table.

Coil No.	Wave-length Range in Meters	L2	Space	L3	Frequency Range Mega-Cycles
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4	56 to 112	18	2	6	2.68 to 5.35
5	107 to 216	49	1	18	1.38 to 2.8

All coils are wound 10 turns to the inch. Where 1 is present underneath the space column, a 1/10" space is left, etc. C1 is a .00013 mfd. variable condenser. C2 is a .000003 mfd. C4 is a .00022 mfd. variable condenser. R1 is a 7 megohm grid leak. C3 is a .0004 mfd. fixed condenser. R1 is approximately a 10 rheostat. R3 is a 25,000 ohm resistance.

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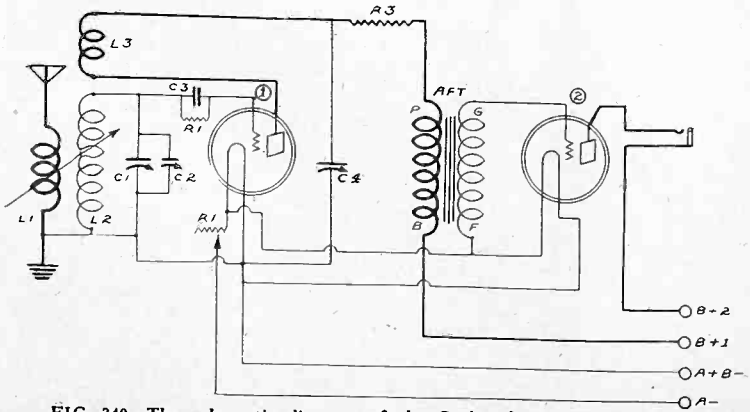

FIG. 340—The schematic diagram of the Grebe short wave receiver.

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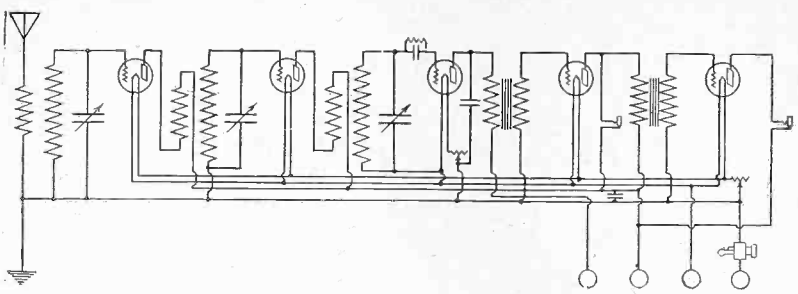


FIG. 337—The diagram of the receiver requested by Jack Brevers.

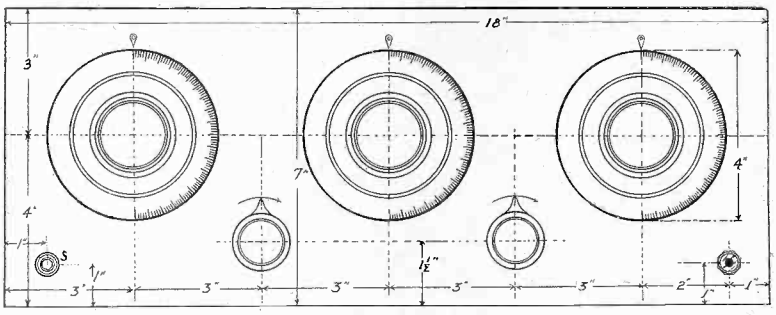


FIG. 338—The panel layout for the set shown in Fig. 337

IN THE April 24 issue of RADIO WORLD there appeared on page 23 an electrical diagram of a 1-tube regenerative receiver, employing a 3-circuit tuner with secondary, so tapped that the low waves could be tuned in with greater volume, etc. (1)—How many turns should be placed on a form 3" in diameter to constitute the primary and the secondary windings? (2)—What size wire should be used? (3)—At what point should the secondary winding be tapped? (4)—How many turns should be placed on a tubing 2½" in diameter, to constitute the tickler? (5)—What size wire should be used here? (6)—What capacity variable condenser shunts the secondary winding? (7)—Can a WD12 tube be used with satisfaction? (8)—Please state the other constants.—Charles B. Rickler, 209 Commonwealth Ave., Springfield, Mass.

(1)—The primary consists of 10 turns. The secondary consists of 45 turns. (2)—No. 22 double cotton covered wire is used. (3)—At the 15th turn from the beginning of the winding. This means, that the tap will be made at the 15th turn from the filament end of the winding. (4)—36. (5)—No. 26 single silk covered. (6)—.0005 mfd. (7)—Yes. (8)—C2 is a .00025 mfd. grid condenser. R2 is a 2 megohm grid leak. R1 is a 10 ohm rheostat. A —01A type tube is used. The plate supply should be 45 volts. The .001 mfd. fixed condenser is an experimental part.

* * *

I WOULD like to have the wiring diagram of a 5-tube receiver employing two stages of tuned radio frequency amplification, a non-regenerative detector and two stages of transformer coupled audio frequency amplification. The filaments of the RF and the AF tubes should be controlled by one rheostat, while the filament of the detector should be controlled by a rheostat. For testing purposes, I would like to have a jack inserted in the output of the first audio tube. The wiring directions of this set, with data on the coils, condensers, etc., and a panel layout using a 7x18" panel would be very much appreciated.—Jack Brevers, Derrick, N. Y.

Fig. 337 shows the electrical diagram of the receiver, while Fig. 338 shows the panel layout. The primaries should be considered as L1, L3 and L5; the secondaries as L2, L4 and L6; the rheostat controlling the RF and the AF tubes as R1; the rheostat controlling the detector tube as R2; the grid condenser as C1; the variable condensers shunting the secondaries of the RFT as C2, C3 and C4; the grid leak as R3; the fixed condenser, by-passing the RF current in the detector tube, as C5; the first audio frequency transformer as AFT1; the second audio frequency transformer as AFT2; the by-pass condenser across the A battery as C6 and the switch as S1. The primaries consist of 10 turns. The secondaries consist of 62 turns. These are wound on a tubing 3" in diameter, using No. 22 ouble cotton covered wire. C2, C3 and C4 are all .00035 mfd. straight line frequency condensers. C1 is a .00025 mfd. fixed condenser. R3 is a 2 megohm leak. C5 is a .001 mfd. fixed condenser. C6 is a .25 mfd. fixed condenser. The jacks on both the first and the second audio outputs are of the single circuit type. Now as to the wiring. Follow the diagram and the text carefully. The beginning of the primary winding, L1, goes to the antenna post. The end of this winding goes to the ground post, to the beginning of the secondary winding L2 and to the rotary plates of C2. The end of the secondary winding, L2, goes to the stationary plates of C2 and to the G post on the first socket. The beginning of L3 goes to the P post on this same socket. The end of this winding goes to the B plus amplifier post, or to the end of the primary winding, L3, to the B plus post on the second AFT and to the bottom terminals of the single circuit jacks. The beginning of the secondary winding, L4, goes to the rotary plates of C3, to the arm of the rheostat, R1, to one terminal of C6, to the F minus posts of the AFT, to the arm of the rheostat, R2, and to one terminal of the switch, S1. The other terminal of this switch goes to the A minus post. All the F plus posts are connected together, then to the A plus battery post. The F minus posts of two RF and the AF tubes are connected to the resistance terminal of R1. The end of L4 goes to the G post on the second socket and to the stationary plates of C3. The beginning of the primary, L5, goes to the P post on the second socket. The end of this winding goes to the B plus amplifier post. The beginning of the secondary winding, L6, goes to the F plus post on the third socket and to the rotary plates of C4. The end of this winding goes to the stationary plates of C4 and to one terminal of C1 and R3. The other terminal of this combination goes to the G post on the third socket. The P post on the third socket goes to one terminal of C5. The other terminal of this condenser goes to the arm of R2. The P post of the third socket also goes to the P post on AFT1. The G post on this AFT goes to the G post on the fourth socket. The P post on this socket goes to the P post on AFT2 and to the top terminal of one single circuit jack. The G post on this AFT goes to the G post of the last socket. The P post on this socket goes to the top terminal of the other single circuit jack. As to the panel layout. Four inch dials are used. R1 is placed between the dial on the shaft of C1 and the dial on the shaft of C2. R2 is placed between the other two dials. The knobs on the shafts of the rheostats should be

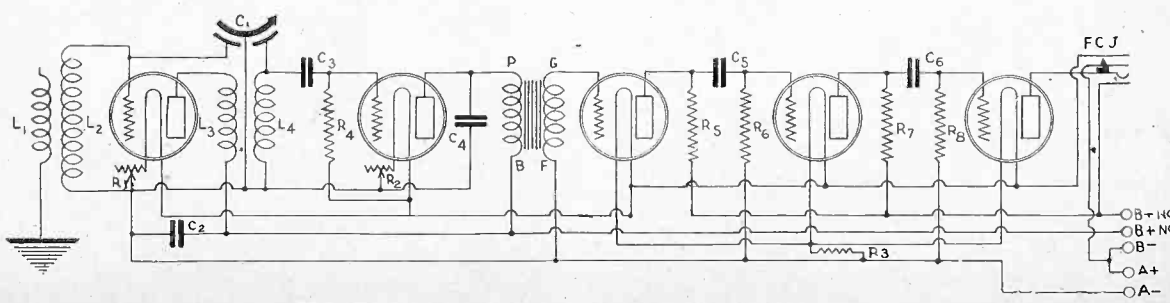


FIG. 339—The electrical diagram of a 1-control, 5-tube receiver.

1¾" in diameter. It will be noted that there is no provision made for the single circuit jack on the first audio output. This being experimental, it should be placed in an upright position, mounted on an angle iron, on the baseboard. The switch is indicated by S. The coils may be mounted directly on the end plates of the variable condenser, in such position that the stray-coupling effect will be as nearly nil as possible, e. g., the middle RFT, L2L4, perpendicularly erect, L1L3 with its winding turning away from L2L4 and L5L6 mounted in the opposite direction. This method is used in the BST-6, described in the April 24, 1926, issue of RADIO WORLD. Both the transformers used should be of the low ratio type, e. g., 3 to 1. No C batteries are used. If desired, this may be installed in the last tube, it being not necessary in the first audio tube. This is done by breaking the F minus lead of the last RFT and running it to the B minus post, the B plus post of this battery running to the A minus post.

* *

I HAVE a double variable condenser, having a total capacity of .001 mfd. I would like to use this in a 5-tube receiver, wherein this condenser shunts the secondaries of an RFT in the RF stage and an RFT in the detector stage. I wish to use a stage of transformer and two stages of resistance coupling audio frequency amplification. The electrical diagram of such a receiver, coil and condenser data, etc., is desired.—Henry P. [illegible], Haverhill, [illegible].

Such a receiver is shown in schematic form in Fig. 339. The primaries L1 and L3, consist of 10 turns. The secondaries, L2 and L4 of 45 turns, wound on a tubing [illegible] meter. No. 22 double cotton [illegible] is used. There is a ¼" space between the primary and the secondings. C1 is the double [illegible] Each section has a capacity of [illegible] mfd. C3 is the grid condenser. This has a capacity of .00025 mfd. R4 is the grid leak, which has a resistance of 2 megohms. C2 and C4 are both 1 mfd. fixed condensers, both of which serve as by-pass condensers. R1 and R2 10 ohm rheostats. R5, R6 and R7 are .1 megohm resistors of the fixed type. R8 is, however, a 5 megohm resistor. C5 and C6 are .25 mfd. fixed condensers. R3 is a ¾ ampere ballast resistor. FCJ is a single circuit filament control jack. When the plug is inserted, the plus posts of the sockets holding the AF tubes are connected with the A plus post. The plates of the three AF tubes receive at least 135 volts. The plates of the RF and the detector tube receive 45 volts. If it is found that the detector tube oscillates beyond control, by [illegible] the common B plus lead and place a special voltage here, about 22½. If it is found that the signals are distorted, bring the bottom terminal of the jack to a separate post, where the 90 or 112 volt post from the B batteries should be connected. The terminal of R8 that goes to the A minus terminal can be brought to a C minus terminal of a 4.5 or 9 volt C battery, depending upon the B voltage as another method of preventing distortion.

* * *

I AM an amateur and very much interested in short wave reception. I have heard that the A. H. Grebe Co., of Richmond Hill, N. Y., have put out a receiver type CR-18, which has a wavelength range with a special plug in system used, from 8.5 to 216 meters. An electrical diagram of this receiver with the coil and condenser date, etc., would be greatly appreciated.—Clifton Stagg, Preston, Cal.

Fig. 340, shows the diagram of this receiver. L is the adjustable antenna or primary coil, consisting of 8 turns wound on a 3" diameter, using No. 16 single cotton covered wire. This 3" diameter form is not the common type of bakelite or hard rubber. It is a special air wound coil, with a special method of mounting. The secondary, L2 and L3, are wound on a form exactly the same as that of the antenna coil, with the same type of wire. The following table gives the winding data for these coils. The coils are numbered as it will be noted from the table.

Coil No.	Wavelength Range in Meters	L2	Space	L3	Frequency Range Mega-Cycles
1	8.5 to 18	1	1	2	16.6 to 35
2	15.8 to 31	3	1	2	9.7 to 19
3	29 to 62	8	1	4	4.85 to 10.3
4	56 to 112	18	2	6	2.68 to 5.35
5	107 to 216	49	1	18	1.38 to 2.8

All coils are wound 10 turns to the inch. Where 1 is present underneath the space column, a 1/10" space is left, etc. C1 is a .00013 mfd. variable condenser. C2 is a .000003 mfd. C4 is a .00022 mfd. variable condenser. R1 is a 7 megohm grid leak. C3 is a .0004 mfd. fixed condenser. R1 is approximately a 10 rheostat. R3 is a 25,000 ohm resistance.

* * *

THE SCHEMATIC diagram of a B eliminator employing the Raytheon tube is requested. The data on the transformers, chokes, condensers, wiring, operation, etc., are also desired.—Charles Legere, Royalton, Ill.

Fig 341, shows the electrical diagram of this eliminator. The core, or that upon which the wire is wound, consists of 128 laminations, ¾" high and 1" wide. The primary, L1, consists of 1,200 turns of No. 26 enameled wire. The tap (90% tap) is made at the 1,000th turn. The secondary, L2L3, consists of 4,400 turns of No. 31 enameled wire. The tap is taken at the 2,200th turn. Both choke coils L4 and L5, consist of 5,950 turns of No. 31 enameled wire, wound upon the same type of core as that of the transformer, just described. Over the primary, a few layers of .014" thick manila paper are placed. The beginning of some No. 18 double cotton covered wire is brought directly to the core. This wire is then brought to ⅛" from the edge and turns are wound until, ⅛" from the opposite edge. This end of the wire is left open. This is known as the static shield. Over this wire, a few more layers of .014" thick paper are placed. See the Dec. 19, 1925 issue of RADIO WORLD for complete data, as how to make the core, etc. C1 and C2 are both 0.1 mfd. fixed condensers. C3 and C4 are 2 mfd. fixed condensers. C5 is an 8 mfd. fixed condenser. C6 is a .5 mfd. fixed condenser. R1 is the variable resistance, being variable from zero to 5 megohms. R2 is a 20,000 ohm resistor. The two taps on L1, are brought to two switch points. The switch arm is then brought to a terminal going to the AC line. The other terminal of L1, which has no taps, is brought to a terminal of a fuse. The other terminal of this fuse is brought to a terminal of a switch, not shown in the diagram. The other terminal of the switch is brought to the other terminal going to the AC line. One end of the secondary winding, L2, is connected to one terminal of C1 and to the anode of the tube. The tapped portion of this secondary winding is brought to the other terminal of C1 and a terminal of C2. The other terminal of C2 is connected to the other anode and the other terminal of the secondary winding. The cathode of the tube is brought to one terminal of C3 and L4. The other terminal of L4 is connected to a terminal of L5 and C4. The other terminal of L5 is con-

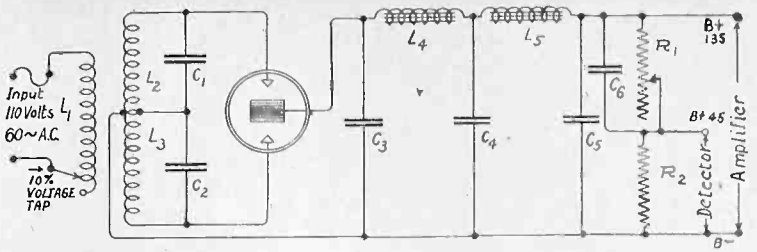
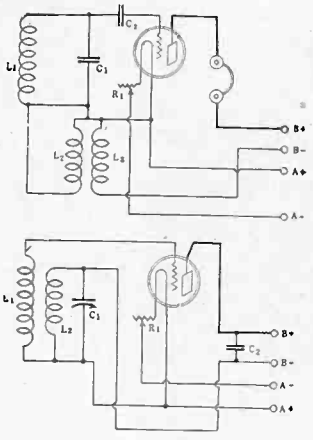


FIG. 341—The electrical diagram of the Raytheon B eliminator unit.



FIGS. 342 AND 343—(Top to bottom.)

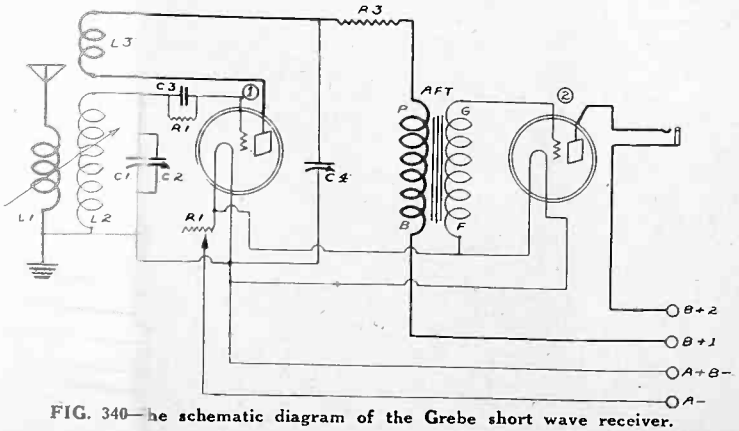


FIG. 340—The schematic diagram of the Grebe short wave receiver.

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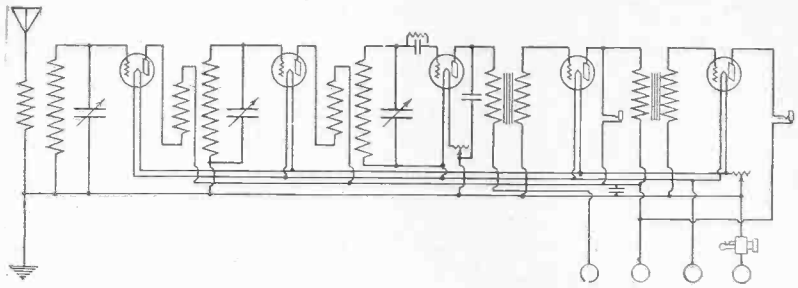

FIG. 337—The diagram of the receiver requested by Jack Brevers.

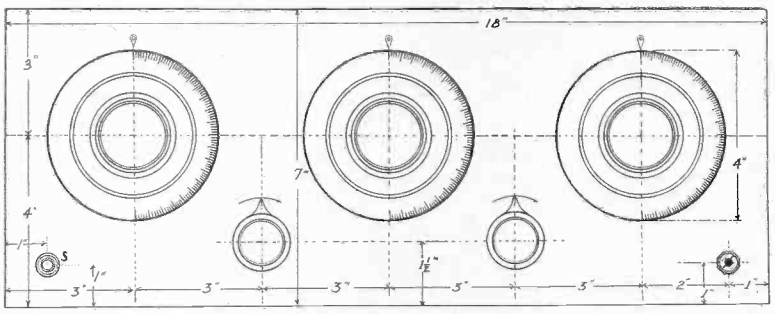

FIG. 338—The panel layout for the set shown in Fig. 337

IN THE April 24 issue of RADIO WORLD there appeared on page 23 an electrical diagram of a 1-tube regenerative receiver, employing a 3-circuit tuner with secondary, so tapped that the low waves could be tuned in with greater volume, etc. (1)—How many turns should be placed on a form 3" in diameter to constitute the primary and the secondary windings? (2)—What size wire should be used? (3)—At what point should the secondary winding be tapped? (4)—How many turns should be placed on a tubing 2½" in diameter, to constitute the tickler? (5)—What size wire should be used here? (6)—What capacity variable condenser shunts the secondary winding? (7)—Can a WD12 tube be used with satisfaction? (8)—Please state the other constants.—Charles B. Rickler, 209 Commonwealth Ave., Springfield, Mass.

(1)—The primary consists of 10 turns. The secondary consists of 45 turns. (2)—No. 22 double cotton covered wire is used. (3)—At the 15th turn from the beginning of the winding. This means, that the tap will be made at the 15th turn from the filament end of the winding. (4)—36. (5)—No. 26 single silk covered. (6)—.0005 mfd. (7)—Yes. (8)—C2 is a .00025 mfd. grid condenser. R2 is a 2 megohm grid leak. R1 is a 10 ohm rheostat. A —01A type tube is used. The plate supply should be 45 volts. The .001 mfd. fixed condenser is an experimental part.

* * *

I WOULD like to have the wiring diagram of a 5-tube receiver employing two stages of tuned radio frequency amplification, a non-regenerative detector and two stages of transformer coupled audio frequency amplification. The filaments of the RF and the AF tubes should be controlled by one rheostat, while the filament of the detector should be controlled by a rheostat. For testing purposes, I would like to have a jack inserted in the output of the first audio tube. The wiring directions of this set, with data on the coils, condensers, etc., and a panel layout using a 7x18" panel would be very much appreciated.—Jack Brevers, Derrick, N. Y.

Fig. 337 shows the electrical diagram of the receiver, while Fig. 338 shows the panel layout. The primaries should be considered as L1, L3 and L5; the secondaries as L2, L4 and L6; the rheostat controlling the RF and the AF tubes as R1; the rheostat controlling the detector tube as R2; the grid condenser as C1; the variable condensers shunting the secondaries of the RFT as C2, C3 and C4; the grid leak as R3; the fixed condenser, by-passing the RF current in the detector tube, as C5; the first audio frequency transformer as AFT1; the second audio frequency transformer as AFT2; the by-pass condenser across the A battery as C6 and the switch as S1. The primaries consist of 10 turns. The secondaries consist of 62 turns. These are wound on a tubing 3" in diameter, using No. 22 ouble cotton covered wire. C2, C3 and C4 are all .00035 mfd. straight line frequency condensers. C1 is a .00025 mfd. fixed condenser. R3 is a 2 megohm leak. C5 is a .001 mfd. fixed condenser. C6 is a .25 mfd. fixed condenser. The jacks on both the first and the second audio outputs are of the single circuit type. Now as to the wiring. Follow the diagram and the text carefully. The beginning of the primary winding, L1, goes to the antenna post. The end of this winding goes to the ground post, to the beginning of the secondary winding L2 and to the rotary plates of C2. The end of the secondary winding, L2, goes to the stationary plates of C2 and to the G post on the first socket. The beginning of L3 goes to the P post on this same socket. The end of this winding goes to the B plus amplifier post, or to the end of the primary winding, L3, to the B plus post on the second AFT and to the bottom terminals of the single circuit jacks. The beginning of the secondary winding, L4, goes to the rotary plates of C3, to the arm of the rheostat, R1, to one terminal of C6, to the F minus posts of the AFT, to the arm of the rheostat, R2, and to one terminal of the switch, S1. The other terminal of this switch goes to the A minus post. All the F plus posts are connected together, then to the A plus battery post. The F minus posts of two RF and the AF tubes are connected to the resistance terminal of R1. The end of L4 goes to the the G post on the second socket and to the stationary plates of C3. The beginning of the primary, L5, goes to the P post on the second socket. The end of this winding goes to the B plus amplifier post. The beginning of the secondary winding, L6, goes to the F plus post on the third socket and to the rotary plates of C4. The end of this winding goes to the stationary plates of C4 and to one terminal of C1 and R3. The other terminal of this combination goes to the G post on the third socket. The P post on the third socket goes to one terminal of C5. The other terminal of this condenser goes to the arm of R2. The P post of the third socket also goes to the P post on AFT1. The G post on this AFT goes to the G post on the fourth socket. The P post on this socket goes to the P post on AFT2 and to the top terminal of one single circuit jack. The G post on this AFT goes to the G post of the last socket. The P post on this socket goes to the top terminal of the other single circuit jack. As to the panel layout. Four inch dials are used. R1 is placed between the dial on the shaft of C1 and the dial on the shaft of C2. R2 is placed between the other two dials. The knobs on the shafts of the rheostats should be

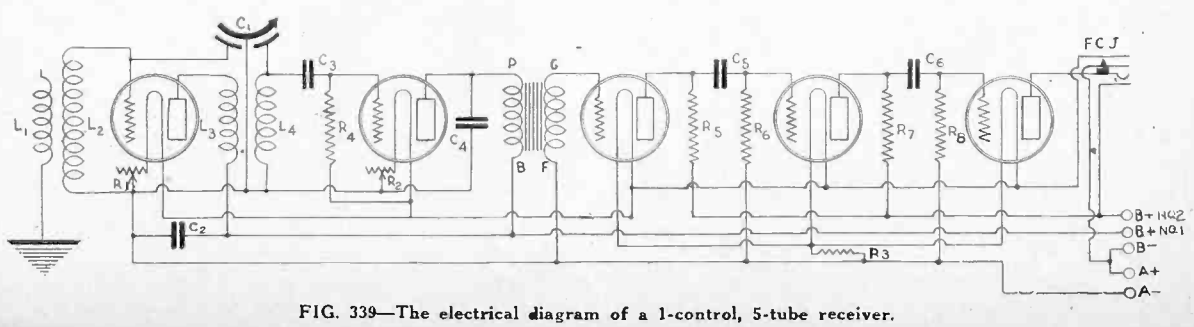

FIG. 339—The electrical diagram of a 1-control, 5-tube receiver.

1¾" in diameter. It will be noted that there is no provision made for the single circuit jack on the first audio output. This being experimental, it should be placed in an upright position, mounted on an angle iron, on the baseboard. The switch is indicated by S. The coils may be mounted directly on the end plates of the variable condenser, in such position that the stray-coupling effect will be as nearly nil as possible, e. g., the middle RFT, L2L4, perfectly erect, L1L3 with its winding turning away from L2L4 and L5L6 mounted in the opposite direction. This method is used in the BST-6, described in the April 24, 1926, issue of RADIO WORLD. Both the transformers used should be of the low ratio type, e. g., 3 to 1. No C battery is used. If desired, this may be installed on the last tube, it being not necessary on the first audio tube. This is done by breaking the F minus lead of the last AFT and running it to the C minus post, the plus post of this battery running to the A minus post.

* * *

I HAVE a double variable condenser, having a total capacity of .001 mfd. I would like to use this in a 5-tube receiver, wherein this condenser shunts the secondaries of an RFT in the RF stage and an RFT in the detector stage. I wish to use a stage of transformer and two stages of resistance coupling audio frequency amplification. The electrical diagram of such a receiver, coil and condenser data, etc., is desired.—Henry P. Jones, Haverhill, O.

Such a receiver is shown in schematic form in Fig. 339. The primaries L1 and L3, consist of 10 turns. The secondaries, L2 and L4, consist of 45 turns, wound on a tubing 3¼" in diameter. No. 22 double cotton covered wire is used. There is a ⅛" space left between the primary and the secondary windings. C1 is the double condenser. Each section has a capacity of .0005 mfd. C3 is the grid condenser. This has a capacity of .00025 mfd. R4 is the grid leak, which has a resistance of 2 megohms. C2 and C4 are both .001 mfd. fixed condensers, both of which serve as by-pass condensers. R1 and R2 10 ohm rheostats. R5, R6 and R7 are .1 megohm resistors of the fixed type. R8 is, however, a .5 megohm resistor. C5 and C6 are .25 mfd. fixed condensers. R3 is a ¾ ampere ballast resistor. FCJ is a single circuit, filament control jack. When the plug is inserted, the plus posts of the sockets holding the AF tubes are connected with the A plus post. The plates of the three AF tubes receive at least 135 volts. The plates of the RF and the detector tubes receive 45 volts. If it is found that the detector tube oscillates beyond control, break the common B plus lead and place a special voltage here, about 22½. If it is found that the signals are distorted, bring the bottom terminal of the jack to a separate post, where the 90 or 112 volt post from the B batteries should be connected. The terminal of R8 that goes to the A minus terminal can be brought to a C minus terminal of a 4.5 or 9 volt C battery, depending upon the B voltage as another method of preventing distortion.

* * *

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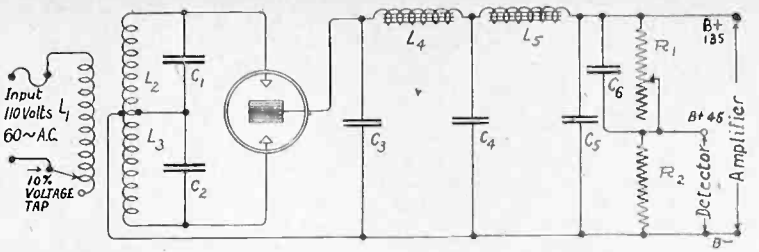
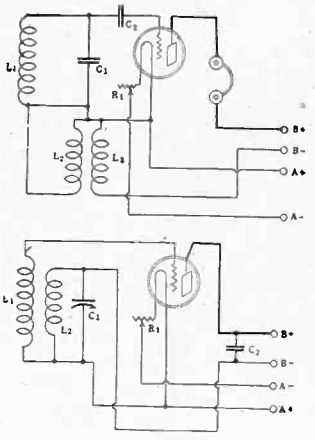


FIG. 341—The electrical diagram of the Raytheon B eliminator unit.



FIGS. 342 AND 343—(Top to bottom.)

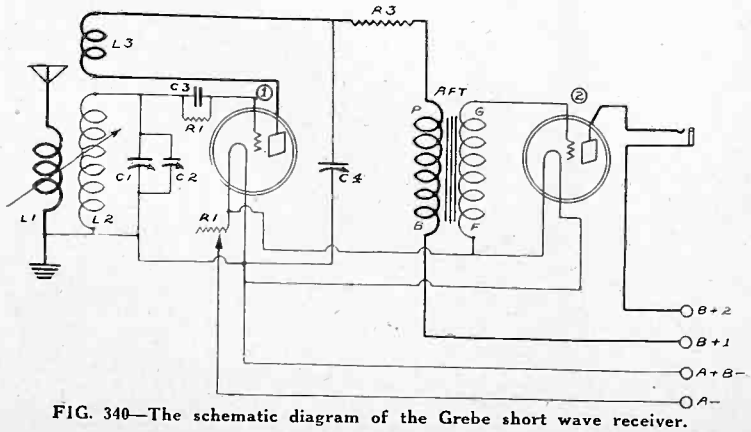


FIG. 340—The schematic diagram of the Grebe short wave receiver.

Coil No.	Wavelength Range in Meters	L2	Space	L3	Frequency Range Mega-Cycles
1	8.5 to 18	1	1	2	16.6 to 35
2	15.8 to 31	3	1	2	9.7 to 19
3	29 to 62	8	1	4	4.85 to 10.3
4	56 to 112	18	2	6	2.68 to 5.35
5	107 to 216	49	1	18	1.38 to 2.8

All coils are wound 10 turns to the inch. Where 1 is present underneath the space column, a 1/10" space is left, etc. C1 is a .00013 mfd. variable condenser. C2 is a .000003 mfd. C4 is a .00022 mfd. variable condenser. R1 is a 7 megohm grid leak. C3 is a .0004 mfd. fixed condenser. R1 is approximately a 10 rheostat. R3 is a 25,000 ohm resistance.

* * *

THE SCHEMATIC diagram of a B eliminator employing the Raytheon tube is requested. The data on the transformers, chokes, condensers, wiring, operation, etc., are also desired.—Charles Legere, Royalton, Ill.

Fig 341, shows the electrical diagram of this eliminator. The core, or that upon which the wire is wound, consists of 128 laminations, ¾" high and 1" wide. The primary, L1, consists of 1,200 turns of No. 26 enameled wire. The tap (90% tap) is made at the 1,000th turn. The secondary, L2L3, consists of 4,400 turns of No. 31 enameled wire. The tap is taken at the 2,200th turn. Both choke coils L4 and L5, consist of 5,950 turns of No. 31 enameled wire, wound upon the same type of core as that of the transformer, just described. Over the primary, a few layers of .014" thick manila paper are placed. The beginning of some No. 18 double cotton covered wire is brought directly to the core. This wire is then brought to ⅛" from the edge and turns are wound until, ⅛" from the opposite edge. This end of the wire is left open. This is known as the static shield. Over this wire, a few more layers of .014" thick paper are placed. See the Dec. 19, 1925 issue of RADIO WORLD for complete data, as how to make the core, etc. C1 and C2 are both 0.1 mfd. fixed condensers. C3 and C4 are 2 mfd. fixed condensers. C5 is an 8 mfd. fixed condenser. C6 is a .5 mfd. fixed condenser. R1 is the variable resistance, being variable from zero to 5 megohms. R2 is a 20,000 ohm resistor. The two taps on L1, are brought to two switch points. The switch arm is then brought to a terminal going to the AC line. The other terminal of L1, which has no taps, is brought to a terminal of a fuse. The other terminal of this fuse is brought to a terminal of a switch, not shown in the diagram. The other terminal of the switch is brought to the other terminal going to the AC line. One end of the secondary winding, L2, is connected to one terminal of C1 and to the anode of the tube. The tapped portion of this secondary winding is brought to the other terminal of C1 and a terminal of C2. The other terminal of C2 is connected to the other anode and the other terminal of the secondary winding. The cathode of the tube is brought to one terminal of C3 and L4. The other terminal of L4 is connected to a terminal of L5 and C4. The other terminal of L5 is con-

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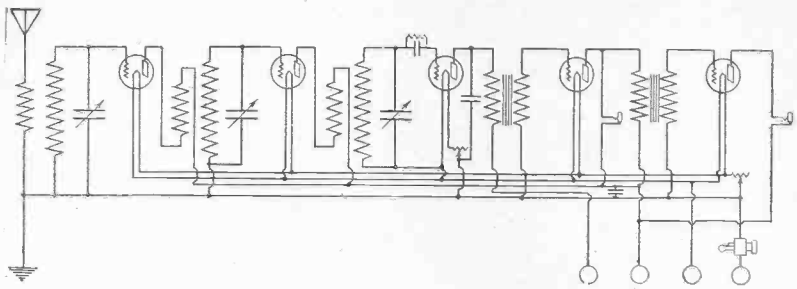


FIG. 337—The diagram of the receiver requested by Jack Brevers.

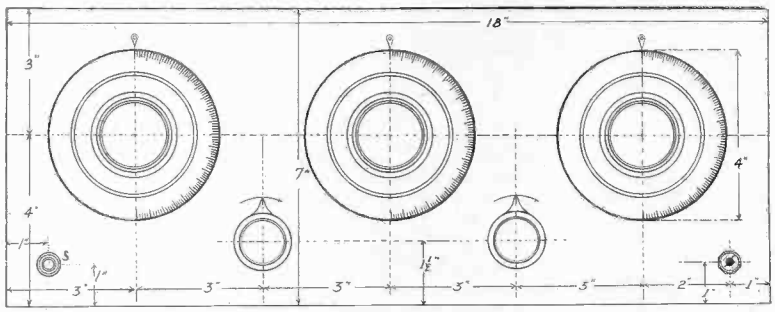


FIG. 338—The panel layout for the set shown in Fig. 337

IN THE April 24 issue of RADIO WORLD there appeared on page 23 an electrical diagram of a 1-tube regenerative receiver, employing a 3-circuit tuner with secondary, so tapped that the low waves could be tuned in with greater volume, etc. (1)—How many turns should be placed on a form 3" in diameter to constitute the primary and the secondary windings? (2)—What size wire should be used? (3)—At what point should the secondary winding be tapped? (4)—How many turns should be placed on a tubing 2½" in diameter, to constitute the tickler? (5)—What size wire should be used here? (6)—What capacity variable condenser shunts the secondary winding? (7)—Can a WD12 tube be used with satisfaction? (8)—Please state the other constants.—Charles B. Rickler, 209 Commonwealth Ave., Springfield, Mass.

(1)—The primary consists of 10 turns. The secondary consists of 45 turns. (2)—No. 22 double cotton covered wire is used. (3)—At the 15th turn from the beginning of the winding. This means, that the tap will be made at the 15th turn from the filament end of the winding. (4)—36. (5)—No. 26 single silk covered. (6)—.0005 mfd. (7)—Yes. (8)—C2 is a .00025 mfd. grid condenser. R2 is a 2 megohm grid leak. R1 is a 10 ohm rheostat. A —01A type tube is used. The plate supply should be 45 volts. The .001 mfd. fixed condenser is an experimental part.

* * *

I WOULD like to have the wiring diagram of a 5-tube receiver employing two stages of tuned radio frequency amplification, a non-regenerative detector and two stages of transformer coupled audio frequency amplification. The filaments of the RF and the AF tubes should be controlled by one rheostat, while the filament of the detector should be controlled by a rheostat. For testing purposes, I would like to have a jack inserted in the output of the first audio tube. The wiring directions of this set, with data on the coils, condensers, etc., and a panel layout using a 7x18" panel would be very much appreciated.—Jack Brevers, Derrick, N. Y.

Fig. 337 shows the electrical diagram of the receiver, while Fig. 338 shows the panel layout. The primaries should be considered as L1, L3 and L5; the secondaries as L2, L4 and L6; the rheostat controlling the RF and the AF tubes as R1; the rheostat controlling the detector tube as R2; the grid condenser as C1; the variable condensers shunting the secondaries of the RFT as C2, C3 and C4; the grid leak as R3; the fixed condenser, by-passing the RF current in the detector tube, as C5; the first audio frequency transformer as AFT1; the second audio frequency transformer as AFT2; the by-pass condenser across the A battery as C6 and the switch as S1. The primaries consist of 10 turns. The secondaries consist of 62 turns. These are wound on a tubing 3" in diameter, using No. 22 ouble cotton covered wire. C2, C3 and C4 are all .00035 mfd. straight line frequency condensers. C1 is a .00025 mfd. fixed condenser. R3 is a 2 megohm leak. C5 is a .001 mfd. fixed condenser. C6 is a .25 mfd. fixed condenser. The jacks on both the first and the second audio outputs are of the single circuit type. Now as to the wiring. Follow the diagram and the text carefully. The beginning of the primary winding, L1, goes to the antenna post. The end of this winding goes to the ground post, to the beginning of the secondary winding L2 and to the rotary plates of C2. The end of the secondary winding, L2, goes to the stationary plates of C2 and to the G post on the first socket. The beginning of L3 goes to the P post on this same socket. The end of this winding goes to the B plus amplifier post, or to the end of the primary winding, L3, to the B plus post on the second AFT and to the bottom terminals of the single circuit jacks. The beginning of the secondary winding, L4, goes to the rotary plates of C3, to the arm of the rheostat, R1, to one terminal of C6, to the F minus posts of the AFT, to the arm of the rheostat, R2, and to one terminal of the switch, S1. The other terminal of this switch goes to the A minus post. All the F plus posts are connected together, then to the A plus battery post. The F minus posts of two RF and the AF tubes are connected to the resistance terminal of R1. The end of L4 goes to the the G post on the second socket and to the stationary plates of C3. The beginning of the primary, L5, goes to the P post on the second socket. The end of this winding goes to the B plus amplifier post. The beginning of the secondary winding, L6, goes to the F plus post on the third socket and to the rotary plates of C4. The end of this winding goes to the stationary plates of C4 and to one terminal of C1 and R3. The other terminal of this combination goes to the G post on the third socket. The P post on the third socket goes to one terminal of C5. The other terminal of this condenser goes to the arm of R2. The P post of the third socket also goes to the P post on AFT1. The G post on this AFT goes to the G post on the fourth socket. The P post on this socket goes to the P post on AFT2 and to the top terminal of one single circuit jack. The G post on this AFT goes to the G post of the last socket. The P post on this socket goes to the top terminal of the other single circuit jack. As to the panel layout. Four inch dials are used. R1 is placed between the dial on the shaft of C1 and the dial on the shaft of C2. R2 is placed between the other two dials. The knobs on the shafts of the rheostats should be

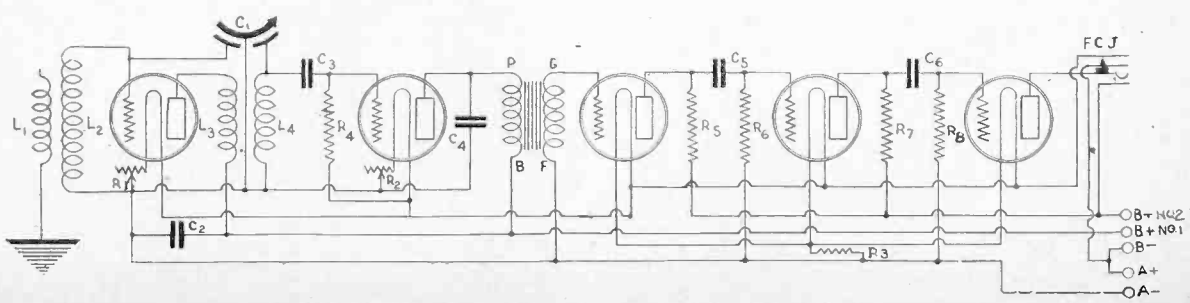


FIG. 339—The electrical diagram of a 1-control, 5-tube receiver.

1¾" in diameter. It will be noted that there is no provision made for the single circuit jack on the first audio output. This being experimental, it should be placed in an upright position, mounted on an angle iron, on the baseboard. The switch is indicated by S. The coils may be mounted directly on the end plates of the variable condenser, in such position that the stray-coupling effect will be as nearly nil as possible, e. g., the middle RFT, L2L4, perfectly erect, L1L3 with its winding turning away from L2L4 and L5L6 mounted in the opposite direction. This method is used in the BST-6, described in the April 24, 1926, issue of RADIO WORLD. Both the transformers used should be of the low ratio type, e. g., 3 to 1. No C battery is used. If desired, this may be installed on the last tube, it being not necessary on the first audio tube. This is done by breaking the F minus lead of the last AFT and running it to the C minus post, the plus post of this battery running to the A minus post.

* * *

I HAVE a double variable condenser, having a total capacity of .001 mfd. I would like to use this in a 5-tube receiver, wherein this condenser shunts the secondaries of an RFT in the RF stage and an RFT in the detector stage. I wish to use a stage of transformer and two stages of resistance coupling audio frequency amplification. The electrical diagram of such a receiver, coil and condenser data, etc., is desired.—Henry P. Jones, Haverhill, O.

Such a receiver is shown in schematic form in Fig. 339. The primaries L1 and L3, consist of 10 turns. The secondaries, L2 and L4, consist of 45 turns, wound on a tubing 3¼" in diameter. No. 22 double cotton covered wire is used. There is a ⅛" space left between the primary and the secondary windings. C1 is the double condenser. Each section has a capacity of .0005 mfd. C3 is the grid condenser. This has a capacity of .00025 mfd. R4 is the grid leak, which has a resistance of 2 megohms. C2 and C4 are both .001 mfd. fixed condensers, both of which serve as by-pass condensers. R1 and R2 10 ohm rheostats. R5, R6 and R7 are .1 megohm resistors of the fixed type. R8 is, however, a .5 megohm resistor. C5 and C6 are .25 mfd. fixed condensers. R3 is a ¾ ampere ballast resistor. FCJ is a single circuit, filament control jack. When the plug is inserted, the plus posts of the sockets holding the AF tubes are connected with the A plus post. The plates of the three AF tubes receive at least 135 volts. The plates of the RF and the detector tubes receive 45 volts. If it is found that the detector tube oscillates beyond control, break the common B plus lead and place a special voltage here, about 22½. If it is found that the signals are distorted, bring the bottom terminal of the jack to a separate post, where the 90 or 112 volt post from the B batteries

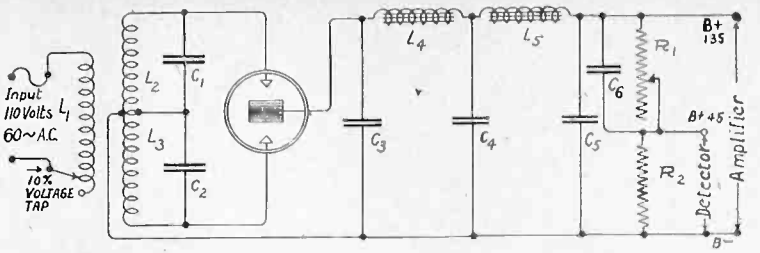
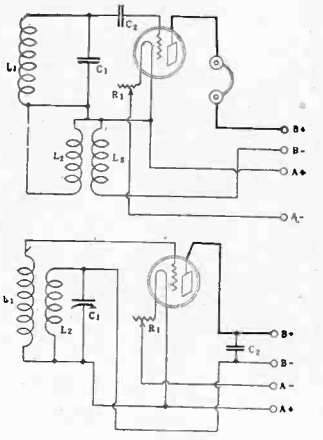


FIG. 341—The electrical diagram of the Raytheon B eliminator unit.

should be connected. The terminal of R8 that goes to the A minus terminal can be brought to a C minus terminal of a 4.5 or 9 volt C battery, depending upon the B voltage as another method of preventing distortion.

* * *

I AM an amateur and very much interested in short wave reception. I have heard that the A. H. Grebe Co., of Richmond Hill, N. Y., have put out a receiver type CR-18, which has a wavelength range



FIGS. 342 AND 343—(Top to bottom.)

with a special plug in system used, from 8.5 to 216 meters. An electrical diagram of this receiver with the coil and condenser date, etc., would be greatly appreciated.—Clifton Stagg, Preston, Cal.

Fig. 340, shows the diagram of this receiver. L is the adjustable antenna or primary coil, consisting of 8 turns wound on a 3" diameter, using No. 16 single cotton covered wire. This 3" diameter form is not the common type of bakelite or hard rubber. It is a special air wound coil, with a special method of mounting. The secondary, L2 and L3, are wound on a form exactly the same as that of the antenna coil, with the same type of wire. The following table gives the winding data

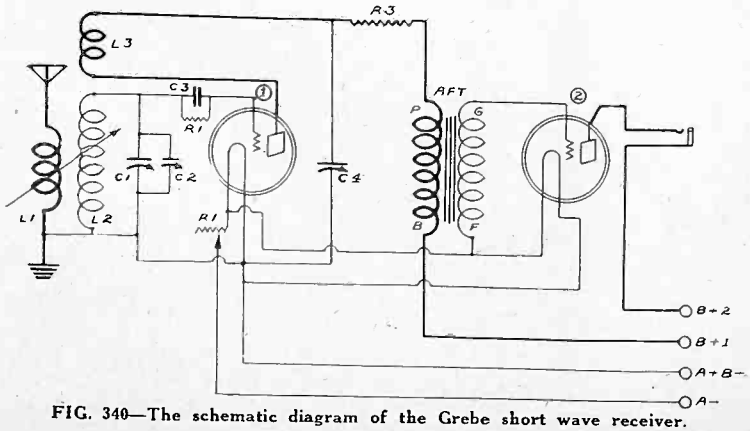


FIG. 340—The schematic diagram of the Grebe short wave receiver.

for these coils. The coils are numbered as it will be noted from the table.

Coil No.	Wavelength Range In Meters	L2	Space	L3	Frequency Range Mega-Cycles
1	8.5 to 18	1	1	2	16.6 to 35
2	15.8 to 31	3	1	2	9.7 to 19
3	29 to 62	8	1	4	4.85 to 10.3
4	56 to 112	18	2	6	2.68 to 5.35
5	107 to 216	49	1	18	1.38 to 2.8

All coils are wound 10 turns to the inch. Where 1 is present underneath the space column, a 1/10" space is left, etc. C1 is a .00013 mfd. variable condenser. C2 is a .000003 mfd. C4 is a .00022 mfd. variable condenser. R1 is a 7 megohm grid leak. C3 is a .0004 mfd. fixed condenser. R1 is approximately a 10 rheostat. R3 is a 25,000 ohm resistance.

* * *

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Fig 341, shows the electrical diagram of this eliminator. The core, or that upon which the wire is wound, consists of 128 laminations, ¾" high and 1" wide. The primary, L1, consists of 1,200 turns of No. 26 enameled wire. The tap (90% tap) is made at the 1,000th turn. The secondary, L2L3, consists of 4,400 turns of No. 31 enameled wire. The tap is taken at the 2,200th turn. Both choke coils L4 and L5, consist of 5,950 turns of No. 31 enameled wire, wound upon the same type of core as that of the transformer, just described. Over the primary, a few layers of .014" thick manila paper are placed. The beginning of some No. 18 double cotton covered wire is brought directly to the core. This wire is then brought to ⅛" from the edge and turns are wound until, ⅛" from the opposite edge. This end of the wire is left open. This is known as the static shield. Over this wire, a few more layers of .014" thick paper are placed. See the Dec. 19, 1925 issue of RADIO WORLD for complete data, as how to make the core, etc. C1 and C2 are both 0.1 mfd. fixed condensers. C3 and C4 are 2 mfd. fixed condensers. C5 is an 8 mfd. fixed condenser. C6 is a .5 mfd. fixed condenser. R1 is the variable resistance, being variable from zero to 5 megohms. R2 is a 20,000 ohm resistor. The two taps on L1, are brought to two switch points. The switch arm is then brought to a terminal going to the AC line. The other terminal of L1, which has no taps, is brought to a terminal of a fuse. The other terminal of this fuse is brought to a terminal of a switch, not shown in the diagram. The other terminal of the switch is brought to the other terminal going to the AC line. One end of the secondary winding, L2, is connected to one terminal of C1 and to the anode of the tube. The tapped portion of this secondary winding is brought to the other terminal of C1 and a terminal of C2. The other terminal of C2 is connected to the other anode and the other terminal of the secondary winding. The cathode of the tube is brought to one terminal of C3 and L4. The other terminal of L4 is connected to a terminal of L5 and C4. The other terminal of L5 is con-

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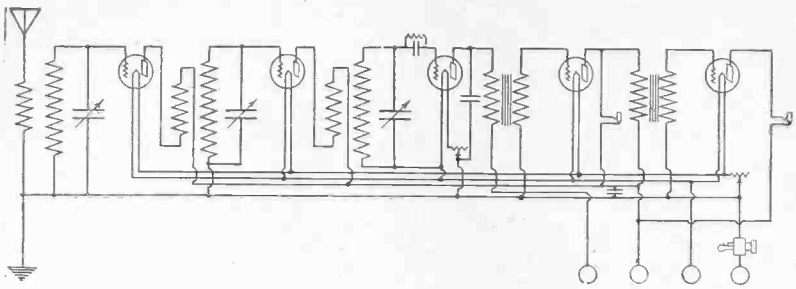

FIG. 337—The diagram of the receiver requested by Jack Brevers.

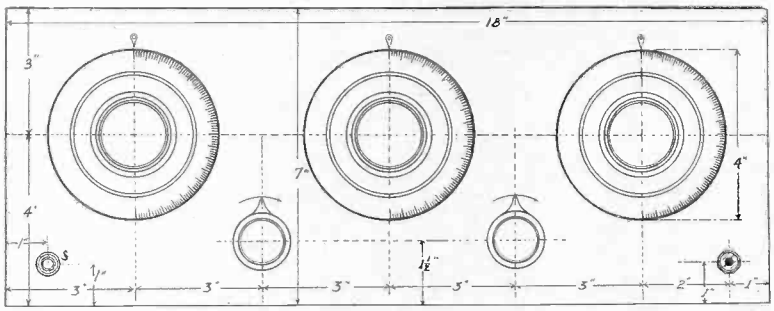

FIG. 338—The panel layout for the set shown in Fig. 337

IN THE April 24 issue of RADIO WORLD there appeared on page 23 an electrical diagram of a 1-tube regenerative receiver, employing a 3-circuit tuner with secondary, so tapped that the low waves could be tuned in with greater volume, etc. (1)—How many turns should be placed on a form 3" in diameter to constitute the primary and the secondary windings? (2)—What size wire should be used? (3)—At what point should the secondary winding be tapped? (4)—How many turns should be placed on a tubing 2½" in diameter, to constitute the tickler? (5)—What size wire should be used here? (6)—What capacity variable condenser shunts the secondary winding? (7)—Can a WD12 tube be used with satisfaction? (8)—Please state the other constants.—Charles B. Rickler, 209 Commonwealth Ave., Springfield, Mass.

(1)—The primary consists of 10 turns. The secondary consists of 45 turns. (2)—No. 22 double cotton covered wire is used. (3)—At the 15th turn from the beginning of the winding. This means, that the tap will be made at the 15th turn from the filament end of the winding. (4)—36. (5)—No. 26 single silk covered. (6)—.0005 mfd. (7)—Yes. (8)—C2 is a .00025 mfd. grid condenser. R2 is a 2 megohm grid leak. R1 is a 10 ohm rheostat. A —01A type tube is used. The plate supply should be 45 volts. The .001 mfd. fixed condenser is an experimental part.

* * *

I WOULD like to have the wiring diagram of a 5-tube receiver employing two stages of tuned radio frequency amplification, a non-regenerative detector and two stages of transformer coupled audio frequency amplification. The filaments of the RF and the AF tubes should be controlled by one rheostat, while the filament of the detector should be controlled by a rheostat. For testing purposes, I would like to have a jack inserted in the output of the first audio tube. The wiring directions of this set, with data on the coils, condensers, etc., and a panel layout using a 7x18" panel would be very much appreciated.—Jack Brevers, Derrick, N. Y.

Fig. 337 shows the electrical diagram of the receiver, while Fig. 338 shows the panel layout. The primaries should be considered as L1, L3 and L5; the secondaries as L2, L4 and L6; the rheostat controlling the RF and the AF tubes as R1; the rheostat controlling the detector tube as R2; the grid condenser as C1; the variable condensers shunting the secondaries of the RFT as C2, C3 and C4; the grid leak as R3; the fixed condenser, by-passing the RF current in the detector tube, as C5; the first audio frequency transformer as AFT1; the second audio frequency transformer as AFT2; the by-pass condenser across the A battery as C6 and the switch as S1. The primaries consist of 10 turns. The secondaries consist of 62 turns. These are wound on a tubing 3" in diameter, using No. 22 ouble cotton covered wire. C2, C3 and C4 are all .00035 mfd. straight line frequency condensers. C1 is a .00025 mfd. fixed condenser. R3 is a 2 megohm leak. C5 is a .001 mfd. fixed condenser. C6 is a .25 mfd. fixed condenser. The jacks on both the first and the second audio outputs are of the single circuit type. Now as to the wiring. Follow the diagram and the text carefully. The beginning of the primary winding, L1, goes to the antenna post. The end of this winding goes to the ground post, to the beginning of the secondary winding L2 and to the rotary plates of C2. The end of the secondary winding, L2, goes to the stationary plates of C2 and to the G post on the first socket. The beginning of L3 goes to the P post on this same socket. The end of this winding goes to the B plus amplifier post, or to the end of the primary winding, L3, to the B plus post on the second AFT and to the bottom terminals of the single circuit jacks. The beginning of the secondary winding, L4, goes to the rotary plates of C3, to the arm of the rheostat, R1, to one terminal of C6, to the F minus posts of the AFT, to the arm of the rheostat, R2, and to one terminal of the switch, S1. The other terminal of this switch goes to the A minus post. All the F plus posts are connected together, then to the A plus battery post. The F minus posts of two RF and the AF tubes are connected to the resistance terminal of R1. The end of L4 goes to the the G post on the second socket and to the stationary plates of C3. The beginning of the primary, L5, goes to the P post on the second socket. The end of this winding goes to the B plus amplifier post. The beginning of the secondary winding, L6, goes to the F plus post on the third socket and to the rotary plates of C4. The end of this winding goes to the stationary plates of C4 and to one terminal of C1 and R3. The other terminal of this combination goes to the G post on the third socket. The P post on the third socket goes to one terminal of C5. The other terminal of this condenser goes to the arm of R2. The P post of the third socket also goes to the P post on AFT1. The G post on this AFT goes to the G post on the fourth socket. The P post on this socket goes to the P post on AFT2 and to the top terminal of one single circuit jack. The G post on this AFT goes to the G post of the last socket. The P post on this socket goes to the top terminal of the other single circuit jack. As to the panel layout. Four inch dials are used. R1 is placed between the dial on the shaft of C1 and the dial on the shaft of C2. R2 is placed between the other two dials. The knobs on the shafts of the rheostats should be

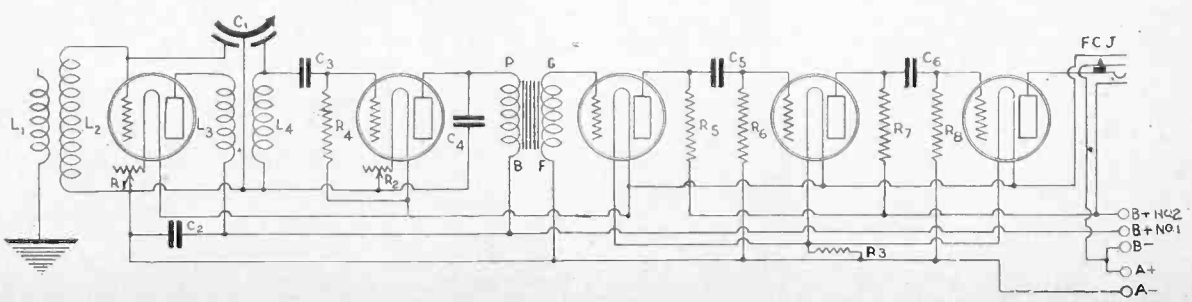

FIG. 339—The electrical diagram of a 1-control, 5-tube receiver.

1¾" in diameter. It will be noted that there is no provision made for the single circuit jack on the first audio output. This being experimental, it should be placed in an upright position, mounted on an angle iron, on the baseboard. The switch is indicated by S. The coils may be mounted directly on the end plates of the variable condenser, in such position that the stray-coupling effect will be as nearly nil as possible, e. g., the middle RFT, L2L4, perfectly erect, L1L3 with its winding turning away from L2L4 and L5L6 mounted in the opposite direction. This method is used in the BST-6, described in the April 24, 1926, issue of RADIO WORLD. Both the transformers used should be of the low ratio type, e. g., 3 to 1. No C battery is used. If desired, this may be installed on the last tube, it being not necessary on the first audio tube. This is done by breaking the F minus lead of the last AFT and running it to the C minus post, the plus post of this battery running to the A minus post.

* * *

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Such a receiver is shown in schematic form in Fig. 339. The primaries L1 and L3, consist of 10 turns. The secondaries, L2 and L4, consist of 45 turns, wound on a tubing 3¼" in diameter. No. 22 double cotton covered wire is used. There is a ⅛" space left between the primary and the secondary windings. C1 is the double condenser. Each section has a capacity of .0005 mfd. C3 is the grid condenser. This has a capacity of .00025 mfd. R4 is the grid leak, which has a resistance of 2 megohms. C2 and C4 are both .001 mfd. fixed condensers, both of which serve as by-pass condensers. R1 and R2 10 ohm rheostats. R5, R6 and R7 are .1 megohm resistors of the fixed type. R8 is, however, a .5 megohm resistor. C5 and C6 are .25 mfd. fixed condensers. R3 is a ¾ ampere ballast resistor. FCJ is a single circuit, filament control jack. When the plug is inserted, the plus posts of the sockets holding the AF tubes are connected with the A plus post. The plates of the three AF tubes receive at least 135 volts. The plates of the RF and the detector tubes receive 45 volts. If it is found that the detector tube oscillates beyond control, break the common B plus lead and place a special voltage here, about 22½. If it is found that the signals are distorted, bring the bottom terminal of the jack to a separate post, where the 90 or 112 volt post from the B batteries should be connected. The terminal of R8 that goes to the A minus terminal can be brought to a C minus terminal of a 4.5 or 9 volt C battery, depending upon the B voltage as another method of preventing distortion.

* * *

I AM an amateur and very much interested in short wave reception. I have heard that the A. H. Grebe Co., of Richmond Hill, N. Y., have put out a receiver type CR-18, which has a wavelength range with a special plug in system used, from 8.5 to 216 meters. An electrical diagram of this receiver with the coil and condenser date, etc., would be greatly appreciated.—Clifton Stagg, Preston, Cal.

Fig. 340, shows the diagram of this receiver. L is the adjustable antenna or primary coil, consisting of 8 turns wound on a 3" diameter, using No. 16 single cotton covered wire. This 3" diameter form is not the common type of bakelite or hard rubber. It is a special air wound coil, with a special method of mounting. The secondary, L2 and L3, are wound on a form exactly the same as that of the antenna coil, with the same type of wire. The following table gives the winding data for these coils. The coils are numbered as it will be noted from the table.

Coil No.	Wave-length Range in Meters	L2	Space	L3	Frequency Range Mega-Cycles
1	8.5 to 18	1	1	2	16.6 to 35
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All coils are wound 10 turns to the inch. Where 1 is present underneath the space column, a 1/10" space is left, etc. C1 is a .00013 mfd. variable condenser. C2 is a .000003 mfd. C4 is a .00022 mfd. variable condenser. R1 is a 7 megohm grid leak. C3 is a .0004 mfd. fixed condenser. R1 is approximately a 10 rheostat. R3 is a 25,000 ohm resistance.

* * *

THE SCHEMATIC diagram of a B eliminator employing the Raytheon tube is requested. The data on the transformers, chokes, condensers, wiring, operation, etc., are also desired.—Charles Legere, Royalton, Ill.

Fig 341, shows the electrical diagram of this eliminator. The core, or that upon which the wire is wound, consists of 128 laminations, ¾" high and 1" wide. The primary, L1, consists of 1,200 turns of No. 26 enameled wire. The tap (90% tap) is made at the 1,000th turn. The secondary, L2L3, consists of 4,400 turns of No. 31 enameled wire. The tap is taken at the 2,200th turn. Both choke coils L4 and L5, consist of 5,950 turns of No. 31 enameled wire, wound upon the same type of core as that of the transformer, just described. Over the primary, a few layers of .014" thick manila paper are placed. The beginning of some No. 18 double cotton covered wire is brought directly to the core. This wire is then brought to ⅛" from the edge and turns are wound until, ⅛" from the opposite edge. This end of the wire is left open. This is known as the static shield. Over this wire, a few more layers of .014" thick paper are placed. See the Dec. 19, 1925 issue of RADIO WORLD for complete data, as how to make the core, etc. C1 and C2 are both 0.1 mfd. fixed condensers. C3 and C4 are 2 mfd. fixed condensers. C5 is an 8 mfd. fixed condenser. C6 is a .5 mfd. fixed condenser. R1 is the variable resistance, being variable from zero to 5 megohms. R2 is a 20,000 ohm resistor. The two taps on L1, are brought to two switch points. The switch arm is then brought to a terminal going to the AC line. The other terminal of L1, which has no taps, is brought to a terminal of a fuse. The other terminal of this fuse is brought to a terminal of a switch, not shown in the diagram. The other terminal of the switch is brought to the other terminal going to the AC line. One end of the secondary winding, L2, is connected to one terminal of C1 and to the anode of the tube. The tapped portion of this secondary winding is brought to the other terminal of C1 and a terminal of C2. The other terminal of C2 is connected to the other anode and the other terminal of the secondary winding. The cathode of the tube is brought to one terminal of C3 and L4. The other terminal of L4 is connected to a terminal of L5 and C4. The other terminal of L5 is con-

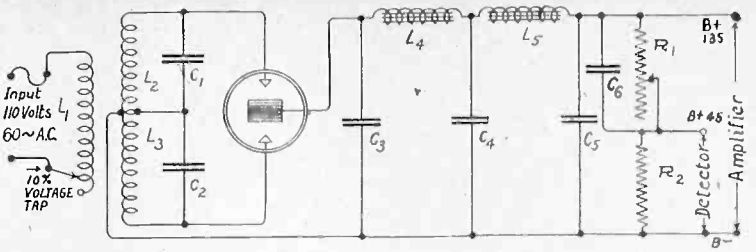
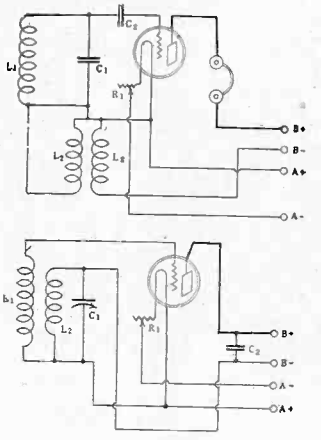


FIG. 341—The electrical diagram of the Raytheon B eliminator unit.



FIGS. 342 AND 343—(Top to bottom.)

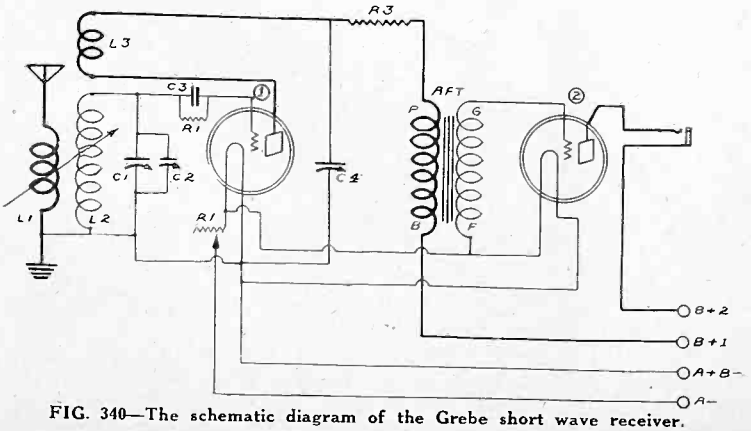


FIG. 340—The schematic diagram of the Grebe short wave receiver.

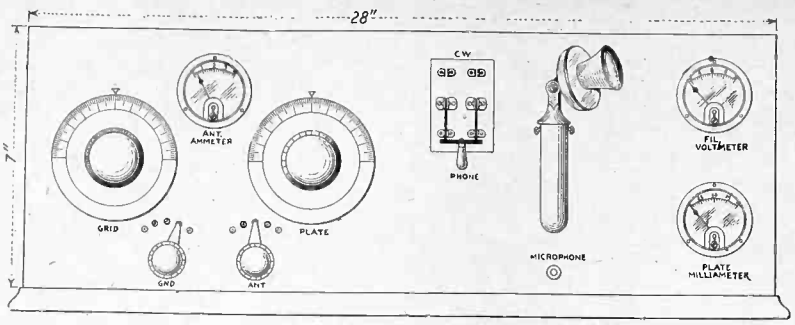


FIG. 344—The panel layout for the transmitter.

nected to the B plus 135 volts post, to a terminal of C5, C6 and the resistance post of R1. The other terminal of C3, C4 and C5 are connected together and to the B minus post. It also goes to the one terminal of R2. The other terminal of R2 is connected to the B plus detector post, to the arm of R1 and to the other terminal of C6. The capacity of the fuse in the input line, will depend upon the number of amperes the primary winding of the transformer draws. That is, if it draws about 1 ampere, then about a 2 ampere fuse should be employed. It will be noted that the capacity of fuses in some B eliminator articles, was 25 amperes. This should have been 2.5 amperes and was a typographical error. With some commercial transformers, it will be found that only a 1 ampere fuse is needed, this being due to the low amount of amperes that the primary winding draws. The parts for this eliminator can be placed on a metal or a wooden baseboard, the metal being preferred. This should be 11⅞" long and 5⅞" wide. This will give one plenty of elbow space for wiring, which by the way, should be done with the aid of No. 14 rubber covered wire. This may be of the fiexible type. Although a porcelain base is desired for mounting the tube, it is not absolutely necessary. All leads should be soldered or bolted down, securely. The complete eliminator should never be placed near the receiver. About a foot distance is o.k.

* * *

PLEASE SHOW two methods of obtaining oscillations from a 3-element vacuum tube, giving specific constants of parts used, to obtain them from the tube. Explain the method of obtaining these oscillations.—Stanley Wilson, Peterson, Minn.

Figs. 342 and 343 respectively, show these methods. The top diagram represents a circuit in which the natural frequency of the grid circuit equals the frequency by which the changes of current take place throughout the entire oscillating system. It has been stated by Major Edwin H. Armstrong that amplification equal to that which is obtained from several stages of 3 element tubes, connected up in standard RF coupling fashion may be taken from a single tube, by the use of regeneration. Instead of coupling the voltage applied to the grid of one tube, to the next, or that applied to L2, it is fed back to the grid circuit of the same tube. This increases the effect of the voltage operating upon the tube. That is, alternations applied to the plate are increased in size and when placed into the grid circuit again, increases the effect of voltage placed upon the grid. Now in Fig. 342, L2 and L3 constitute the feed-back. If the coupling between these coils is increased, the emf fed back will become larger than required. In this manner no matter how small the oscillations may be in the L1, L2, C1 circuit, they will be built up in amplitude, until a peak determined by the specific characteristics of the tube and surrounding circuit, is arrived at. Fig. 343, shows a more powerful method of obtaining oscillations from a tube. In order to carry out these theoretical considerations in practise the following requested data are given. The constants for the apparatus in Fig. 342 will first be considered. L1 consists of 34 turns wound a tubing 3½" in diameter, 4" high. L2, L3 are also wound on the same tubing. L2 consists of 10 turns, while L3 consists of 35 turns. C1 is a .0005 mfd. variable condenser, although not shown diagrammatically, in that fashion. C2 is the common grid condenser, having a capacity of .00025. The grid condenser, which is not shown and which may or may not be required, due to the operating characteristics of the tube, is a 2 megohmer. Now as to the data for the coils, etc., in Fig. 343. L1, L2 are both wound on one tubing, which is 4" in diameter and about 5" high. L1 consists of 37 turns, while L2 consists of 36 turns. It might be found that, by moving the P and S windings further or nearer apart, an effect upon the output results may be had. This, of course, will show that such coupling has an effect upon the oscillator action of the tube, even though a variable capacity is aiding this action as in Fig. 343. C1 in this Fig. is a .0005 mfd. variable type, while C2 is a .001 mfd. fixed type. Although the grid condenser and leak combination is left out, it may be inserted in series with the grid of the tube, the constants being the same as that for those in Fig. 342. No. 24 double cotton covered wire may be employed when winding all these coils. The —01A type tubes will be found to be very stable oscillators. Also a high plate voltage can be applied to the plates of these tubes, with the result that a greater oscillatory action is obtainable. Although 45 volts is suitable to use as a plate supply, a higher or lower voltage will give contrasting results. A milliameter placed in series with the plate leads, as well as a low reading voltmeter placed in shunt to the grid filament circuits, are absolutely necessary to obtain scientifically accurate results, the readings being placed upon a graph for future reference. These instruments were left out of the diagram so that the wiring of the oscillatory circuit would not be difficult to follow. It must be remembered that when making these tests, the capacity and inductance of the socket, base of the tube, phones, connecting wire, are to be calculated or known. Otherwise, when desiring to use these schemes practically in circuits, the insertion of such apparatus with different constants will have a tendency to vary the results greatly. True, these variations are originally small, but the small ones build up, causing a great variation. The meters of course will change the constants, but the difference here will be negligible. That is, the same meters may be installed with specific lengths of test wire to the circuits at all times. These have nothing to do with the actual working of the circuit, as they are disconnected soon after test, while the sockets, etc. are always in the circuits. The constants of most meters, at any rate, may be obtained from the manufacturer.

I AM going to construct a transmitter in which two 5-watt tubes are employed. I have the wiring diagram of such a set, but would like to have a neat panel layout. Herewith is the "dope" on the coils, condenser, etc., and also the wiring of the transmitter so that it will be clear as how to place and mount the parts, etc. which I would like to know, also. The antenna coil, L1, consists of 30 turns wound on an air form 6" in diameter, using No. 14 bare ribbon copper wire, spaced every ¼". A grid coil, known as L2, consists of 10 turns, wound on a air form 4" in diameter, spaced every ⅛", using the same wire as the antenna coil. The plate coil, known as L3, consists of 20 turns, also wound on a 4" air form and spaced every ⅜", using the same wire as the antenna coil. Across these coils are shunted .0005 mfd. variable condensers. The plate condenser is known as C2, while the grid condenser is known as C1. These coils are mounted within the antenna coil on special bakelite brackets. They may be moved about, and resemble very much that of a variable primary in the present day RF coils. These coils and condensers will tune from 200 to 300 meters, when the resistance of the antenna is 15 ohms and the efficiency of the oscillator system is about 50%. The grid condensers, C3 and C4 are .002 mfd., fixed. The grid leaks, R1 and R2 are 10,000 ohms, fixed. These two 5-watt tubes are so arranged that they both can be used for CW, giving a total of 10 watts, or one can be used as an oscillator and one as a modulator, the Heising system of moduation being employed. A double throw double pole switch is used for this purpose. A chemical rectifier, using one-half of the wave is used for supplying the plate voltage. The filter system is a simple fixed condenser, shunt choke idea. A 250 turn choke coil is connected in series with the grid of the second or switch modulator tube and the secondary of the modulator transformer. The antenna coil is tapped every three turns, five being in the antenna circuit and five in the ground circuit. Three meters are employed, viz., one an antenna ammeter, which is in series with the antenna; a filament voltmeter, and a plate milliammeter. Now as to the wiring. The antenna post goes to a terminal of the ammeter, while the other terminal is brought to the antenna switch arm. The five taps of the 15 turn portion of the coil are brought to their respective tap points. The other 5 taps on the other 15 turn portion of the coil are brought to their tap points, with the arm being brought to the ground post. The beginning of the grid coil, L2, is brought to the rotary plates of C1, to the minus terminal of a C battery (15 volts variable), to a common ground terminal, to the minus terminal of the chemical rectifier and to the center tap on the secondary winding of the step-down portion of the alternating current transformer. The beginning of this grid coil goes to the stationary plates of C1, to one terminal of a 1 mfd. (C5) key by-passing condenser and to the base of the key. The other terminal of this condenser is brought to the open or free moving portion of the key, to one terminal of R1 and R2 and to one terminal of C3 and C4. The other terminal of C3 goes to the other terminal of R1, to the G post on the socket which will hold the original oscillator tube, and to a terminal of a small, 3/16" gap, which is there, I understand, to prevent any surges in the key circuit, etc. The other terminal of the gap is brought to either the F minus or plus terminals on the oscillator socket. Holding the switch lengthwise, the upper left hand post is marked A, the upper right hand post being marked B, the left hand center post is marked D, the right hand center post is marked C, the bottom left hand post is marked F, while the bottom right hand post is marked E. The other terminal of R2 and C4 are brought to A on the

switch. D is brought to a terminal of another small 3/16" gap and to the G post on the other socket. The other terminal of the gaps, goes to the F minus or plus post (to the same post the gap was connected on the other socket.) The beginning of the plate coil, L3, is connected to the rotary plates of C2 and to the P post on the first socket. This same connection is also brought to the terminal B on the switch. Terminal C goes to the P post on the other socket. Terminal E is conected to the end of the plate winding, L3, to the stationery plates of C2, to the plus terminal of the rectifier and to one terminal of the choke and condenser in the filter circuit. Terminal F is connected to a terminal of the RF choke coil, while the other terminal goes to the G post on the modulation transformer. The other terminal of the secondary of the modulation transformer goes to the plus of the C battery and to a terminal of the primary winding. The other terminal of the primary winding, is brought to the one terminal of a switch. The other terminal of this switch is brought to the G terminal on the michrophone. The other terminal of the michrophone goes to the minus post on the C battery, this being one of the variable posts. The filament voltmeter is shunted across the filaments, while the plate milliameter is connected in series with the minus terminal of the rectifier. I am going to use a small hand michrophone. I wish to use a 7x28" panel.—Arnold Fiat, Epworth, Mo.

Fig. 344, shows the panel layout for the transmitter which you described. The tubes should be mounted directly in back of the plate and filament meters. The coil should be placed horizontally on the baseboard, in back of the condensers and taps. This should be mounted in this position so that the variable coils can be accessible. The power transformer, chemical coils, choke coil and condenser should be mounted in a separated cabinet, about 7" high, 14" long and 10" wide. The modulation transformer should be mounted in back of the michrophone. The terminal strip, should be placed in back of the coil. In your description, there is no mention of a filament control or switch. Although rheostats are not necessary, and are not placed on the panel, they may be used, for vernier control. If so, they can be placed underneath the switch block. They should be inserted in series with the filament leads and have a resistance of approximately 6 ohms, being able to pass 2 amperes each. The switches are not shown on the panel layout either. It was not known as to which you might wish to install. These might be placed underneath the switch block, on the panel layout. They should be connected in series with the filaments of the respective tubes. The holes for the meters need be about 2" in diameter, depending upon the exact type you are going to use, most of which have the same dimensions. The dials are of the 4" type. The switch block may be porcelain or bakelite. If bakelite, it will have to be made, by taking the contacts off the porcelain block and bolting them on. The small bakelite switch should not be used, as they cannot pass any kind of a load, burning out very shortly. The key is placed on a separate board, either on back of the baseboard of the transmitter or outside. It should be screwed down securely, to some base though.

* * *

PLEASE DESCRIBE in detail a full wave eliminator, to be used on the 110 volt, 60 cycle line, using three standard audio frequency transformers, two as a means of stepping up the voltage for the plate supply, one as a choke coil; a bell ringing transformer, with a 6 volt output and two —01A tubes, etc.—Roland Starck, West Sterling, Mass.

The P and the B posts of both the transformers are connected to each other. This

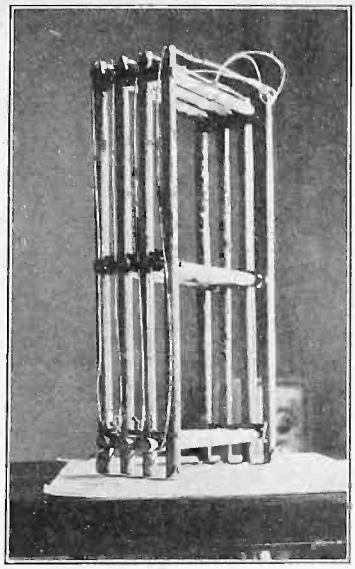


FIG. 345
The photo of the antenna coupler for the Super-Heterodyne.

results in two common leads. The common B leads are connected to one side of the 110 volt line, while the common P leads are brought to the other side of the 110 volt AC line. The G and P posts on both sockets are connected together, leaving three terminals on each socket. One terminal of the input of the bell transformer is brought to one terminal of the 110 volt line. The other terminal of this transformer is brought to the other terminal of the AC line. This means that the input winding is placed in shunt to the line and to the primary windings of the audio frequency transformers. The G post of one of the AFT is brought to the F post of the other AFT. The G post on this same AFT is brought to the GP post on one of the sockets. The F post on the other AFT is brought to the GP post on the other socket. One terminal of the output of the bell transformer is brought to the F minus or plus posts of both sockets. The other terminal of this winding is brought to the arm of a 20 ohm rheostat. The resistance terminal of this rheostat is brought to the other F terminals on both sockets. It does not matter in which leg the rheostat is placed, as the current fed to the filament is alternating. However, be sure that the pluses or minuses of both sockets are connected together, and not minus to plus, etc. It will be remembered that the F and G posts of the AFT were at one point joined together, while the same posts at opposite points were brought to the GP posts on both sockets. The F and G joint is brought to the G post on another AFT (this is a new one), and to a terminal of a fixed condenser, having a capacity of 2 mfd. The P post on this AFT is brought to the resistance terminal of the 20 ohm rheostat and to the other terminal of the 2 mfd. fixed condenser. The B post on this AFT is brought to the external B plus Amp. post and to one terminal of another 2 mfd. fixed condenser. The other terminal of this condenser is brought to the F post on this AFT and to the external B minus post. The B post on this AFT goes to one terminal of a variable resistance, being variable from zero to about ten megohms. The other terminal of this resistance is brought to the external B plus detector post. By connecting the grid and the plate together, a larger plate rectifying surface is obtained. Only two elements, a filament and a plate, are needed for rectifying action, therefore the tying together of these elements, which is an aiding factor, as was just stated. It should be noted that the secondaries of the AFT are connected in series. The audio transformers employed should not have a higher ratio step up than 3 to 1. Instead of the bell transformer, a toy transformer may be employed, the same connections holding true.

* * *

I READ with great interest the description on how to make an antenna coupler for the Super-Heterodyne in the May 15 issue of RADIO WORLD. However, I am a bit puzzled as to the exact making of this piece of apparatus. A picture of such a coil would clear matters up, I think.—Merton Rea, Columbus, Ky.

Fig. 345, shows a photograph of such a coil. It will be noted that the coil resembles very much that of a box loop. It has not, however, any directical qualities.

* * *

I HAVE built the 3-Tube Quality receiver described by Brainard Foote in the Feb. 20, 1926, issue of RADIO WORLD. The volume on signals above 400 meters is great, but below that it is poor. (1)—What can I do to rectify this? (2)—Is R2 a 1.0 megohm resister? (3)—Would it be better to use two low ratio AFT, or one high and one low ratio AFT in the 4-tube Diamond?—J. M. Marcott, 601 North Nicholson Ave., Monterey Park, Cal.

(1)—Take 10 turns off the honeycomb coil, L1. (2)—No, it is a .1 megohm resistor. (3)—Use two low ratio AFT.

RADIO BOARD OF 5 BACKED BY SENATORS

The Committee Rejects Coolidge Plan of Executive Control and Ballots to Strip Hoover of Power.

DILL BILL APPROVED

Summary of Its Terms—Recommendations of the Fourth Conference Ignored.

The Commission plan of radio control, as opposed to the executive plan favored by President Coolidge, was adopted by the Senate Interstate Commerce Committee when it voted favorably on the new Dill bill. A special commission of five, at $12,000 a year for each commissioner, is provided. Secretary Hoover would be stripped of his radio power. The bill now goes to the Senate. It has not been considered by the House, which adopted the White bill, which Hoover favors.

If the Senate passes the bill it would go before a joint committee of Senate and House.

The Dill bill ignores the recommendations of the Fourth National Radio Conference.

WASHINGTON

Whether Secretary Hoover is to be backed up in his control of radio or whether it is to be given over to a commission is the crux of the present fight in the Senate. There are many other features in the White bill as amended by the Senate Interstate Commerce Committee likely to arouse controversy. In reality it is a substitute bill written by Senator Dill, of Washington State.

Some of the problems are: Can this bill pass the Senate? If so, would the House concur? Would President Coolidge sign the bill? (Five members would draw $12,000 each). Could all this be accomplished in the remaining few weeks?

The bill, comprising 30 printed pages, seems to deal with every phase of radio that anybody has been able to think of. The question of state rights is raised where it speaks of the "right of each state to have allocated to it * * * * * the use of a wavelength for at least one broadcasting station." The commission would determine the power and wavelength of each station in chain broadcasting and when a charge is made to listeners would see that it was not unjust or unreasonable.

To Prevent Wavelength Speculation

Specifying that a license shall be granted for a period of only two years, that it does not carry with it any vested property right, the bill provides that a license or broadcasting station shall not be disposed of or transferred to another owner without the consent of the commission," and said exchange value shall in no case exceed the original cost of the station apparatus, and the same provision shall apply to fixtures, studio and equipment thereof if they are transferred with the apparatus."

Anti-monopoly provisions also are calculated to draw fire, e. g:

"The shares directly or indirectly owned or controlled by the applicant in any corporation or association engaged in the business of manufacturing, using, purchasing, or selling apparatus for the transmission or reception of radio communications."

According to one interpretation, if on the face of the evidence a concern is, in the opinion of the commission, a monopoly, a license may be refused and there would be no adequate court appeal.

Discrimination and Slander

Discrimination against those desiring to go on the air, censorship, slander and the like are dealt with at length and repeatedly. The first of these references is that a license may be revocable if a station "has made any unjust and unreasonable charge, or has been guilty of any indiscrimination." One person construed this to mean if a station allowed a hotel orchestra, for instance, to go on the air, it would have to allow *all* other hotel orchestras the same privilege no matter how many applied.

The slander clause reads that "no person shall knowingly utter any false or fraudulent radio communication, nor any libelous or slanderous communication by radio, and the violation of this section shall be punishable by a fine not exceeding $1,000 or one year in jail, or both."

Don't Want Candidates Censored

After setting forth in Section 4 that all advertising matter shall be announced as "paid for or furnished by" the person paying for it, there comes the clause that refers to time bought on the air for political purposes:

"If any licensee shall permit a broadcasting station to be used as set forth in Section 4, or by a candidate or candidates for any public office, or for the discussion of any question affecting the public, he shall make no discrimination as to the use of such broadcasting station, and with respect to said matters the licensee shall be deemed a common carrier in interstate commerce: Provided, That such licensee shall have no power to censor the material broadcast except so as to prevent false, fraudulent, obscene, indecent, profane, libelous or slanderous statements."

May Permit Direct Advertising

Likewise since the above amendment evidently refers back to Section 4, the paid advertising clause, it may be construed to mean that if an advertiser pays for his time he may say what he wants to say uncensored. Up to now the general practice has been for the advertising to be indirect, that is permissible to mention a firm name but omit prices. Under the new bill, it would appear an advertiser, as well as a political candidate, would be able to say anything he pleased.

The right of free speech is again referred to in Section 8 which reads: "Nothing in this act shall be understood or construed to give the commission the power of censorship and no regulation shall be fixed which shall interfere with the right of free speech, except that no person shall utter any obscene, indecent or profane language by means of radio."

Those having to do with navigation have expressed some concern in reading Section 6 that it does not specify that coastwise broadcasting stations, at least, shall close down during the period of an SOS. It does provide, however, that such stations would be required to keep a competent operator listening in for SOS signals.

Scope of Authority

If the bill were passed as now written, the radio commission would have authority to "classify licensed radio stations and the operators required therein; prescribe the nature of the service to be rendered by each class; designate call letters or names, assign bands of frequencies or wavelengths to the various classes of stations, and assign frequencies or wavelengths for each individual station and determine the power which each station shall use and the time during which it may operate.

Deadlock Is Prophesied By Broadcasters' Group

The National Broadcasters Association made the following statement on the Congressional legislative situation:

"It is believed the Senate will not pass any bill which places radio control in the Department of Commerce.

"The administration strongly favors keeping radio control in the Department of Commerce, or the Interstate Commerce Commission. When and if the Senate passes a bill providing for an independent radio commission, or places radio in the Interstate Commerce Commission, it will be sent to a Committee on Conference, probably consisting of three members from the House and three from the Senate.

"The House having already passed the White Bill leaving radio control in the Department of Commerce undoubtedly will cause its members of the Conference Committee to stand pat, and the Senate members will hold for the independent radio commission, or the Interstate Commerce Commission.

"A deadlock is possible."

Censorship Experience Guided One Senator

WASHINGTON

When the Senate committee was considering the radio control bill, the question of propaganda which might be disseminated by a radio station or speeches which might be censored seemed to concern the Senators greatly.

It is said the central figure of the discussion was an outstanding Administration Senator whose political friends a year or so ago are declared to have bought time for him at a certain radio station. However, just before the speech was to be delivered this Senator was asked to send a copy of his remarks that they might be looked over by the station manager. This he refused to do.

The speech was never delivered and if the story be true, it was supposed to be this Senator who argued long and earnestly with fellow members of his committee in an effort to include provisions in the bill to safeguard future political campaigns.

Seance Is Broadcast To Regale the Curious

CHICAGO

For the first time in the history of radio an attempt was made to broadcast a spiritual seance. Hundreds of thousands of persons, who may not believe in spiritualism, had an opportunity to "attend" a regular spiritualist "circle" and hear what were claimed to be the voices of the dead.

Arrangements for this experiment were made by Charles Garland, broadcasting director of WBBM, the Stewart-Warner Air Theater, Chicago. The medium was a former Chicago woman, now a resident of St. Joseph, Michigan, and a member of the national spiritualists' organization.

In announcing the test, Mr. Garland said: "In conducting the experiment, WBBM does not place itself in the position of sponsoring spiritualism in any way. This subject is controversial and we are not aligning ourselves either for or against those who believe the voices of departed persons can come back from the beyond. We do believe, however, that there are hundreds of thousands of persons who have some curiosity or interest in spiritism. It is a subject that has been widely discussed both here and abroad. Consequently in attempting to put a seance on the air we do it only with thought in mind that it is an interesting experiment.

"I have attended a demonstration seance and have convinced myself that the medium is competent to conduct a seance. She declares that she has had the powers she professes since she was a child of nine years. At the demonstration I heard voices that were claimed to be those of Carter Harrison, former mayor of Chicago, Abraham Lincoln, Theodore Roosevelt and others. WBBM, however, assumes no responsibility as to the truth or falsity of the claims made by her."

The seance was staged in the station studio, which was darkened in compliance with the usual request of media. It is asserted that darkness is more conducive to the proper reception of the spirit visitors. While the medium went into a trance-like state, Nate Caldwell, announcer, gave a description of the experiment.

Not a Success

The seance broadcast did not prove a success. The station was literally swamped with telephone calls, telegrams and other forms of requests for questions to be answered.

The medium, Mrs. Tina Moser, is a member of the Chicago League of the National Spiritualistic Society and is a certified medium. The seance was held in the Broadmoor Hotel Studio of the station and was a regular spiritualistic "circle." Mrs. Moser was seated in a chair and in front of her on a small wooden bench was placed a small tin trumpet. She was questioned by members of the studio staff who were permitted to sit in.

Insofar as the broadcasting is concerned one could hear the questions easily. The answers that were supposed to come from persons now dead, among them Napoleon Bonaparte, Robert Ingersoll and others, could hardly be distinguished.

A Champion Soprano

HILDA HOPKINS BURKE, soprano of WBAL, Baltimore, Md., who is heard every Tuesday night between 8 and 9 P. M., E. E. T. Miss Burke was chosen as the best soprano at a municipal vocal contest.

Organist's Psychology Makes Audience Sing

CHICAGO.

"Radio psychology"—that mysterious something which enables the broadcasting artist to sway his unseen audiences—has often been discussed but never explained. A vivid example of it is seen in the experience of Henri A. Keates, organist, popular member of the Paul Ash musical organization which broadcasts from McVickers theatre over Westinghouse Station KYW. Keates has become famous for his ability to make theatre audiences join in "community singing." Thousands in the theatre audience unite in singing while he plays, something never before successfully accomplished in a Chicago theatre, where the community spirit often is lost in the "big city" crowds. Yet Keates never says a word to the audiences, conveying his message entirely through the organ and on the screen. The strange thing is that Keates exerts the same psychological influence on his radio audiences!

This is indicated by the hundreds of letters he receives telling him that entire families and even groups of neighbors gather to hear the organ recitals and sing with him. The other day he tabulated his mail and found that letters, referring to a single one of his recitals, indicated that groups of listeners from three to nearly 100 were singing in towns and cities scattered from coast to coast. In Olathe, Kansas, one letter stated, a school room filled with country folk held a community sing while Keates' music came in over KYW.

"Singing will cure or prevent most human ills," says Keates. "It is almost as natural for human beings to sing as for birds—but they need encouragement. Radio can make America a singing nation—which means a happy nation and a nation that can conquer anything."

West Point Academy To Have Own Station

Because cadets come from every state in the Union there is more than passing interest in the announcement that West Point is to have its own broadcasting station. It will be located above the picturesque Cadet Chapel, overlooking the Hudson River, and concerts will be given by the Military Academy Band of 58 pieces, the great organ, and the cadet choir of 150 voices.

A Stumbling Block

Miss Grace Hazen, a physicist in the radio laboratory at the U. S. Bureau of Standards, one of the few women in radio scientific work, was asked if she ever got so that she pronounced the word physicist with ease.

"No," she replied, "I never could."

Foster to Be Honored With U. S. on July 4

Radio will be used extensively July 4 in the celebration of the one hundredth anniversary of the birth of Stephen Foster, composer of "My Old Kentucky Home," "Massa's in the Cold, Cold Ground," "Down on the Suwanee River," and numerous other famous songs. The exercises will be broadcast from Pittsburgh, where Foster was born.

A bill has just been introduced in Congress by Representative Porter, of Pittsburgh, which provides for an issue of memorial half dollars to be put into circulation in commemoration of the event.

Antennas Standardized By Apartment Houses

To avoid a jungle of all sizes and heights of antennas the roofs of new apartment houses are being equipped with frames, made of piping, from which antenna wires may be uniformly strung.

By means of the frames the wires are also placed high enough above the roof to comply with fire department regulations and so that when a person walks about the roof the wires are well overhead.

RADIO BOON IN STRIKE

So essential has radio become that it was one of the very few agencies that continued to operate during the British strike. It was the most effective instrument the Government had for quieting rumor and disseminating news.

Berlin Radio Gurdy Proves Profitable

(*Herbert*)

WITH HIS portable receiver hanging to his belt and holding an umbrella type antenna in one hand and a loud speaker in the other, the Radio Music Man of Berlin is wheeled about by a pretty girl. His business is profitable.

A Jaunter's Aerial

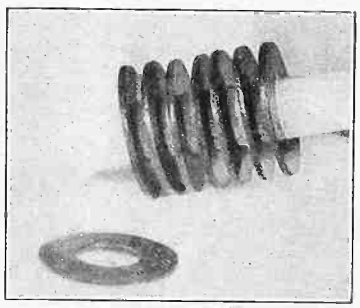
(*Hayden*)

TIE a stone to one end of a stretch of aerial wire, and throw the stone over a tree. You then have a temporary antenna for your portable, and may crouch with some assurance you will bring in a station. The ground may be another stretch, laid on the ground, or a short piece buried in the earth.

The Musical Homers

BEFORE the WEAF microphone are shown Louis Homer, contralto; Katherine, her daughter, a soprano; and Sidney Homer, husband of the contralto. Mother and daughter sing many duets and dad does the piano.

A Simple RF Choke



(*Hayden*)

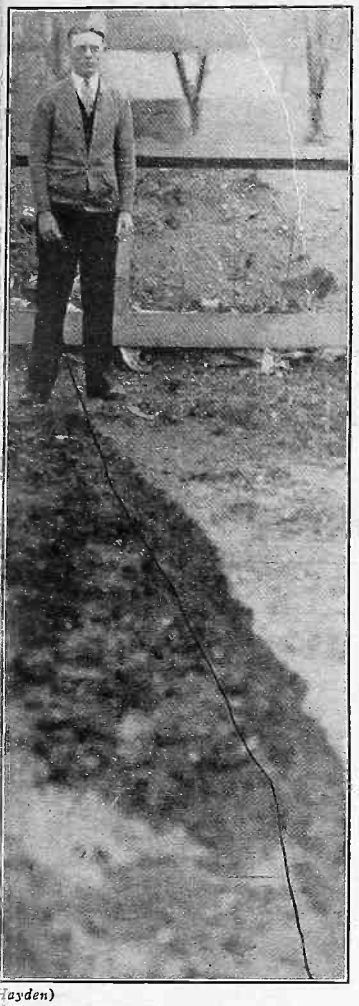
EFFICIENT RF choke coils may be made by placing the windings in a slotted form having 15 slots, about 1/16" wide, and separated 3/8", wound in a haphazard manner. However, such a form is difficult to make. Instead, one may get a dowel stick about 3/4" in diameter and eight rubber washers having a diameter that will just pass over the stick. Wind a turn of twine around the dowel between each pair of washers, for spacing, and fill up the slots with No. 34 SSC wire, or until about 200 turns are wound. This is placed in series with the detector plate.

A Ditched Ground

(*Hayden*)

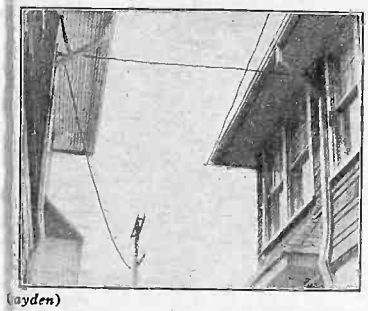
WHEN you desire to use a buried ground wire, terminate it as a large piece of metal, even bolting it to a tin pail, then pour a bag of charcoal in the ditch. This helps keep the ground moist.

An Underground Aerial



(Hayden)
EXPERIMENTS may be made with buried antenna by cutting a wide channel in the earth and burying heavy rubber covered wire. Reception proves radio waves penetrate the earth.

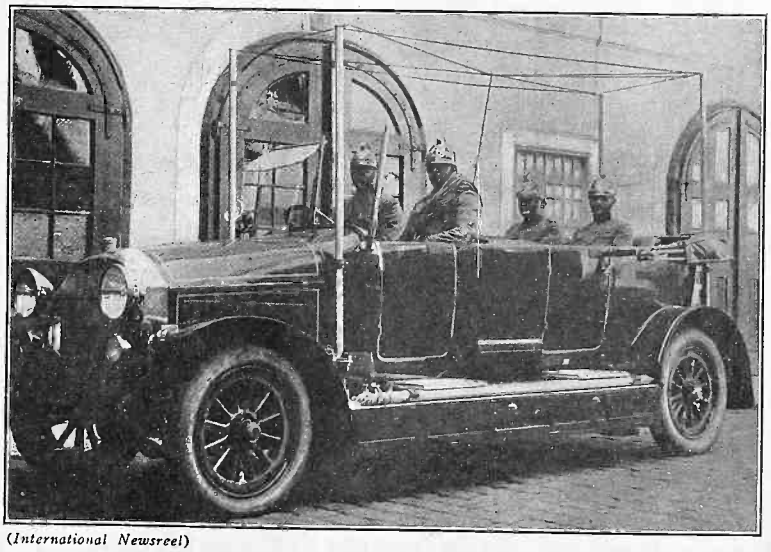
An Invitation to the Hum



(Hayden)
WHEN a power line comes into house as shown the aerial leadin always should be brought in at right angles to the line to avoid hum pick-up.

Artists Who Appeared at Opening of WHAD

FIFTY-EIGHT persons were on the program opening WHAD, 275 meters, the Marquette University-Milwaukee Journal station, at Milwaukee. The Dvorak trio were heard, two of them being shown above; Marie Strasen, cellist (A); and pearl Brice, violinist (D). The staff soprano is Clementine Malek (C). Wally Seitz (right), and "Doc" Dorward are rollicking ditty specialists at the station (B).



(International Newsreel)
RADIO TRANSMITTING and receiving apparatus is now being installed in the hurry call cars of the fire department in Vienna. One of the cars is shown above.

A THOUGHT FOR THE WEEK

THE general strike in England, the enforced suspension of the great London dailies, and the consequent use of radio to disseminate news throughout the British Isles, has led to the query: "Is radio finally to supersede the printed word?" A far cry to be sure—but permit us again to call your attention to the millions, including scientists, who said the heavier-than-air proposition was a madman's dream.

RADIO WORLD

REG. U.S. PAT. OFF.

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

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

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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
⅓ Page, 3¼" D. C.	231 lines	150.00
¼ Page, 4⅛" D. C.	116 lines	75.00
1 Column, 2¾"x11"	154 lines	100.00
1 Inch		10.00
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Time Discount

52 consecutive issues	20%
26 times consecutively or R. O. W. one year	15%
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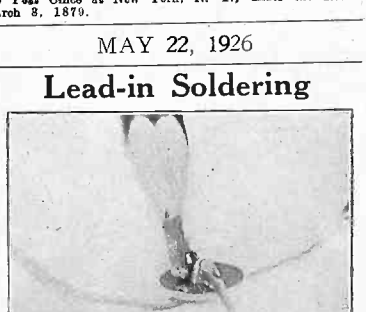
MAY 22, 1926

Lead-in Soldering



(*Hayden*)

A BRASS WASHER can be used as a lead-in connector with very good results. Drill two holes in approximately the center of the washer. Loop the end of the antenna through the holes. Pass the lead-in wire under the loop. Solder the two wires. This makes a strong soldered joint.

Pep at the Source

E. E. SCHULTZ, physical director of the Cincinnati Y. M. C. A., broadcasting the setting-up exercises at the Crosley Station WLW, in Cincinnati, O. This is broadcast every morning at 7:30, with the exception of Saturday and Sunday.

WEAF IS ON CORPORATE BASIS NOW

Effective May 15 the broadcasting activities carried on by the radio broadcasting department of the American Telephone and Telegraph Company, under the general designation of WEAF, was incorporated under the name "Broadcasting Company of America."

This step was made desirable by the growth in these activities and by the fact that the problems involved are of a special nature. These problems differ from those of regular telephone operation and can therefore be more effectively handled by a separate organization. This corporation, owned entirely by the American Telephone and Telegraph Company, continues the same general policies as had existed.

The personnel of the new company is chiefly made up of the WEAF organization, and this personnel continues to direct its efforts toward enlarging and strengthening its standing with the listening public by constantly seeking out for development all that is best in the art of radio broadcasting.

The general plan of operation of WEAF and of connecting broadcasting stations together throughout the country will be followed as at present.

Time Signals Big Thrill To Gobi Desert Explorers

PITTSBURGH.

When Roy Chapman Andrews and his co-workers from the American Museum of Natural History set out from Peking, China, on their third Asiatic expedition, the technical staff took care to load their prized radio equipment on the back of their most trusted camel from the herd of 150 going with them into the unexplored wastes of the Gobi desert.

The scientists, who on returning from their last expedition brought news that they had found dinosaur eggs 10,000,000 years old, set forth this time with two principal expectations. They hope to make discoveries even more notable than pre-historic eggs and to keep in touch with Westinghouse radio station KDKA, whose time signals, they declare, will be of invaluable aid to the topographers in mapping and determining their latitude and longitude.

"Most Welcome"

Word concerning the expedition's radio plans is contained in a letter written by J. B. Shackelford, of the Technical Staff, to G. Dare Fleck, program director for KDKA.

To what extent the explorers of the desert will rely on KDKA's time signals is emphasized by the scientist who writes that they are carrying a receiving set built especially for long distance reception from this station.

"Music, news from home and other broadcasts will be welcome," he says, "but most welcome of all will be the time signals from KDKA."

It is such listeners—and they are many calculating from the number writing KDKA—who depend on the signals for their safety and even their lives, who sense the importance of this broadcast.

A correspondent, who identifies himself with the seafaring trade, writes:

"Permit me to express my appreciation of your sense of public duty in the matter of time signals. Ever since you began broadcasting you have been on the job, and you have let nothing interfere with that job.

Bypassing the Soprano

"You seem to be the only station which even faintly realizes the value of this service, and your handling of it has earned the confidence of those who depend on the unfailing accuracy of those signals for the safety of their lives and property. Yours is the only station which bypasses the suffering soprano a minute or two before ten o'clock, so that when we tune in to 309 meters at that time we are absolutely sure to get your signals no matter who is burbling."

KDKA has received numerous letters commenting on the value of the time signals, particularly to vessels along the eastern coast and in the Gulf of Mexico.

By means of this service radio aids the mariners in keeping their correct bearings and safeguarding them against accidents along the coast.

MAJOR INSPECTS WAR NET

As a further step in co-ordinating traffic conditions, Major O. K. Sadtler, U. S. A., the new head of the War Department Radio Net, left Washington for an inspection tour which will include stations in Atlanta, San Antonio, Los Angeles, Leavenworth, Kans., Chicago, and Columbus.

CONSTRUCTION OF THE 4-TUBE A-A RECEIVER, by Herbert E. Hayden, appeared in RADIO WORLD dated Nov. 21. 15c per copy, or start your subscription with that number.

Promise of Television Thrills Manufacturers

ATLANTIC CITY, N.J.

The second annual convention of the Radio Manufacturers' Association, at the Hotel Ambassador, heard several speakers say television is not far off. This expressive view of the near future thrilled the listeners.

This invention unites the broadcasting of sound with the broadcasting of scenes. Actors will be seen in their home, though they are thousands of miles away, the listeners were told.

There was not a corner of the United States that would not be under the influence of the radio, Dr. A. E. White of Chicago, said. He added, however, that one-tenth of the farmers of the country—about 5,717,032—were still without radio receivers and that sets best suited to meet the needs of these farmers would probably win this potential market.

R. W. De Mott, president of the Radio Magazine Publishers' Association, told of the development of the industry and prophesied the completion of successful experiments with television.

Only fair results, at best, were obtained in the last international broadcasting week, A. H. Lynch of New York told the convention, adding that great impetus had been given to the industry.

Herbert H. Frost of Chicago, president of the Radio Manuacturers' Association, read a letter sent by Secretary Hoover, who expressed his regret at not being able to attend.

"I have long thought," said Secretary Hoover, "that the Radio Manufacturers' Association could profitably engage in an economic inquiry in the trade with a view to determinnig whether some substantial changes could not be made in the method of distribution which today imposes upon the consumer. The first movement toward a remedy would be a competent statistical service as to production and shipment and an economic study of trade practices, the object being not to stifle competition but to eliminate waste."

"The life and future of commercial radio," Mr. Frost told the convention, "depends on continuous improvement of broadcasting."

Powel Crosley, Jr., of Cincinnati, said a thing so vital to every citizen should be the property of the people. He also spoke of the need of adequate radio legislation, and hoped it would be enacted.

Exclusive Radio Store Doomed, Says Griffin

ATLANTIC CITY, N. J.

The exclusive radio store will be a thing of the past in a year or two, is the belief of John W. Griffin, president of the Haynes Griffin Radio Service, Inc. Mr. Griffin, in addressing an open session of the Radio Manufacturers' Association expressed his belief in the future of radio, even while believing the retail stores of the country will slowly change their complexion. He said:

"I personally believe that the exclusive radio store is all through, and that a year or two hence it will not be possible to find such a store anywhere in the United States. This is true, of course, because during the last three years, the seasonal nature of radio has become more and more marked. The season has become shorter at both ends and the break between the months of good business and bad business more and more sharply defined. The radio business as a business probably begins about Columbus Day, October 12, and it is pretty nearly all finished by St. Patrick's Day, March 17. Enough business may be gained during these few months to show a small profit for the year, if added to the small sales that may be eked out of portable sets and accessories during the summer. But this is an immense waste of space facilities for energy during the summer months of the year, which should certainly be applied to some good purpose.

"The successful radio manufacturers of the future are going to be culled out first from the exclusive radio dealers of today who have the means and sense to add to their present activities such other lines and interests as will give them a fair volume during the months of the year when for all practical purposes radio doesn't exist. And secondly, from merchants in either a related or unrelated line of business who have or will recognize the tremendous potentialities of this industry, its opportunities for remarkable sales during a limited part of the year and are willing to go down to the A B C's of radio in purchasing, selling and servicing.

"The day of radio as a novelty has largely passed. There are very few people today who use their radio sets simply for the thrill which it brings them through listening to programs broadcast from a distant point, regardless of the character of this program. Radio has found a definite place in the average American home but it is being used with great discretion.

"The average radio set owner today turns his set on not merely for the pleasure of listening to radio but because of some definite program feature which he knows is scheduled and which he wishes to listen to. Consequently, unless the programs are continued at their present high standard, and unless throughout the year features of great public interest are offered, radio will become to be used less and less.

"The financing and arrangement of these programs must of necessity come largely through those who profit by them, and that, of course, means those who are in the radio business. Tremendous strides have already been made by large manufacturers along these lines. It is not fair that they should carry all of the burden, and the time has arrived in my opinion when the work which they have started must be taken up by manufacturers and dealers generally. Arrangements must be made whereby the financing of these programs can be carried on in a co-operative manner, and only by this means can programs be maintained at their present high standard. Broadcasting is the very life of the radio industry and as our industry has become more stabilized, it is necessary for all of us to look to the maintenance of broadcasting programs and provide means whereby they can be made available throughout the twelve months of the year."

Mr. Griffin also stated that the future of the radio business depended largely upon the character of future broadcast programs.

LYNCH ASKS FUNDS FOR NEW TESTS

ATLANTIC CITY, N. J.

Arthur H. Lynch, chairman of the Overseas Arrangement Committee for the International test for 1926, reported to the International Radio Week Committee:

"If we are to judge the International Radio Broadcast Test for 1926, by the standard set during 1923 and 1924, we will be materially disappointed so far as actual results obtained are concerned.

"A great deal of preliminary work was done, a great deal of publicity of a highly interesting, instructive and effective character was also done and the preparation made for receiving the European stations throughout this country, Canada and Mexico, have never before been equalled. The results obtained were in almost every instance a disappointment. Our own activities carried on by Radio Broadcast magazine at several receiving stations on Long Island were just about as satisfactory as those carried on anywhere else in the United States and the sum total of our week of endeavor could very well be placed at almost zero.

"Many of them sacrificed one of the most important hours they have for the entire week in an effort to share in giving the public an opportunity for some real DX work. This sacrifice, particularly after the first three or four days resulting in nothing but failure, showed the real spirit of co-operation which the Broadcasting Station Manager displayed. It is very doubtful that International Radio Broadcast Week would have had anything like the publicity in the newspapers and magazines, had it not been for the very valuable services rendered by Mr. L. A. Nixon, who had charge of the publicity.

"Whether another series of International Radio Broadcast tests will take place next year or not depends upon a great many different circumstances over which no one but you manufacturers have control. Principal among those circumstances is the fact that if tests of this character are to be worked out satisfactorily, they must be properly publicized. And in order to be properly publicized, a certain reserve fund for use in presenting to the papers and magazines interesting stories concerning the contemplated test must be provided. This year most of that expense was borne by Doubleday, Page & Co., and by Mr. Nixon, himself. A condition of this character cannot go on and though both of these contributors were in a way partly repaid for their endeavors, sound business dictates that those from whom the sums necessary should be procured, should be spread over the entire industry, rather than left to a few to carry on.

"There is no question whatever in my mind as to the desirability of running an International Test next year and I offer a suggestion that a committee be appointed at this convention at once, in order to undertake the preliminary work which must be done if such a test is to be carried on. Although I have been elected permanent chairman of the International Test Committee, I feel that since these tests have gone on under my direction for the past three years, it is about time now to turn the helm over to someone else, and I doubt very much, that a more suitable arrangement could be made than having Mr. Nixon elected chairman of the International Test Committee as well as its secretary."

Industry Needs Czar, Shaw Tells Convention

ATLANTIC CITY, N. J.

Declaring the need for closer unity in the radio industry and suggesting that a czar be appointed from the trade to govern the diversified interests of the radio industry, Henry M. Shaw, president of the National Radio Trade Association, sounded the keynote of the fifth annual convention of the National Radio Trade Assciation in an address to the board of directors of that organization.

"We are overburdened and taxed for the enforcement of local, state and national laws, which neither represent the majority or even take care of the minority," Mr. Shaw said in urging the radio industry to attempt to find a cure for its ills in its own council halls.

L. A. Nixon, executive secretary of the organization, in his annual report stressed the importance of radio manufacturers, jobbers and dealers, who comprise the National Radio Trade Association, taking a more vital interest in the legislative problems of the broadcaster.

"Unless broadcasting is protected and fostered, the level of entertainment furnished the radio public will be seriously damaged with consequent injury to radio sales," Mr Nixon said, in pointing out the large number of radio bills that have recently been introduced in Congress.

In addition to the trade association convention, members of the International Radio Week Committee gathered for an annual meeting. Other organizations in session were the Radio Magazine Publishers' Association and the Radio Manufacturers' Association.

Meeting socially, the manufacturers discussed plans for the new season and several revealed novel products that they are about to manufacture.

Wing Asks All-American Plan for 1926 Test Week

ATLANTIC CITY, N. J.

Station OAX of Lima, Peru, was the most popular overseas broadcaster during the recent International Radio Broadcasting Tests, according to Willis K. Wing, editor of "Radio Broadcast" and chairman of the verifications committee for the International Radio Week movement.

Only one listener in the United States was able to prove to the verifications committee that he actually heard Stuttgart, Germany, in the tests, while two hundred proved reception of Lima and were issued verification certificates.

Mr. Wing, in his report to the International Radio Week Committee, explained that undoubtedly several hundred other listeners were successful, but because they failed to give exact moment of reception and otherwise identify the programs heard, no verifications could be issued.

More than 15,000 letters were received by the committee on verifications, he said, but only a little more than 1,000 official certificates were issued.

The bad atmospheric conditions, the worst in years, prevailing during the tests were blamed for the failure of many thousands of other listeners in their efforts to receive progress especially transmitted by overseas stations during the third annual tests, which were held in January of this year.

The report includes the following:

"We did all within our power to make the tests successful, particularly, as our European stations had already committed themselves to a series of special local tests.

"Judging from our correspondence, the greatest interest was excited by the special American fifteen minute test periods during the last two nights, Friday and Saturday of the Test Week.

"We believe that in considering plans for a test to follow next year majority emphasis be put on distance tests involving stations on this side of the Atlantic. We are confident, judging from our correspondence also, that the failure of listeners to hear all the transmitting stations was taken in a spirit of good sportsmanship and the failure of foreign signals to penetrate to all parts of the United States was not regarded by the great body of listeners as any indictment of radio. It was particularly interesting to note from the point of scientific interest in the tests, that we have verified reports of reception of European signals in many points in California and other Western States, notably Oregon and Washington, Colorado and the Dakotas. This is definite proof that it is not technically impossible for signals on broadcast wavelengths to travel from European stations across the Atlantic and the United States to the far West."

Germany Eases Up Restrictions on Trade

WASHINGTON.

Recent changes in the radio regulations in Germany cancel the requirements that apparatus be tested and marked by the Federal Post Office, and manufacturers are no longer required to submit a sample of every series of receiver built, states a report to the Department of Commerce from Assistant Trade Commissioner Theodore Pilger, Berlin.

Radio listeners are no longer required to hold membership in an approved radio club. A reduction in the amount of manufacturers' license fee is made.

Germany has adopted a policy of lightening the burden on the radio trade.

Hazeltine Corporation Votes 25-Cent Dividend

A quarterly dividend of 25 cents per share was voted by the directors of the Hazeltine Corporation. The dividend is payable on May 24 to stockholders of record at the close of business May 4. The company owns the patents and trade marks covering neutrodyne inventions of Professor L. A. Hazeltine, as well as 80% of the capital stock of the Latour Corporation. The gross income of the corporation for the quarter ending March 31 was $95,951. The expenses during the same period, including provision for federal taxes, was $40,892.39, leaving a net profit of $55,058.61 before providing for amortization of patents.

BYRD'S FLIGHT TO POLE PRAISED IN A RESOLUTION

The spectacular flight of Lieut. Commander Byrd over the North Pole prompted the convention to pass a resolution of praise.

Eric Palmer, of Brooklyn, introduced it, and it was adopted as follows:

"Whereas this conference of representatives of the radio industry is held coincident in time and interest with an exploit that does highest honor to the American people, and particularly to the United States Navy; and

"Whereas radio has become so vastly important a contributing factor to the success of expeditions of research and exploration, and gives additional protection to the daring and courageous men involved in these hazardous explorations and investigations, and also makes known to the world almost instantly what has been accomplished; therefore be it

"Resolved, That the members of the Radio Manufacturers' Association in convention tender their heartiest congratulations to Lieut. Commander Richard E. Byrd in the inspiring success of his polar flight, and express the hope and conviction that radio may extend its usefulness to science in the days to come, to the general benefit of mankind."

Alden Will Market Truphonic Couplers

The Alden Manufacturing Co., of Springfield, Mass., has been licensed to manufacture and sell the Truphonic couplers. These afford a new system of audio-frequency amplification said to give almost perfect reproduction, having points of superiority over straight transformers, choke coils, auto-transformers and resistances. The Truphonic coupler was designed by Harold P. Donle, inventor of the Sodion tube, the patent for which was sold to Westinghouse, tube makers for the Radio Corporation of America. The Sodion then was taken off the market.

An announcement states that the new R. C. A. detector tube is simply the Sodion detector, being marketed as the UX171 and CX371. The CX is the Cunningham duplicate of the UX tube. It is said R. C. A. has bought control of Cunningham, whose offices are being moved from San Francisco to New York.

DE JUR JOINS R. M. A.

The De Jur Products Company, New York City, manufacturers of the De Jur rheostat and other radio products, have been admitted to membership in the Radio Manufacturers' Association. Ralph De Jur represented the company at the recent R. M. A. Convention held in Atlantic City.

HOOVER TO OPEN SHOW

Secretary of Commerce Hoover has consented to officially open the Radio Show at Grand Central Palace, New York City, on Sept. 10, on the invitation of leading manufacturers of radio sets, accessories, and parts, who have organized the Radio Exhibition Corporation to conduct this exposition.

ELECTRODYNE INCORPORATES

The Electrodyne Co. are now incorporated and have increased their facilities to manufacture additional items this season together with their fixed mica and by-pass condensers.

Garod's New Set Works Without Any Batteries

A set operating from house current, eliminating A, B and C batteries, is the newest product of the Garod Radio Corporation, Belleville, N. J. The two radio-frequency tubes are 112, while a 199 is the detector, another 112 is the first audio and the 210 tube is the heavy-duty power tube in the last AF stage.

The method of applying house current to the receiver involves several features believed new to the industry. The filaments of all the amplifier tubes are lighted by straight alternating current which is not rectified or filtered in any way.

The plate current is obtained from a specially designed stepup transformer capable of producing the voltage necessary for the various tubes. The current so obtained is rectified direct current and filtered in such a way that it balances the alternating current variation on the filaments of the amplifiers.

Current For the Detector

It is here that one of the novel features of the receiver enters. The common point of the plate circuits is carried to the filament of the 199 detector tube and used to light it. In this manner direct current is applied to the detector, which requires approximately sixty milliamperes of current —the amount of current demanded by the combined plate circuits of the receiver.

The operation of the filaments at correct voltages is fixed at the time the receiver is balanced in the factory. It is not necessary for the ultimate owner to touch this in any way. The control of volume is achieved in a new manner that adds to the selectivity of the receiver.

The Volume Control

The control consists of a small knob which varies an antenna series condenser. When the capacity of the latter is reduced by simply turning the condenser knob, the current fed to the radio frequency amplifier is reduced. This gives a means of controlling the loud speaker down to a whisper without introducing any distortion. It has also the effect of further increasing the selectivity of the receiver.

The tone color is controlled by another small knob which operates a variable resistance across the first audio transformer. A slight turn of this knob varies the tone to the individual taste, and once made need never be touched again. This control also prevents any possible overloading of the audio frequency tubes.

The power conversion equipment is housed in a metal box in a compartment of the supporting table. The interior of the table cabinet is shielded, and a red pilot light on the panel indicates whether the power is on or off. The set is neutralized.

Sales plans are being perfected.

Hawkeye Reel Aerial

A 100-foot antenna of ¼" wide hard drawn flat copper wire which can be quickly reeled out to any desired length and then as easily reeled back into a pocket-size case, is manufactured by the Hawkeye Radio Company, Cedar Rapids, Iowa. A cord with plug is provided for connecting to the set, the copper tape serving as its own lead-in. The case is 4¼" in diameter and the outfit, complete, weighs less than 21 ounces.

The inventors state that, with this device, campers, tourists, picnickers, fishermen, resorters and traveling men can in a few moments install an aerial anywhere. The outer end has an insulator to which a cord and weight are attached and thrown over a tree, or lowered from a window. Set demonstrators may also use it for quickly installing aerials, while experimenters and engineers are said to find it convenient for testing sets on different length antennas.

As the copper wire is not insulated, there are no dead-end losses caused by any unwound portion of the aerial remaining in the case, it is stated.

Adelman Joins Freshman

Leon L. Adelman, formerly associate editor of "Radio News," is now connected with the advertising and publicity department of the Charles Freshman Co., manufacturers of the well-known line of tuned radio frequency receivers. Mr. Adelman, who has been actively engaged in the radio field since the international radio laws of 1912 were passed, is an associate of the Institute of Radio Engineers and a fluent writer on radio subjects, both general and technical.

NEW CORPORATIONS

University Radio Mfg. Corp., N. Y. City, $10,000; H. and H. F. Heins, N. Bolet (Atty., E. F Spitz, 141 Broadway, N. Y. City).

B. C. L Radio Service Co., N. Y. City, $20,000; L. Lager, A. Kaufman, G. Goldner. (Atty., H Gittleson, 26 West 43d St., N. Y. City).

An Invaluable Saw

A new saw of a thousand uses and which will prove a boon to every radio set builder is being marketed under the registered trade-mark "Kit-Haxaw." This is a double-edged, rigid hack saw, size 10" overall. The blade is 1/32" thick. Among several unusual features of this saw is the fact that it cuts through chilled steel, iron, bakelite, wood or stone, and will stand the roughest usage. While rigid the blade can be bent into any kind of a curve so as to reach otherwise inaccessible places and can then be instantly straightened. The average saw breaks if this is tried. Blades are interchangeable and can be mounted in a second. Extra blades can be had. This saw is marketed by the Georges Picard Company, 105 Water Street, New York City. Mention RADIO WORLD when inquiring.

WASHBURN JOINS MODELL & CO.

R. D. Washburn, formerly technical adviser at "Radio News" and radio consultant for the Aeolian Company, now heads the technical staff of J. Modell & Co.

Business Opportunities Radio and Electrical

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

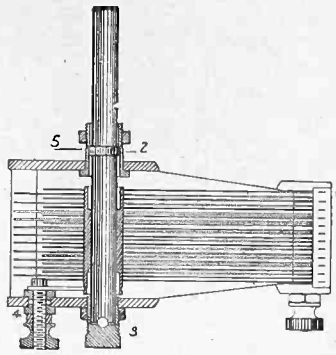
WOODWORKING AND RADIO CABINET plant, fully equipped with practically brand new machinery; individual motors, Blowers spraying outfit, plenty of lumber, over 1,000 finished and unfinished cabinets, hardware, finishing materials; very cheap rent; bargain to quick purchaser. 20 Mill Road, Jersey City, N. J.

ELECTRICAL ENGINEER, MANUFACTURING experience, developing electrical mechanical devices, inventions, seeks part or full time connection; have suitable laboratory. Box 1000, Radio World.

WILL FINANCE BATTERYLESS RADIO; write full particulars. Box 2000, Radio World.

VICTROLA-RADIO STORE FOR SALE IN city of 40,000, 30 miles from New York; established 10 years; capable of netting $10,000 per year; cash required $18,000; valuable franchise; reason, other interests. Box 3, RADIO WORLD.

New Bruno Condenser Has a Bakelite Shaft



Cross section view: (1) shaft of solid bakelite. (2) Brass bushing, acting as forward bearing and mounting stud. (3) Rear bearing. (4) Insulated binding post with spring making wiping contact with rotary plates. (5) Brass contact ring fastened to shaft.

A distinctly new note in variable condenser construction has been struck in an instrument just placed on the market by the Bruno Radio Corporation, parts manufacturers of 40 Payntar Avenue, Long Island City. The new condenser, which is straight line frequency, employs a shaft of special clear bakelite instead of the common brass or steel one, and is built onto a U-shaped frame in such a manner that the shaft itself furnishes the insulation between the rotary and stationary plates.

The design eliminates the usual side strips of insulating material and their attendant supporting ribs, and permits the use of an all-metal frame that makes the condenser extremely compact and rigid. The .0005 mfd. model, the largest one made, is only 3¼" wide, 1⅛" high, and 2" deep behind a panel.

The rear end of the shaft rests on a ball bearing, while the forward part, where it turns against a brass bearing, is equipped with a small brass ring that supplies the actual contact surface. The bakelite itself is practically wear-proof, a diameter reduction of only two-thousandths of an inch being noted after a test of 250,000 revolutions made on a stock ¼" shaft. This severe test corresponds to about 100 years of normal service.

The condenser has brass plates and is made in .00025, .00035 and .0005 mfd. maximum capacities. It is designed especially for broadcast reception, and gives a uniform separation of the American broadcasting stations operating on the present frequency division. Its small radio frequency resistance and general RF characteristics place it most decidedly in the low-loss class.

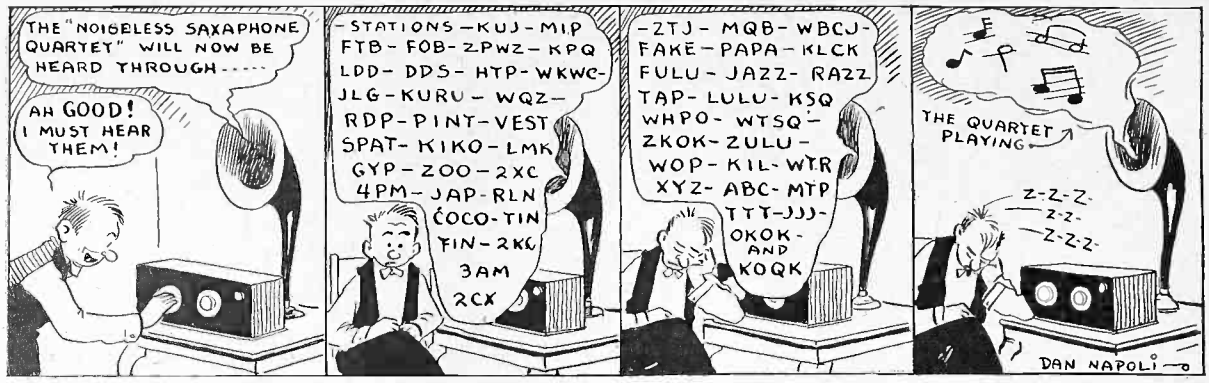
The instrument has a one-hole panel mounting stud. It also may be mounted flat against the baseboard. It is made in right and left hand models so that two can be place in line with each other and the two abutting shafts controlled by one paddle-wheel type of thumbactuated dial. The Bruno Radio Corporation will shortly bring out a special dial for this purpose.

The bakelite, of which the shaft is made, is a special transluscent composition of unusual strength, resembling amber in color. It is so tough an ordinary man cannot break a rod of it ¼" in diameter and 3" long.

Another novelty of the condenser is that the stator is connected to the frame, so that the grid of a tube should be joined to the rotor shaft, the A battery or grid return being joined to the stator.

THE INSOMNIA CURE

By Dan Napoli



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 Ashton, 317 Haskins Place, Reading, Pa.
L. J. Moffitt, Scotland, Conn.
Fred Pearse, 538 South Fremont St., Los Angeles, Cal. (Dealer)
Sidney Rand, Madison, Me. (Dealer)
Roy Fleming, Rossville, Ga.
C. B. Grassel, 809 West Clayton St., Mahonington, Pa.
E. F. Stephenson, Box 373, Tunica, Miss.
Byron Crawford, Arvadh, Wyo. (Dealer).
E. Roewekamp, 3015 N. Jefferson, St. Louis, Mo.
U. T., 4206 Nebraska Ave., Tampa, Fla.
Michael J. Liseo, Breckenridge, Pa.
Leroy A. Prahl, Maumee, O.
H. E. Marsden, 12119 Koselawn, Detroit, Mich.
Duncan E. Cargile, Sabinal, Tex.
R. E. Baker, 17 Court St., Newark, N. J
H. Aussem, 643 29th St, Milwaukee, Wis.
World Radio Shop, York Village, Me. (Dealer).
Daniel Maloney, 58 Dyne Ave., Liberty, N. Y. (Dealer).
Otis T. Wingo, Jr., Kenesaw Apt., Washington, D. C.

112 AMPERITE FOR NEW TUBE

The new detector tube, UX171 or CX-371, may be controlled at the filament by the same Amperite, No. 112, used for the UX112 tube.

COMPLETE LIST OF BROADCASTING STATIONS appeared in RADIO WORLD dated May 1. Sent on receipt of 15c, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

New Vacuum Resonator Uses Crystal to Police Station's Wavelength

A new departure in piezo-electric crystals has been brought to this country by David L. Loewe, brother of Dr. Siegmund Loewe, former chief engineer of the Telefunken Company. This crystal or frequency standard is enclosed in a vacuum tube similar to that used for broadcast reception, and is known as a quartz resonator.

The quartz is ground in certain relation to the optical axle and placed in a glass tube, thereby making use of the high voltage set up by the oscillation of the quartz. The tube is then filled with a combination mixture of neon and helium gas, so that a visual indication will be given when the transmitter is at the approximate wavelength.

When the actual wavelength is reached to which the quartz is ground the pale neon glow which filled the tube previously disappears and the quartz glows with a bright red light. This shows that the circuit is tuned to the proper predetermined frequency.

Since the calibrated quartz resonator is placed within an evacuated glass bulb, the measuring instrument may be regarded as absolutely accurate, because variations of temperature have no influence. Therefore the "frequency standard" may be regarded as being entirely independent from the temperature.

The quartz can be ground to such a tiny wafer that it can be made accurate to the one-thousandth part of the wave length. On account of the low tension required, the strain imposed upon the quartz is reduced to a minimum and the life of these resonators is said to be practically unlimited.

Some of the European stations are now being equipped with the quartz resonator in order that they may keep on the wavelength assigned to them. By doing this, considerable interference is eliminated by the overlapping of carrier bands from other stations.

Several quartz resonators of varying frequencies can be connected in multiple, one being for the exact frequency desired. As the station approaches the desired wavelength, the operator, by looking at the resonator, can tell whether he is above or below the proper frequency, and to what extent.

Tobe to Distribute the Loewe Resistors

The Tobe Deutschmann Company, Cornhill, Boston, Mass., has obtained the contract as sole representative in the United States for the Loewe leaks. These are the metallic resistors in the vacuum tube designed and developed by Dr. Siegmund Loewe of Berlin, former chief engineer of Telefunken.

Postal License Required For Imports to India

WASHINGTON

The Government of India has issued a notification that it will "restrict the bringing into India of any apparatus for wireless telegraphs to cases in which a license to import such apparatus has been granted by the Director General of Posts and Telegraphs," according to a Consular report to the Department of Commerce from Calcutta.

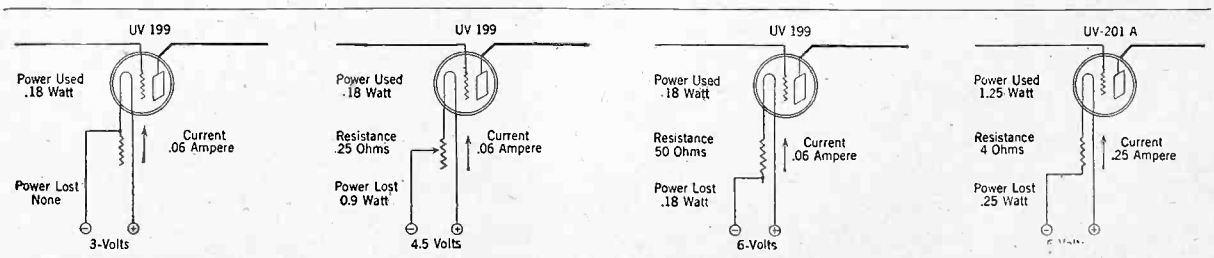
A form of license is prescribed and the license must be produced before the Customs authorities when apparatus mentioned in the form is being imported.

Irish Bill Proposes 33 1/3% Import Duty

WASHINGTON

New import duties have been established by the budget introduced into the Irish Free State parliament, according to a cablegram received in the Department of Commerce from Consul John Corrigan, Jr., at Dublin.

These duties became effective immediately and include a duty of 33 1/3 per cent ad valorem upon radio apparatus.



DIAGRAMS that explain the loss and gain of power in tub circuits, when different resistances and sources of voltage are employed with the two most popular tubes, viz.—99 and —01A. J. E. Anderson, in the December 5, 1925, issue of RADIO WORLD, gave an excellent description of the why and wherefores of the gaining and losing of power in tube circuits, etc.

Medium Ratio Favored For Audio Transformers

The use of high ratio audio frequency transformers does not necessarily mean maximum amplification, except perhaps on one frequency, which condition is not permissible when the audio transformer is to operate in an amplifying unit functioning over the musical frequency spectrum. The reason for the lack of maximum response with highest ratio transformers lies in the function of the primary winding. When it is desired to increase the turn ratio of transformers it is customary to reduce the number of turns in the primary winding, the secondary winding remaining constant.

Due to this reduction in the number of primary turns, the maximum amount of energy is not transferred to the secondary, since the magnetic field created by the flow of the alternating current through the primary winding is not as great as it normally would be with a larger primary. In addition, the reduction of the number of turns in the primary winding results in a lower inductance value for the primary and some of the low notes of the musical scale are lost, which action is a deficiency in transformer design. Various authorities agree upon the selection of a 3½ or 4½-to-1 ratio of transformation as consistent with best amplification.

Confession of a Super Bug

(*Concluded from page 6*)

to meet the requirements of friends, with economy of operation—the plate consumption is less than that of the average 5-tube set—and priced elastically. The outfit above can be duplicated for less than $125, or it can be built de-luxe for up to $500. Operation on 6-volt tubes costs about $15 per year and on 3-volt tubes about half that. For those who wish to build for portable use or to operate solely on 199 tubes the George W. Walker Co. has produced a set of coils wound and calibrated to work to the best advantage with these tubes. Every radio fan who qualifies for his thirty-third degree must have built at least one Super and this circuit is a good one to start with—easy to build and satisfactory in results.

Four Stations Quit

WASHINGTON

Four broadcasting stations were discontinued as follows:

KFXM, Neches Electric Co., Beaumont, Texas, 227 meters.

KFVR, Moonlight Ranch Broadcasting Station, Denver, Colorado, 224 meters.

WGBM, T. N. Saaty, Providence, Rhode Island, 234 meters.

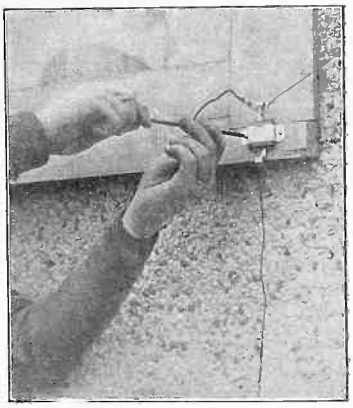
WFBD, Gethsemane Baptist Church, Philadelphia, 234 meters.

Suzanne Explains How

(*Underwood & Underwood*)

SUZANNE LENGLEN, France's foremost woman tennis player, at the microphone of the Paris radio station, broadcasting lessons on how to play tennis properly.

Install An Arrestor!



(*Hayden*)

A LIGHTING ARRESTOR of an approved type is required by the Board of Fire Underwriters on all receiving set installations. This arrestor sidetracks strong foreign current. It is best to install it outdoors. No arrestor is needed if the set is exclusively loop operated.

GET RADIO WORLD ON YOUR VACATION

Be sure to take RADIO WORLD along with you on your vacation, or read it while you are at your summer home So that you will not miss a copy, send $1.50 for three months subscription and RADIO WORLD will be sent to you all summer. RADIO WORLD, 145 W. 45th St., N. Y. C.

KILOCYCLE-METER CHART, appeared in RADIO WORLD dated May 1. Sent on receipt of 15c. or start sub. with that number, RADIO WORLD, 145 W. 45th St., N. Y. C.

BUTTE SEEKS WAYS TO GET OWN STATION

BUTTE, MONT.

According to information given to members of the Butte Radio Club, the possibility of a broadcasting station for Butte is considered likely.

Ray L. Hofstatter, vice-president of the club, gave an extended discourse covering his visit to broadcasting station WCCO, known as the "Gold Medal" station at Anoka, Minn.

This station superseded station WLAG, the newer and larger equipment having been purchased and installed at a cost of $260,000, half of the money being raised by public subscription, the balance being donated by the Washburn-Crosby Co. The station, which costs $100,000 per year to operate, is connected by land wires running from Anoka, Minn., to the main studio in Minneapolis, which is divided into two sections, the control switch being thrown to whichever section is broadcasting. The visitors' gallery is separated from the microphone rooms by plate glass partitions.

Besides broadcasting from the studio the station is connected through land wire, or "coppers," as Mr. Hofstatter termed them, to 23 microphones at different points in the Twin Cities such as dance halls, theatres, schools, auditoriums and churches.

This station is "coppered" to station WEAF, New York City and rebroadcasts many eastern programs.

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

Applicants Outnumber Stations Now On the Air

WASHINGTON.

Outnumbering stations that are actually broadcasting, applicants for licenses now total 600. Among those who have applied to Secretary Hoover for the broadcasting privilege are:

T. J. Truitt, Inc., Salisbury, Md.; J. Goldsmith & Sons Co., Memphis, Tenn.; Firmin M. Fiolle, Thomas, Okla.; J. A. Sanders, Clovis, Calif.; Walter W. Strong, Los Angeles, Calif.; L. R. Man, Fort Worth, Tex.; Union League Club, San Diego, Calif.; J. W. Lienollen, Moscow, Ida.; W. H. Roush and Associates, Lima, Ohio; and

John G. Slade, Hamilton, Ohio; Industrial Radio Service, Saginaw, Mich.; Carleton Kinch, Walton, N. Y.; Review Publishing Co., Youngstown, Ohio; Baraboo Baptist Church, Baraboo, Wis.; Walter Marling, Columbus Junction, Iowa; Duluth Broadcasting Association, Duluth, Minn.; Linton-Stockton High School, Linton, Ind.; Jenkins Motor Shop, Mitchell, Ind.; D. A. Burton, Muncie, Ind., and Benso Radio Co., St. Louis, Mo.

In striking contrast to the hundreds clamoring for permission to broadcast is the fact that during an entire month only four stations closed down permanently. They were:

KFMR, Beaumont, Tex.; KFVR, Denver; WGBM, Providence, R. I., and WFBD, Philadelphia.

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 21, March 21, 28, April 4, 11, 25; May 16, 23, 30; June 6, 13, 20; July 4, 11, 18, 25; Aug. 8, 15, 29; Sept. 5, 26; also Jan. 23, 1926.

Good Back Numbers of RADIO WORLD

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

1925:

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

Sept. 12—The 1926 Model Diamond of the Air, (Part (1), by Herman Bernard. A 25-to-116 Meter Receiver, by Sidney E. Finkelstein.

Sept. 19—Diamond of the Air (Part 2), by Herman Bernard. A Tube B Battery Eliminator, by Louis Winner.

Oct. 24—A Phonograph Cabinet Set, by Lewis Winner. The Thoroughbred, by Herbert Hayden (Part 2).

Oct. 31—The 4-Tube Pathfinder, by S. E. Finkelstein. How to Make a Simple Loop, by Herbert E. Hayden.

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

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

Dec. 5—A Toroid RF Set, Using Crystal, by Lewis Winner. The Diamond of the Air (in Text and Diagram), by Herman Bernard.

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

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

1926:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Any copy, 15c. Any 7 copies, $1.00. All these 20 copies for $4.00, or start subscription with any issue. RADIO WORLD, 145 W. 45th St., N. Y. C.

WRNY Unites Music Notes Of Players 4 Miles Apart

A novel stunt in synchronizing the broadcasting of an organ and an orchestra, four miles apart, was successfully performed by WRNY, the "Radio News" station in New York City. The idea was originated by Hugo Gernsback, editor of "Radio News" and one of America's leading exponents of the radio art.

It was said to be the first time such a radio program had ever been attempted. The organ was played at the West Side Unitarian Church at 550 Cathedral Parkway, while the orchestra played in the Palm Room of the Hotel Roosevelt, about four miles away.

Guests in the lobby of the Roosevelt noticed that Herbert Soman, leader of the orchestra, was wearing a special set of light headphones which had been plugged into the wire line, thus allowing him to hear every note as it was sounded by te organ uptown. At the same time Rock Ferriss, the organist at the 110th Street church, wore a similar pair of head receivers so that he could keep time with the playing of the orchestra. The music of both came over the air in almost perfect synchronization, and there was no indication in the quality of tone or in the rhythm that the music was coming from two sources.

Difficult problems had to be overcome in regulating the volume of sound. Not only did there have to be a balance among the different instruments of the orchestra, but the two wire lines had to be balanced electrically so that the volume of the organ would not drown out the orchestra or be drowned out by it. The program, which continued for forty-five minutes, was made up chiefly of classical and semi-classical orchestral numbers.

Mr. Gernsback was immensely pleased with the success of the program. Its possible development, he said, would enable a great singer or instrumental artist to broadcast at home, accompanied by an orchestra in a radio station studio or elsewhere. This was the first of a series of synchronized air concerts to be given by WRNY, and will soon be followed by a recital at which three separate orchestras will play at different parts of the city.

RESEARCH PIONEER TO RETIRE

Having supervised some of the most unusual achievements in radio, especially those having to do with shortwave development, Captain Paul Foley, U. S. N., director of the Naval Research Laboratory, Bellevue, D. C., will be retired at his own request July 1. Captain Foley has been in the Navy thirty years.

New Television Machine Demonstrated to Public

Although many successful demonstrations of the Baird Televisor, invented by John L. Baird, 36-year-old Scotch electrical engineer, have been given before private individuals, for the first time a successful demonstration was given to a public audience in London. Those standing in front of the transmitting televisor were seen and recognized by friends on the receiving televisor in another portion of the building, there being no direct connection between the two remote points. The face of a woman being transmitted and received is seen in the photos on the front cover.

Light is first converted into electric waves at the transmitting end. This light is synchronized with the motions of the face, body, etc., so that when it is reconverted at the receiving end, the eye receives the impression of seeing a whole picture instead of only a part. The mechanisms in this instrument are so sensitive that they will respond to small quantities of light instantaneously. Each of the small areas into which the picture is divided causes a light-sensitive cell to send out an electric current. This is equal to the amount of light in the area.

In this way the dim parts of the picture transmit a weak current, while the bright parts send out a stronger current. At the receiving end these currents control a certain source of light. This is projected onto a screen, in exact synchronism with the projection of the picture at the transmitting station. A light-sensitive cell is used at the transmitting end. The picture is broken up into certain areas by means of lenses in a rapid whirling disk. The special lenses in the disk individually focus the areas of the picture onto the cell. When the disk has been whirled around once, every area of the picture has been focused onto the cell, the speed depending upon the number of variations of the object to be transmitted.

This light cell is connected by a special vacuum tube amplifier and electrical gearing device to the special transmitting apparatus. The outgoing wave is continually modulated, so as to bring the light from the successive areas of the photo. At the receiver there is a source of light whose strength is controlled by the transmitted wave. This light is brought to a specific spot. It is then moved, so as to follow the beam which follows the whirling disk onto the cell at the transmitter.

Coincident with the televisor transmission, broadcasting is carried on, so that one hears and sees the artist at the same time.

(Photos on Front Cover)

Set Measures Sea Depth

(*International Newsreel*)

R. T. RUSSEL, of the Washington Navy Yard Radio Testing Station, with a special device he has invented for measuring the distance from the keel of a ship to the bottom of the ocean. Special microphones aid the test.

WLWL Is Authorized to Use 5,000 Watts

WLWL, the Paulist Fathers' station in New York, has been gradually increasing its power under the direction of the district supervisor and is now authorized to transmit with 5,000 watts. With its power established at 3,500 watts, no complaint of interference was received. It is the second broadcaster in New York with 5 kw, WEAF being the only other high powered station in the metropolis.

500-Mile Auto Race To Be Broadcast May 30

The famous 500-mile auto race at Indianapolis on Memorial Day, the most important motor event in America, will be broadcast this year by WGN, Chicago. This is the third year that the station has put the famous motoring classic on the ether lanes, and this year's attempt promises to be the best by far.

At no time has WGN made such careful and thorough preparations for a broadcast as are in evidence in the case of the Indianapolis race, and in this work the station is receiving the full co-operation of the Presto-Lite Company, under whose auspices the race is broadcast each year. A special booth, just under the judges' stand, is being constructed this year that will be a model of its kind. It will be divided into two parts, and both the little chambers thus created will be lined with soundproof material, making them to all purposes radio studios of the best type.

WGN remains on the air almost continuously for six hours during the auto race, and special efforts have been made to entertain listeners while telling them the story of the race.

CHANGES OF ADDRESS

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

FILL OUT AND MAIL NOW

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RADIO WORLD

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Six Months 3.00
One Year, 52 Issues..... 6.00
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KNECHT QUITS WALDORF FOR AIR ORCHESTRA

Joseph Knecht, musical director of the Waldorf-Astoria Hotel for the last fifteen years, has resigned to devote all his time to an orchestra that will specialize in broadcasting.

While music lovers have followed Mr. Knecht's career, first as violinist with the Boston Symphony, later as an outstanding member of the Metropolitan Opera House Orchestra and finally as musical director of the Waldorf-Astoria, broadcasting is the medium through which he multiplied his host of friends. When radio broadcasting first came into the Waldorf in 1922 Mr. Knecht stated: "It has made me feel twenty years younger, this machine which causes my friends, many of whom I thought had forgotten me, to write and telephone expressing their appreciation for my radio concerts."

Stations Charge Composer With a Change of Front

"Music publishers seem afraid to face the broadcasting issue," said Paul B. Klugh, executive chairman of the National Association of Broadcasters, in discussing a statement made by E. C. Mills, chairman of the administrative committee of the American Society of Composers, Authors and Publishers regarding the Dill-Vestal Copyright bill.

"After going through two weeks of the Dill-Vestal copyright hearings and listening to the arguments advanced by those opposed to these measures, we are more at a loss than ever to understand why any straight-thinking people can object to these bills.

"The broadcasters have repeatedly stated their willingness to pay for the use of copyrighted music; and will pay any fair figure that may be set by any duly constituted body, subject to revision at three or five year periods, if such seems to be the best method.

Charges Change of Front

"We concede that the copyright owner should determine whether or not this music shall be broadcast. However, the nature of music is such that it should be accessible to all of the public upon a fair basis. If the copyright owner decides to broadcast his composition, then all stations of similar power and size should have access to it upon similar payment for its use.

"We learn from a recent newspaper statement that Mr. Mills opposes the idea of using station power as the basis for payment. Out of several plans submitted to the administrative committee of the American Society, Mr. Mills and his associates selected this basis themselves, and now appear in the role of criticizing their own selection.

"It would seem that the administrative committee of the American Society is determined to try to confuse the issue by talking about everything except the facts in question. This is one of the many reasons why broadcasters are seeking legislation as a solution to the three-year-old copyright controversy. In trying to deal with the American Society, which controls 90% of the music the public wants to hear, we find that there is no uniformity in their charges to stations of the same power, and that from year to year they increase their license demands as much as 50%, frequently withdrawing musical numbers just when the public wants to hear them most.

Good for the Individual

"They cry that the Dill-Vestal bills rob the composer of his rights of individual bargaining. Here they fail to face the facts. The composer of the piece does and always has bargained individually with his publisher, while the publisher in turn, through the American Society, forces the broadcaster to take the entire catalog or else none of it and suffer the consequence.

"The greatest benefit of these bills is to the individual copyright owner. They will insure every copyright owner being paid the full rate every time his composition is used, thereby bringing an automatic reward for meritorious and popular compositions and eliminating the high overhead cost of collecting license fees through the American Society, which is said to approximate 65% of the amount collected.

"We have yet to learn of one valid reason which can be advanced in opposition to the broadcaster's position, when the facts are clearly analyzed."

NASHVILLE CHURCH QUITS

The First Baptist Church at Nashville, Tenn., has relinquished its station WCBQ to two commercial concerns. Hereafter the station will be known as WBAW.

Station Bars "Adeline" And "Prisoner's Song"

CHICAGO

Guided largely by a chart, based on letters from listeners, WBBM, Chicago, has put the ban of silence on two songs. They are "The Prisoner's Song" and "Sweet Adeline." The purpose of the chart includes not only the elimination of certain musical selections, but the restriction of others.

Aside from letters from radio listeners, other considerations play a part in the determination. For instance if a song or number happens to be popular for the moment and is being reproduced in broadcasting studios all over the United States, the artists of WBBM will be allowed to use it only a specified number of times a week.

The age of a song or an instrumental number will not be taken into consideration. If it is a musical classic and has lived through the ages it will be used. On the other hand a number may be only a few months old, but its general character may be such that the public will tire of it rapidly. In that case it will be barred entirely or restricted.

WHT Schedule Broken Less Than 1-4 of One P. C.

CHICAGO.

Of the 35,000 hours the station has been on the air since April 24, 1925, WHT stayed on the air 99.758% of the time they were scheduled.

Twice the aerial at the transmitting station at Deerfield, Ill., came down during a storm. Both times a temporary aerial was erected and the station was off the air for only a few hours each time.

On another occasion lightning made it impossible for an incoming power line to carry the current. This was remedied within a short time also.

WHAV BECOMES WDEL

So that listeners may readily recognize the fact that they are tuning in on Delaware's only station, the call letters of WHAV at Wilmington have been changed to WDEL.

Quartet's Song Memory Boon After Fire Ravage

CHICAGO.

Fire in their rooms has consumed most of the clothes, all of their personal belongings and 150 songs of the Badger Four (male quartet).

Having filled a late engagement the night before, they were asleep when the fire broke out at 10 a. m. Al Trigs was the first to awake. Shouting to the others, he pulled on his shoes, trousers, shirt and coat, then made his exit.

Otto Suess was awake by this time. He donned a pair of trousers and swayed toward the stairs. Bill Davies was not far behind. Their last warning shouts had barely awaked Bob Palmer. Rolling out of bed, he careened toward the door through the smoke, grabbing four tuxedos and a bathrobe as he passed the closet. Half way down the stairs he paused to put on the bathrobe.

An hour later Triggs, the only one who had more than a pair of trousers besides a tuxedo, appeared at WHT for financial assistance, which was given him.

So the Badger Four will begin all over again, each with a tuxedo and little more. They have memorized 72 of the 150 songs which were burned, and with this equipment will carry on.

BEAUTIFUL BUT NOT PROFITABLE

Discussing the invasion of radio into his field, an official of a leading phonograph concern remarked that the making of fine records by world-famous artists never proved profitable. His assertion was that the popular records, including dance music and jazz, were the ones which brought in the money.

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS.

10 CENTS A WORD. 10 WORDS MINIMUM. CASH WITH ORDER

FENWAY SUPER BUILT EXACTLY AS SPECIFIED. Money order for $75.00 takes it. A six-tube Hanscom Super for $50.00. V. Dawson, Elwood, Indiana.

BULLDOGS

BEAUTIFUL REGISTERED BULL PUPS, $15. Bulldogs, 501 Rockwood, Dallas, Texas.

THE CONTROL OF FEEDBACK, by Barney Feete, appeared in RADIO WORLD dated April 24. Sent on receipt of 15c, or start sub. with that issue. RADIO WORLD, 145 W. 45th St., N. Y. C.

THE AERO ALL-WAVE SET, by Capt. P. V. O'Rourke, appeared in RADIO WORLD dated April 24 and May 1. Sent on receipt of 30c. RADIO WORLD, 145 W. 45th St., N. Y. C.

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

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

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.

SELL AND INSTALL RADIO SETS. With a $25 capital we can put you in the radio business and show you how to earn a hundred or two a week. For full details write Columbia Print, Radio Division, 143 West 45th St., New York City.

THE BERNARD PORTABLE SUPER-HETERODYNE appeared in RADIO WORLD dated April 3, 10, 17 and 24. Sent on receipt of 60c, or start your subscription with April 3 issue.

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

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

TWO SHEETS OF SPECIAL HEAVY CONE SPEAKER PAPER and fifteen ways to reduce static, all for one dollar. VICTOREEN KITS, all six coils, $28.50. Everything in radio from twenty to forty per cent. off. Selling out. Box 32, Station C. Toledo, Ohio.

SPECIAL DISCOUNTS ON SETS AND parts. Send for price lists. Martien Radio Shop, Galion, Ohio.

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

CONSTRUCTION OF RADIO PHONE AND TELEGRAPH RECEIVERS by M. B. Sleeper, sent on receipt of 75c. The Columbia Print, 145 W. 45th St., N. Y. C.

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

COMPLETE LIST OF BROADCASTING STATIONS appeared in RADIO WORLD dated May 1. Sent on receipt of 15c, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

TEAR OFF AND MAIL TODAY

8 Week's Trial Subscription, $1.00

KEEP ABREAST OF THE LATEST RADIO DEVELOPMENTS

RADIO WORLD

145 WEST 45th ST. NEW YORK CITY

RADIO WORLD'S

Fifth Annual Vacation Number

JUNE 12th

A radio doubles vacation joys, gives baseball and all sports results, play by play; there are no dull, rainy days at seashore or mountains with a radio.

Thousands of RADIO WORLD'S readers are now most interested in installing radio in their bungalows, summer cottages, pleasure boats, camps and hotel rooms. This Vacation Issue of June 12th will give the latest and best information on portables, battery eliminators, DX getters, new sets and hookups.

Advertisers read this

RADIO WORLD is the only national WEEKLY.

The one radio publication giving quick, immediate results.

RADIO WORLD'S readers are buying NOW.

Offer to send them your goods direct from factory—many of them live miles from a radio dealer.

You will be surprised and amazed at the big direct returns that RADIO WORLD'S advertisements give.

The Trade's Best Opportunity to Build a Big Sales Demand

RADIO WORLD is now the only illustrated national radio fan weekly. RADIO WORLD is the only publication having 100,000 weekly readers, most of whom are *experimenters* in radio. RADIO WORLD'S readers build sets for the fun of it, the thrill of the successful experiment, and when something new comes along they start all over again with a new set, and they not only build sets but buy sets as well.

"Drops of water wear away the hardest granite." Even a small advertisement in RADIO WORLD brought to our readers' attention week by week, fifty-two times a year, wears away trade resistance and brings a brand or trade-mark to the buyers' attention so persistently it creates real demand. RADIO WORLD gives you a service that no other publication can, because it is a radio *service* publication.

Fiction magazines of general circulation supply the best fiction; newspapers, even small-town papers, give good radio programs, but only RADIO WORLD gives real weekly radio service information—the newest things in radio, the latest and best hookups, the last word in battery service and elimination, etc. In other words, RADIO WORLD is the only national radio weekly, and its 100,000 weekly fan readers who are constant buyers of radio can give you the biggest result for your advertising dollar.

RADIO WORLD is dated each Saturday, is on the news-stands the previous Wednesday, and closes each Wednesday noon, ten days in advance of date of issue. Results are quicker from RADIO WORLD than any other radio publication. A single inch message can be delivered in RADIO WORLD to the 100,000 people most interested in radio throughout the United States in ten days for ten dollars.

RADIO WORLD gives its advertisers every possible editorial co-operation. The set builder as a rule follows as closely as possible the laboratory models of radio tuned circuits in which the manufacturer's article is specified, and in this way it is constantly creating a demand, and new users for radio parts and accessories.

In regard to factory-made sets, we take various leading sets from week to week, giving full and detailed information regarding each particular set, creating not only a demand for the goods but showing the buyer in advance how to get the best possible results from the set, making the buyer a pleased and satisfied customer that will recommend your set to his friends. To get any real joy out of radio, one should know something about radio. RADIO WORLD fifty-two times a year is putting joy into radio reception by giving useful radio information—nothing else—no programs, no fiction—*just all radio.*

To sell the retailer is important, but not the most important thing. The big idea is to move your goods off the dealers' shelves. It has been proven over and over again that RADIO WORLD, with its week-by-week advertising urge, can best do this at the lowest cost. May we send you the proof? RADIO WORLD, 145 W. 45th St., New York.

Summer schools, camps, hotels throughout the country receive and preserve RADIO WORLD'S Vacation Issues.

Thousands of extra circulation—no increase in advertising rates: Page $300, Column $100, Inch $10.

Extra color red FREE on full page advertisements if copy is received by Tuesday morning, June 1st.

LAST ADVERTISING FORMS CLOSE JUNE 2nd

FRED S. CLARK, Advertising Manager

Radio World, 145 W. 45th St., New York

The Newest Up-to-the-Minute Radio Set—It has Never Been on a Dealer's Shelf—Most Selective. A Wonderful DX Getter. Sold on a Guarantee of Satisfaction or Money Back.

Volume Control—Perfect Calibration—Rang 180-550

BST-6

B-for Beauty
S-for Selectivity
T-for Tone purity
6-its 6 tubes for distance

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

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

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

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

LOG OF BST-6

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

WSBC	10	WGY	50
WBBR	16	WMAK	51
WEBH	49	WMSG	11
WHT	55	WOC	85
WCCO	61	WFAA	78
WSB	66		

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

Specifications

Bakelite Panel, Walnut Finish—
With Etch-O-Gravure and Gold Decorations—
Bakelite Sub-Base—
Kurz-Kasch Bakelite-Walnut Pointers; Gold-filled, to Match—
Kurz-Kasch Bakelite Gold-filled Rheostat Knobs—
Lubree Straight Line Frequency Condensers—
Special Coils; Double Silk Solenoids—
Shore Audio Transformers—
Caswell-Runyan Two-tone Walnut-Finished Cabinet.

Guarantee

Satisfaction or Money Back

Each receiver is tested and retested, boxed and inspected before leaving factory, and guaranteed to reach you direct in perfect condition. Workmanship throughout guaranteed the best. Assembled by experts.

Immediate Delivery

Direct from factory to you
No dealers' or middlemen's profits

$40.00

SAFETY FIRST!—Why buy obsolete models, or radio failures at department store "bargain sales" when a BST-6, the latest achievement in radio, can be bought direct from the factory with no department store profit added? Here is a real bargain, sold you with a guarantee of satisfaction or money back.

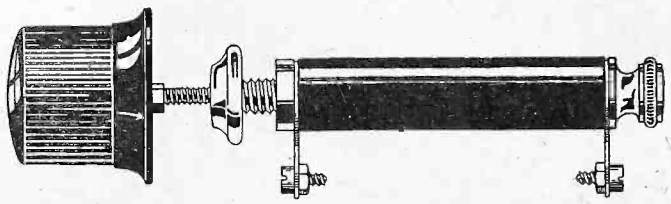
Send Check or P. O. Money Order to

COLUMBIA PRINT,

Radio Division, 143 West 45th St., New York City

RADIO WORLD Guarantees the Responsibility of This Advertiser

MORE POWER!
NO EXTRA TUBES!



The Bretwood Variable Grid Leak

(Bretwood, Ltd., Sole Patentees and Owners)

Guaranteed Precision Range ¼ to 10 Megohms

Brings in More Distant Stations — Affords Greater Volume — Improves Tone Quality! Fits Any Set, Panel or Baseboard. Price, $1.50

"IT DOES THE TRICK"

"Nothing Better"

The North American Bretwood Co.

For some time I have seen in the Radio World your advertisement of the Bretwood Grid Leak, as well as some of your testimonials, and I decided to try one of them at the first opportunity which presented itself last night,

I own a 5-tube factory built set. During the last three days I could not get a sound out of it due to what I thought was a terrific spell of static, but which was caused by a defective grid leak. The noise was indeed so terrible that rather than hear such a racket I turned off the set and went to bed.

To-day, as luck would want it, I happened into a store and saw a Bretwood Variable Grid Leak on display. I decided to try it immediately. The results were absolutely gratifying. Other sets in the neighborhood are not getting anything at all, while I have brought in a great number of stations with speaker volume, with a socket aerial. I must say for the benefit of those who have not tried your grid leak that there is nothing better in this line.

ALFONSO FABRIS ARCE,
4116 Ave. R, Galveston, Tex.

The North American Bretwood Co.

Telephone, BRYant 0559

145 West 45th Street, N. Y. City

Sole Distributors for United States

North American Bretwood Co., 145 West 45th St., N. Y. City.

Gentlemen: Enclosed find $1.50. Send me at once one Bretwood Variable Grid Leak on 5-day money-back guarantee.

NAME .....

ADDRESS .....

CITY ..... STATE .....

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HOW BETTER AF IMPROVES DX

Filament Hookups for Greatest Economy

MAY 29
1926

RADIO WORLD
Reg. U. S. Pat Off.

Vol. 9. No. 10. ILLUSTRATED Every Week

15 Cents

AERIALS FOR USE ON TRIPS

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LOOP inside the cover of the set makes a good aerial. Turn the set to get directional effects. See articles on Page 3 and following pages about aerials for use on trips.

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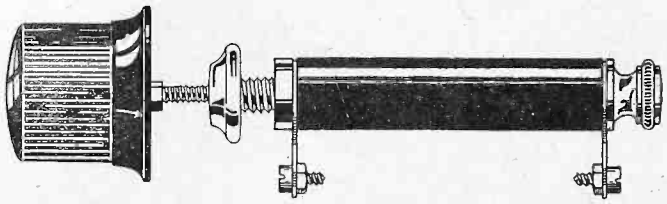

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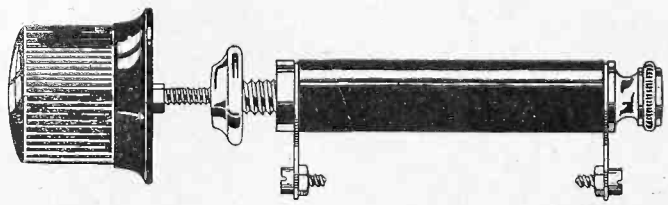

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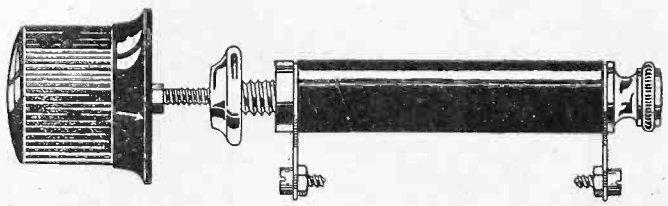

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Vol. IX
No. 10
Whole No. 217
MAY 29, 1926
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RADIO WORLD
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Aerials in Ground or Water

A TREE may be used as an aerial mast, and the usual insulation and other precautions taken for an L-type antenna.

By Lewis Winner

Associate, Institute of Radio Engineers

ALTHOUGH communication by the use of underground antennas has found its only extensive use in connection with the submarine, tests have found it to be of a wonderful value to the camper, hiker, motorboatist or canoeist. Such scientists as Kiebitz have found that signals can be effectively received on an antenna underneath the ground or water whether the wire be short or long. More satisfaction is obtained from a ground antenna when the soil is wet. Better yet is an antenna placed in clear or even salt water. The wire, as will be noted in the photographs, should be of the heavily insulated type. The waves penetrate the ground to a certain extent, this depending upon the wavelength and character of the ground. This applies also to the underwater antenna.

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The noises received on the overhead type, during a storm, prevent good reception. Also the underground or underwater antenna has a greater ratio of signal strength to strays than has the overhead antenna.

The length of the wire used in the underground system is dependent upon the wavelength of the signals from the transmitting station. For short waves a short wire will be necessary. With a given size of wire, the thicker the insulation, the longer the most effective wavelength. With a given thickness of insulation, the larger the wire, the shorter the most effective wavelength. If one desires to bury a wire in the ground or water for a long time, then the wire should be isulated with at least ⅛ or ¼" of soft live rubber. Although such construction is expensive, the results obtained are worth the trouble. Leadin wire may be used for such an aerial.

A wire about 75 feet long, used in connection with a standard receiver, will give reception of from 170 to 550 meters. No. 14 hard drawn or stranded copper wire, with a good coat of rubber insulation should be used. If using the earth, then bury the wire about 15". The deeper, the better, to a certain extent. In most cases, 24" should be the maximum depth. This earth should be fairly wet, which will result in louder, more stable signals.

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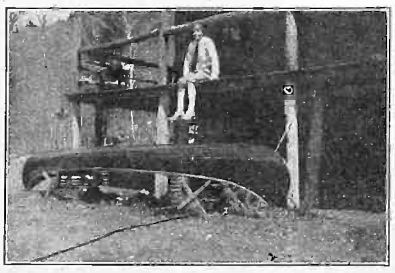
When using the ground or the water antenna, the receiver must have at least a stage of radio frequency amplification or a sensitive detector, as in most portable receivers.

Besides the ground and the underwater wire as antennas, the tree may be employed as such. This was demonstrated about a year ago by General George Squire. A nail may be driven into the uppermost trunk of the tree, or as high as it is possible to do so and the wire attached thereto. According to leading authorities on this system, the actual receiving of the waves is mostly effected by the wire coming from the tree to the receiver, e. g., lead-in. The uppermost portion of the tree serves to increase the capacity of the antenna. It also serves to intercept to a certain extent the electromagnetic waves which induce currents in the electrically conducting juices of the tree, as well as in the lead-in wire.

Generally, it can be said that any system of electrical conductors, so arranged that they are above or underneath the ground, but insulated, is capable of absorbing energy from a transmitted wave, and when used in conjunction with a receiver employing a sensitive detector, may detect the presence of these waves.



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If a loop antenna is at hand, it may be put to good use. That is, it may be used in conjunction with the ground or underwater antenna, which will be of considerable assistance in the elimination of interference. A unidirectional antenna system is obtained and signals often are louder.

Summarizing, if the simple antenna is to be used, it should be properly insulated wire and deeply buried. If the underwater antenna is used, a heavily insulated wire should be used and if in clear water should be fairly deep, but if in salt water should be very near the top. If the tree is used, it should be very high and fairly distant from the set. The underground and the underwater antennas are about equal in performance.

When using the overhead antenna end the tree as a mast, as shown in the upper left-hand photograph, a 75-foot wire, with a leadin, being suitable to height of tree should be used. It might be found that when employing this system the longer wavelengths cannot be received, this being due to the set being so designed as to operate on a 100 foot antenna with a longer leadin such as is installed on most housetops. This, however, can be easily cured by placing a 4 or 5-turn coil wound on a 3" diameter tubing with No. 22 double cotton covered wire, in series with the antenna or rather leadin. When doing this, be sure that neither the leadin nor the antenna touches the moist ground. This will cause the fundamental wavelength to be increased.

The Newest Up-to-the-Minute Radio Set—It has Never Been on a Dealer's Shelf—Most Selective. A Wonderful DX Getter. Sold on a Guarantee of Satisfaction or Money Back.

Volume Control—Perfect Calibration—Rang 180-550

BST-6

B-for Beauty
S-for Selectivity
T-for Tone purity
6-its 6 tubes for distance

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

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

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

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

LOG OF BST-6

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

WSBC	10	WGY	50
WBBR	16	WMAK	51
WEBH	49	WMSG	11
WHT	55	WOC	85
WCCO	61	WFAA	78
WSB	66		

SELECTIVITY

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

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Bakelite Panel, Walnut Finish—
With Etch-O-Gravure and Gold Decorations—
Bakelite Sub-Base—
Kurz-Kasch Bakelite-Walnut Pointers; Gold-filled, to Match—
Kurz-Kasch Bakelite Gold-filled Rheostat Knobs—
Lubree Straight Line Frequency Condensers—
Special Coils; Double Silk Solenoids—
Shore Audio Transformers—
Caswell-Runyan Two tone Walnut-Finished Cabinet.

Guarantee

Satisfaction or Money Back

Each receiver is tested and retested, boxed and inspected before leaving factory, and guaranteed to reach you direct in perfect condition. Workmanship throughout guaranteed the best. Assembled by experts.

Immediate Delivery

Direct from factory to you
No dealers' or middlemen's profits

$40.00

SAFETY FIRST!—Why buy obsolete models, or radio failures at department store "bargain sales" when a BST-6, the latest achievement in radio, can be bought direct from the factory with no department store profit added? Here is a real bargain, sold you with a guarantee of satisfaction or money back.

Send Check or P. O. Money Order to

COLUMBIA PRINT,

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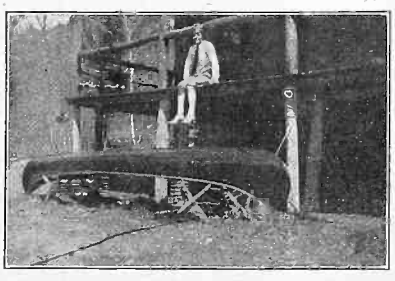

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In Defense of the Loop

By Roscoe J. Ross

THERE are two great types of antennas—the outdoor aerial and the loop. The more popular by far is the outdoor antenna. It costs less and it picks up more energy. For many, those considerations settle the question. But much may be said in favor of the loop. Certainly it is more convenient and versatile.

In a sense all outdoor aerials are home-constructed, since the erection constitutes the construction. This may include the erection of two towers between which the wire is strung, properly insulated. If one goes in for towers of any size an outdoor antenna will cost more than a loop. Often the slipshod erection of an antenna between chimney pots on a roof gives one an energy collecting source that has little advantage over a good loop.

Making Up the Difference

As a loop collects less energy than an outdoor antenna, to equalize performance addition of radio frequency amplification may be necessary. That is the chief economic point. It is obvious, therefore, that some sets will not give satisfactory results from a loop, e.g., the 1-tube regenerative receiver. Yet little need be added to make loop operation effective. A stage of tuned radio frequency amplification ahead of a regenerative detector will do it. If properly designed, a set using two stages of tuned RF ahead of a non-regenerative detector tube is sensitive enough to permit of loop operation. Hence it is not true that an elaborate set is necessary before one may obtain good results on a loop.

The Super-Heterodyne is essentially a loop set. While an optional outdoor antenna connection is a good plan, no Super Heterodyne should be built unless provision for loop connection is included. The outdoor antenna energy may be supplied to the loop in auxiliary fashion, by inductive coupling of an antenna coil to the loop, or some switching arrangement may be used, whereby the loop is cut out (instead of being left in) and the secondary of an RF transformer is cut in. The primary, in this system, is connected to aerial and ground.

Loop Jack Usually Omitted

The efficiency of a 5-tube set is impugned if loop operation is not electrically possible. Usually no mechanical provision for loop connection is included, and this manufacturing omission is one reason why the loop is less popular than it would be. Assuming the truth of the oft-repeated statement that eagerness for receiving distant stations is at a low ebb, there is all the less reason for ignoring the loop.

Any set efficient enough to be put in the loop class will duplicate, more or less, on a loop the stations receivable on an outdoor antenna, with the proviso that where weak signals are concerned the volume, with loop reception, may be noticeably less. In any case, weak signals are not brought in with comfortable, clear volume on any receiver or any aerial. The miscellaneous noises along the route between station and receiver have to be amplified beyond the satisfaction stage, hence the quality declines as the volume ascends. An available extra stage of audio may be made more serviceable than extra RF amplification, under such circumstances, granting that the signal does actuate the detector, for the amplification of static is less.

Complexion of Outdoor Antenna

The outdoor antenna and ground are the plates of a condenser. The wire has resistance, of course, and a little inductance, but primarily the system is one of capacity pickup. A loop is an inductance, having resistance and some small capacity. In an outdoor antenna the capacity is lumped, the inductance distributed. In a loop the inductance is lumped, the capacity is distributed. Hence we may compare inductance with capacity to distinguish loop from outdoor antenna.

The capacity system addresses itself to the electro-static component of the broadcast wave. The inductive system relies on the electro-magnetic component. As between the two, the magnetic seems to make for better quality than does the static component. On strong signals the loop may be louder than the outdoor antenna on the same set. The fact that a capacity antenna picks up more energy than a coil antenna is no denial of the fact that it often picks up too much, e.g., in the Super-Heterodyne. Many receivers of a lesser degree of sensitivity than the Super-Heterodyne use some form of audio frequency amplification that is rather strictly limited as to the voltage the grids will endure without loading up. Resistance coupling is an example. Its quality is superb, until the grids are loaded, when it is wretched. This may be controlled by providing a greater leakage path (i.e., using a grid leak of lower resistance in each AF tube). As the resistance goes down, so does the volume, though the volume remains comfortable. Suitable negative bias helps, but it does not wholly overcome the difficulty.

It must be logical, therefore, to use a loop in instances where an outdoor antenna contributes too much energy. In other words, an outdoor antenna will do more than a loop, but often too much more. Diminished risk of loading the grids therefore augments the quality argument in favor of a loop.

Loop Pretty in Home

A well-made loop is a very sightly ornament. A home-made loop is no more expensive than an outdoor aerial installation, but is not suggested, because the loop, unless very skillfully made, is not likely to be a thing of beauty.

The loop should be rotatable rather than fixed permanently inside the cabinet, for only by turning the loop does one gain the advantage of directional effect.

The loop renders the set and equipment transportable. If the set, speaker, batteries, etc. are on a tea cart, or in a console, as is common, the set may be wheeled from one room to another, on the porch, or into the garden for a festival under the grape vine canopy. Manual ease accompanies the loop at every step, from installation to all stages and conditions of operation.

Covering the Band

On the point of wavelength scope—not distance range—the loop is much more likely to tune in the entire band with a small capacity variable condenser (say even .00025 mfd.) than if an outdoor antenna were used. In fact it may be accepted as generally true that .00025 mfd. will not tune in the whole band (200 to 550 meters) where an outdoor antenna is employed. A .00035 mfd. condenser just "makes it," with a slight margin. Yet with a loop, due to the absence of strong antenna capacity effect, there is no difficulty.

This is merely another point relative to a loop's versatility. Many sets do not tune down low enough because a relatively sharply tuned input is loaded with antenna capacity that makes the minimum capacity of that tuned circuit several times the minimum capacity of the condenser alone. Subsequent tuned circuits in the set, free from the antenna capacity load, may go down low enough, but the signal wave is irreparably damped in the first stage. This may be overcome by substituting a small indoor aerial for the outdoor one. But the indoor aerial causes volume to drop more than most persons care to endure (unless the receiver is supersensitive). Hence a short indoor aerial, in pickup, is rather in the loop class than in the outdoor antenna group, and if one thinks of selecting an indoor antenna, why not a coil antenna? The loop turns even a colder shoulder to static than does the indoor capacity antenna, indeed a moving shoulder, so that the elimination or reduction of interference is easier.

Give the Loop a Trial

Loops are like other things in life—liked by some, disliked by others. Each person surely should select what he or she prefers, or have a switching system, to cater to changing moods. At least the loop should not be condemned without trial.

How New Super-Thin Diaphragm Works

WASHINGTON—The new process for the manufacture of super-thin metal diaphragms, developed by Doctor Carl Mueller of the Physikalisch-Technische Reichsanstalt in Berlin, enables manufacture in thicknesses down to 1/100,000 millimeter.

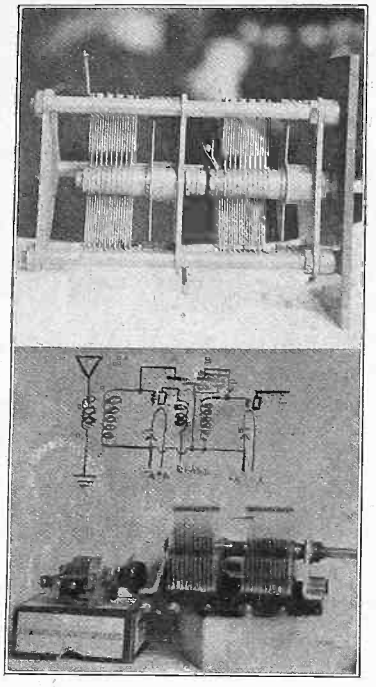
The practical application of super-thin diaphragms is stated to be of considerable importance in radio communication. It is stated that the largest field of practical application will be found for microphones, telephones, loud speakers, gramophones, etc.

The microphone consists of two parallel metal membranes. Between these two membrances and from 1 to 5 millimeters distance from each, is stretched a very fine silk tissue which is plated with gold, silver or platinum. A 200-volt electric current supplied by a storage battery is passed through the silk-metal tissue. The tissue is connected with an amplifying tube. The sound waves induce the silk-metal tissue betwen the two metal membranes to swing back and forth, and this swinging motion produces a low frequency current which is amplified by the amplifying tube with which the microphone is connected. The tone strength after first AF tube is equal to that from a carbon microphone.

BOON TO SHUT-INS

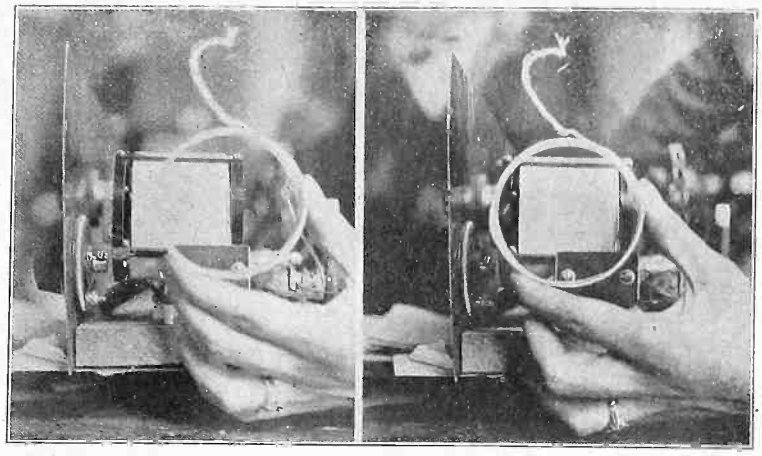
The Washington, D. C., radio hospital fund is a charitable undertaking to install sets in hospitals, institutions, and homes of shut-ins.

Double Condenser Tests



THE PLATES of a double condenser must not be warped, otherwise given dial settings will not always represent equal capacity in both sections. Poor volume and little DX results. The plates should be equi-distant throughout the entire rotation (top photo). A midget condenser may be used for compensating a double condenser, but it constitutes another control, though a minor one, requiring variation only for DX. The double condenser has two stators (A and B) and one rotor (C). The midget is hooked up as shown at DE.

Straight Center Line Prevents Coupling

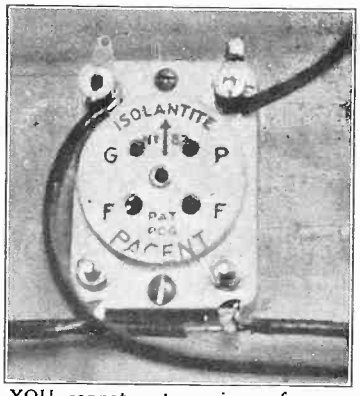


WHEN zero coupling is desired, as between radio-frequency transformers in two stages, it is not enough that the coils be at right angles, but the center through the length of one should pass through the central width of the other, on an imaginary line. An interesting confirmation of this may be made by disconnecting aerial and ground from your set and connecting them to the terminals of an external coil of few turns, like the one pictured, or of smaller diameter. Though you hold the new aerial coil at right angles to the secondary, signals will be heard if the relative position is as shown at left. Put the centers on a straight line (as at right) and no signals will be heard, due to absence of coupling. The zero point is lost if the small coil is moved so much as 1/16".

Conserver of Electrons

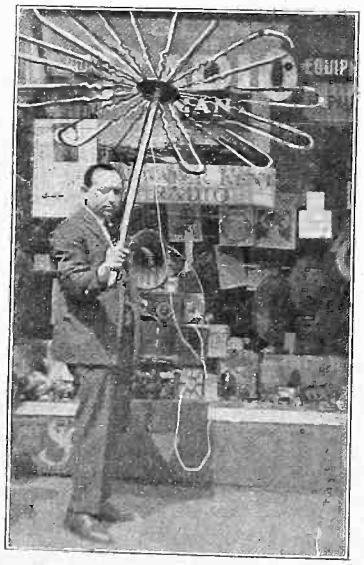
A MOULDED bakelite covering, permanently built into the tube, the base being a part of the mould, is being experimented with by one manufacturer. The theory is that the casing conserves the tube's heat and thus facilitates the electronic flow. The tube is shown in an X socket.

Neutralizing UX Tube



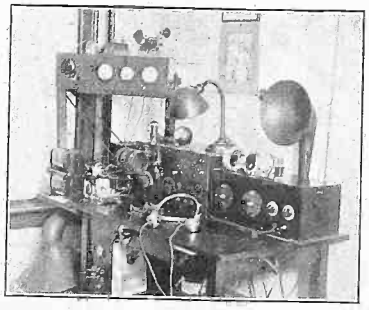
YOU cannot put a piece of paper under a filament prong of a UX socket to keep the tube "cold" when in the socket for neutralizing condenser adjustment. Therefore insert tube in socket and disconnect one of the filament leads to the socket post. The posts are lower left and right.

Proud of His Aerial



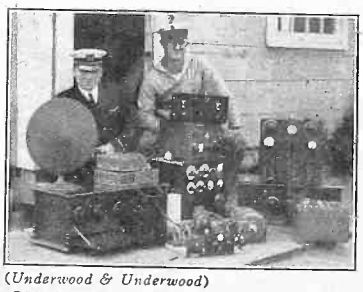
MICHAEL BLAN, known to the radio public as "Blan the Radio Man," of 145 East Forty-second Street, New York City, is shown demonstrating the latest type of antenna.

Hears 24 Countries



THE TRANSMITTING and receiving apparatus used by Station 2AMJ, owned and operated by Frank Lester, 4305 Broadway, N. Y. City, to communicate with stations in more than 24 countries, throughout the world.

Ready for Alaska



(Underwood & Underwood)

GUNNER C. G. ALEXANDER and Chief Radio J. T. Kiepler with the receiving and transmitting apparatus which will be employed on the aerial survey of 40,000 square miles of the south-eastern portion of Alaska. Three years will be spent by the Navy in covering this vast area.

Aerial Coupling Methods

Compromise Between Sensitivity and Selectivity May Be Reached at the Original Input—Tuned Impedance Affords Greatest Volume But Requires Larger Capacity Tuning Condenser Than Other Systems.

By Herman Bernard

Associate, Institute of Radio Engineers

MUCH depends on the aerial input of a receiver. A great deal may be lost by using a poor method of introduction of the radio frequency currents that strike the antenna. It is not possible to achieve perfection, but one may obtain the most possible under the circumstances. The question therefore is: What is the compromise you desire to make? It is like an exchange of advantages. You can not keep all the virtues of all systems in any one system.

The most popular method is to have a tuned radio frequency transformer, consisting of a primary coil with few turns, in inductive relationship to a secondary of about four times as many turns. The coupling is fixed (Fig. 1). This enables one to log the condenser dial setting with ease. Generally speaking, nothing will cause the dial settings to change for given wavelengths. This advantage is highly rated nowadays, and fans are willing to sacrifice much for its enjoyment.

Response Not Uniform

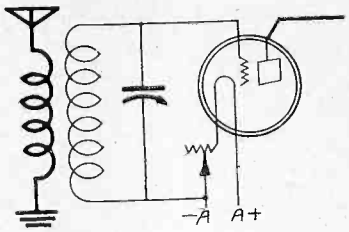
Naturally the amplification, or degree of response, is not the same on all wavelengths, so far as the aerial alone is concerned, because the signals will be stronger nearer the wavelength fundamentally established for the aerial by the antenna capacity, antenna distributed inductance, the lumped inductance of the untuned primary, and the reaction of the secondary upon the primary. The system is responsive to all wavelengths, however, even down to the short waves (those far below the broadcast band), as is proven by the fact that the same aerial and same untuned primary are useful in conjunction with short-wave receivers, although of course the secondary would have fewer turns and the tuning condenser would be of smaller capacity.

The general favor which the Fig. 1 method has met and its high average efficiency establish it as one of the really worth-while input hookups. Besides, it calls for a coil of the same as that used for interstage coupling, and this simplifies matters by affording interchangeability.

The tuning condenser may be .00035 mfd. or higher, but usually does not go higher than .0005 mfd. maximum, since that is a perfectly safe capacity to insure tuning in the entire broadcast spectrum. The number of turns on the secondary is decreased as a condenser of higher maximum capacity is used and also the primary turns usually are regulated by the 1-to-4 ratio.

Example of Effect

For example: Suppose the tuning condenser is .00035 mfd. maximum capacity.



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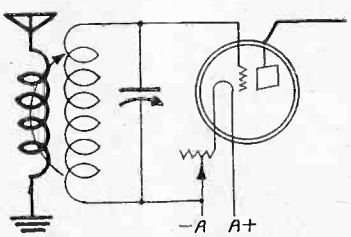


Fig. 2

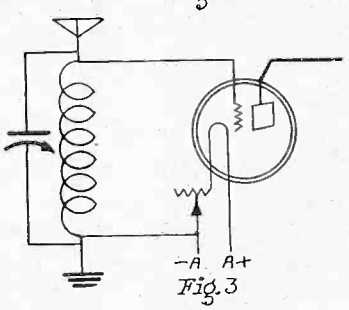


Fig. 3

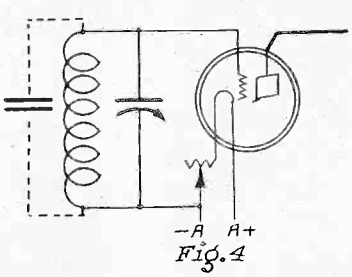


Fig. 4

Then a radio frequency transformer, wound on a 3½" diameter tubular form, may consist of 15 turns for the primary and 60 turns for the secondary, with ¼" separation between the two windings, which are side by side. If a .0005 mfd. condenser is used, the secondary turns would be 50 and the primary would have 12 turns. The diameter is the same, as is the kind of wire used (say, No. 24 double cotton covered).

The rule is to be modified by working conditions. For instance, if greater selectivity is needed, either the space between respective windings is increased beyond the conventional ¼", or the number of turns on the primary in cut down.

The Variable Primary

A better system, from the viewpoint of efficiency, is shown in Fig. 2, where the primary is rotatable, thus enabling one to vary the degree of coupling so that highest sensitivity is attained. Likewise the variable primary affords opportunity to regulate the selectivity. Where greater selectivity is needed it may have to be obtained at the expense of volume, but the drop may not be enough to cause any concern.

Instead of the primary being variable the secondary may be so, to the same effect, but this method is hardly ever used.

Against the variable primary method one must register the fact that the dial settings of the condenser shaft will not be the same for the same wavelengths, if the primary is shifted. Tight coupling causes the apparent inductance of the secondary to increase, hence to compensate for this the capacity setting of the condenser must be decreased. This interferes with logging, unless the variable primary is dialled, just like a tuning control.

The Adjustable Primary

A compromise between the two is to have the primary adjustable. The variation is made until the optimum point for general utility is reached, and then the primary is left in that position. It is a fixed primary in every practical sense, the adjustment being a consideration only at the time of installation. The adjustment is accommodated to the aerial conditions encountered. A greater or fewer number of turns on a regulation fixed primary would accomplish the same object, only the adjustable primary method is quicker and more convenient.

A tremendous increase in volume, accompanied by a decrease in selectivity, is encountered when the tuned impedance method of aerial input is used. Note that the aerial goes direct to the grid and that the end of the coil goes direct to ground and minus A. Whenever the aerial goes direct to grid, without series condensers anywhere in the antenna-ground system, the volume is great.

The Selectivity Question

Unfortunately, many receivers, while functioning satisfactorily under any of the systems previously discussed, are not selective enough in subsequent stages to allow the reception of so much energy. Fig. 3, the tuned impedance input, is broad in tuning, indeed the condenser requires no dial, actually, since a knob serves the purpose very well, and may be adjudged a volume control. For instance, at a point about 500 miles away, KDKA, East Pittsburgh, is tuned in regularly on a receiver using the Fig. 3 method, yet the signals will not disappear until the dial is turned 9 degrees either way.

A small dial probably would be preferred by most persons, say a 2" diameter, unless a pointer knob is used, and there are panel engravings to designate relative settings.

The variable condenser in the tuned impedance method must be larger than the usual types. For instance, .0005 mfd. is the most popular capacity of the day, but this will not tune in the broadcast band with this hookup. A condenser of .00075 mfd. capacity is likely to do it, but .001 mfd. is safer.

Antenna Capacity Effect

The reason for the necessity of a larger capacity condenser is shown in Fig. 4. The antenna and ground system constitute a physically large and electrically moderate condenser, of which the antenna is one plate and the ground the other. The dotted lines are used to supplant the usual aerial-ground diagrammatic representations. Therefore it is obvious that the capacity we are referring to is connected in parallel to the tuning condenser. Parallel capacities equal the sum of the

The Control of Set Results

Solution of Over-Oscillation Trouble Suggested, So That Strong Input Is Obtained, to Counteract Reduced Amplification Due to "Skinny Primaries" — Autotransformer Advantages Outlined.

respective capacities. Hence if the antenna-ground capacity has .00025 mfd., as is not unusual, this is added to the minimum capacity of the tuning condenser. Assuming the minimum capacity of the condenser to be .00005 mfd., and the maximum .0005 mfd., the ratio is 1-to-10, which is safely more than necessary to enable one to tune in the band. But if .00025 mfd. is added, then the figures are .0003 and .00075, a ratio of 1-to-2½, which is not nearly enough.

In an attempt to overcome this a series condenser often is used in the aerial circuit (Fig. 5), since the effective capacity is reduced by using a series condenser of a capacity less than that of the antenna system. The reduction may result in tuning in the whole band, although this seldom happens, but there is bound to be a severe drop in volume that puts the signal strength about on the same basis as that derived from the hookup shown in Fig. 1. Indeed, the antenna is converted into simply a pick-up system, wherein the series condenser may be considered as a capacity coupled primary. The shifting of the fixed condenser to the ground lead (Fig. 6), gives about the same results all around as does the antenna series condenser.

Needs Large Tuning Condenser

Therefore one must conclude that the best practice, if one desires the greater volume and sensitivity, is to use a large capacity tuning condenser and not attempt to utilize series makeshifts. If one has not such a large condenser, a smaller one will do just as well, if one is willing to resort to taps. Indeed, one tap will do, about one-third from the filament end of the coil. This interferes a little with the fullest logging convenience, since the switch point and the condenser must be read together.

Note the manner in which the tap switch is included. It is in the ground part of the coil, that is, at low radio frequency potential, and both the movable switch arm and the end of the coil are connected to ground and minus A. Hence any unused part of the coil is short-circuited, and dead end losses are considerably reduced. One need not worry much about these when one considers the terrifically augmented input.

As the selectivity of the tuned impedance method is low, it is necessary that tuned RF follow the input.

The regulation 5-tube set may be accommodated to this system, there being a second stage of tuned RF and a tuned detector input, in other words three tuned circuits. As the volume originally introduced into the receiver is very large, due to the high effective voltage obtained by the input method, the primaries of the interstage couplers may be reduced far below the number of turns supportable

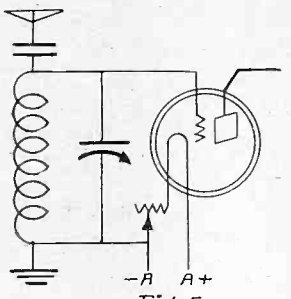


Fig. 5

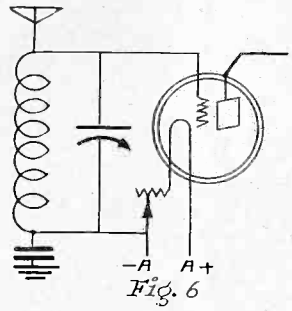


Fig. 6

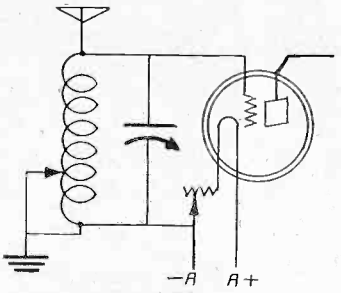


Fig. 7

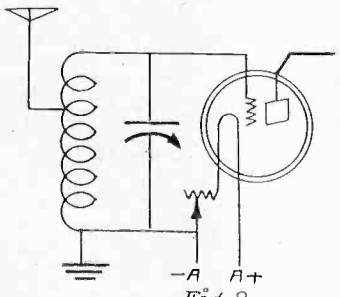


Fig. 8

by other methods of aerial input. The fewer the turns on these primaries the lesser the tendency toward over-oscillation and the lesser the amplification at high wavelengths, therefore here is an opportunity to make a receiver that needs no external methods of balancing, but which justifies the use of "skinny primaries." These not only reduce the over-oscillation tendency on the lower waves but also add to the selectivity. A non-selective input, therefore, gets the added advantage of high selectivity derived from succeeding stages and the strong input justifies the lowered amplification on the higher waves.

A point worthy of notice in regard to tuned impedance is that its broadness makes possible the tuning in on succeeding stages of wavelengths below those which the variable condenser would handle at the original input. In other words, despite the inability of the condenser to tune down low enough, the signals flow through, due to their drowning effect. Hence, if you calibrate the condenser in the tuned impedance stage, the chart would show you that it does not tune down to 209 meters, because the condenser is not of proper effective capacity range. But strong stations would come in nevertheless, due to the low resistance of the input circuit to other frequencies.

The impedance coil is not susceptible to general definition as to turns and diameter, because the winding depends on the antenna-ground capacity, as well as on the capacity of the tuning condenser. As a point of guidance, however, it may be said that with a particular aerial, using a .001 mfd. variable condenser, 37 turns of No. 24 DCC wire, on a 3½" diameter tubing, did the trick.

Auto-Transformer Coupling

The auto-transformer method of coupling (Fig. 8) is a cross between the impedance type and the inductive radio-frequency transformer method. Indeed, the aerial may be introduced at a point low enough on the winding to make the results about the same as with the Fig. 1 method. In fact, if that were done it would be the same as if the negative filament were grounded in Fig. 1 (excepting only that current flow is reversed). Therefore any desiring to use the Fig. 8 method, which will develop loud signals indeed, although not so loud as in Fig. 3, may experiment with the location of the tap. The nearer to ground the aerial is introduced, the less effective is the antenna capacity upon the tuning condenser, hence this method will support use of as low as .00035 mfd. variable condenser. A mid-tap location requires .00075 mfd., at least, for the tuning instrument, while if the aerial is connected about one-third the way up (counting from the ground), .0005 mfd. will work nicely.

It will be seen from the foregoing that the tuned impedance method is actually a way of tuning the aerial, and a tuned aerial makes for best sensitivity and loudest signals, especially when the connection from aerial goes direct to grid. Fig. 5 is an instance of tuning heaped upon detuning, so to speak, and is consequently less effective.

Fig. 7 is an out-and-out tuned aerial system, indeed only Figs. 3 and 7 are such, the rest being examples of untuned antennas, the variations being in the manner and degree of coupling.

Those who have not made experiments along these lines will find a little work on these problems pays a big reward. Your set may be more selective than need be, and you can change your antenna input so that the result is like that obtained from an extra stage of audio frequency amplification. Or you may be about to build a receiver and are wondering how much tuned RF you should use. If you want a very selective receiver, with three stages of tuned RF and a tuned detector input, you may develop one, using an condenser tuned impedance coil in the antenna circuit, perhaps utilizing a multiple condenser for the next two stages to keep the controls down to three.

At least you should see what form of coupling is best suited to your location, for factory-made coils can not take into account the varying conditions met in different locations.

Economized Filaments

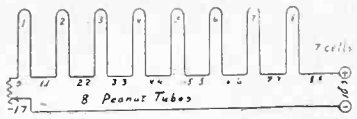


FIG. 1

By J. E. Anderson
Consulting Engineer

THERE are three fundamental ways of connecting the filaments of a multi-tube set across the source of filament current—in parallel, in series, and in series parallel. Also, combinations may be worked out. The method used depends on the voltage of the A battery, on the filament terminal voltage of the various tubes, and on the filament current requirements of the tubes. Not all the methods are equally economical under all conditions.

Some seem to think that plus current and minus current exist side by side and travel in a conductor in the same fashion that traffic travels in both directions on a street. There is only one current, and it travels from high potential to low potential, just as there is only one current of water in a river, which travels from high altitude to low altitude. And some think that plus and minus are something absolute. These terms are purely relative, indicating direction. We may call any point within a battery, or any point within a circuit, zero potential. Then from this point we may measure negative voltages in one direction and positive voltage in the other.

The Relativity of It

Suppose we call the negative terminal of the battery zero, then the other terminal is at a higher potential, or positive. It may be 45 volts positive, for instance. But we may also call the positive terminal zero if we wish. Then the negative becomes minus 45, because it is lower in the potential scale. Plus and minus are merely convenient, though misleading, terms to designate which of two terminals, or two points in a circuit, is at the lower potential or voltage. It is necessary to mark them in some manner because we cannot tell by looking at them which is higher and which is lower.

A battery in one sense may be compared with an elevator in a tall building which carries passengers in only one direction. It produces a sudden change in the altitude, or potential, of those riding in it. Suppose all the passengers preferred to, or were obliged to, walk down the stairway. This then would represent the external circuit connected to a battery. We do not have to mark the top of the elevator shaft plus or positive, because we can see that it is higher than the first floor. And we do not have to mark the basement minus or negative, because we can see that it is lower than the first floor. But we can call any point on the elevator shaft zero. If we call the main floor zero, then everything above it would be positive, that is, higher, and everything below it, or in the basement, would be negative.

Different Zero for Different Tubes

In a radio circuit it is customary to regard the negative end of the filament as at zero potential, or as being on the ground floor. But that refers only to that particular tube. Each tube may have a different zero, just as in a stairway each flight has a different zero. In a stairway the low end or zero end of one flight coincides with the high end of the flight next below. That is, the plus end of one is on the same level as the minus end of the other. If filaments are connected in series, the minus end of one will be at the same potential as the plus end of the one next below it. The zero of the entire series may be taken anywhere. A convenient point is the negative end of the lowest filament. If there is a rheostat below this, as is customary, the low end of this is a minus potential. It is in the basement. Of course the battery goes all the way down, just as the elevator does.

One often speaks of ground potential, and this is frequently taken as zero. The zero point in our circuit may or may not be the same as ground potential. It is not unless we ground the zero point. Often the zero point on the filament as defined above is at a potential higher than ground potential, for it is very often desirable to ground some point of lower potential than that of the minus end of the filament. We may ground the positive end of the A battery, but it is more customary to ground the negative.

The Analysis of Fig. 1

Now let us proceed to Fig. 1. This represents the filament circuit of an 8-tube Super-Heterodyne employing peanut tubes throughout, and is the arrangement used by the Western Electric Co. These tiny tubes require a filament voltage of 1.1 and a current of .25 ampere. Since their filament voltage is very low they are especially suitable for the series connection. Eight of them may be so connected and operated satisfactorily on a bank of seven No. 6 dry cells connected in series. The nominal voltage of this battery when fresh is 10.5 volts, and since the eight tubes require only 8.8 volts, there is an excess of 1.7 volts. This excess is taken up in the single filament control rheostat. As the cells run down this excess of course decreases, and when the voltage of each cell is about 1.26 there is no excess. The battery must then be replaced by a new one, or an additional cell of 1.5 volts may be added in series with the seven old cells to boost the voltage. Since the current required is .25 ampere the drain on the No. 6 dry cells is quite heavy, though not excessive. However, it would be better to use two sets of seven cells in parallel so that the current in each cell would only be one-eighth ampere. This would be much more economical. If the set is a portable one the question of weight is important, and then it is best not to use more than seven cells.

The filament circuit connected as in Fig. 1 is quite efficient. The only energy lost is that dissipated in the rheostat. The average voltage drop in this resistance during discharge of the battery is .85 volt. Since the current is .25 ampere the power loss is .212 watt. The useful voltage drop in the filaments is 8.8 and the power used in the filaments is 2.2 watts. Hence the efficiency is 91.25 per cent.

A Variety of Bias Available

Another advantage of connecting these tubes in series is the ease with which almost any grid bias may be obtained. The negative end of the filament of the first tube is taken as zero in Fig. 1. The negative end of the eighth tube is then at plus 7.7 volts. Now suppose we wish to give the grid of the eighth tube a negative bias. If we connect the grid return of that tube to the point 6.6 between 6 and 7, the grid bias will be 1.1 volts, since 6.6 is that much lower than 7.7 volts. Connecting the grid return to the point 5.5 between 5 and 7 gives a bias of 2.2. Thus the last tube may be given any bias in multiples of 1.1 up to 7.7 volts. This bias remains fairly constant provided the filament current is kept constant. In addition to the 7.7 volts

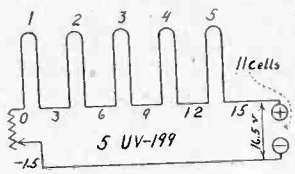


FIG. 2

bias there is the voltage drop in the rheostat, or 1.7 volts. If the grid return lead from tube 8 is connected to the negative terminal of the battery, the total grid bias will be 9.1 volts. The 1.7 volt part of this, however, is variable, depending on the state of the battery. For this reason it is best not to use this for bias at all, except for the first and second tubes.

The Correct Bias

The tubes located lower in the potential scale may also be given a grid bias by properly connecting the grid return lead. No. 7 can have any bias from zero to 6.6 volts, No. 6 any bias from zero to 5.5 volts, and so on down the scale. The first tube can only have zero bias unless advantage be taken of the drop in the rheostat. The steps by which the bias may be varied are smaller than if dry cells were used to obtain it, and this is a decided advantage. If the tubes are connected so that No. 1 is the first radio frequency tube and the others in the order of increasing signal strength concluding with No. 8 for a power amplifier, then the grid bias obtainable for any tube is just about correct for the plate voltage that should be used.

The effect of the series connection on the plate voltage will bear comment. Suppose that we use a 45 volt plate battery and that we connect the negative of the B battery to the positive of the A battery. The last tube will then have an effective plate voltage of 46.1 volts, since the voltage drop in the last filament is added to the battery voltage.

Tube No. 7 will have an effective voltage of 47.2 volts, because the voltage drop in two filaments is added to the voltage of the battery. The tubes lower in the scale will have correspondingly higher plate voltages. The first tube will have an effective plate voltage of 53.8 volts. That is not as it should be for the tubes which require the highest plate voltage get the lowest.

The Plate Voltage Analyzed

Let us try connecting the negative of the B battery to the negative end of the first filament, that is, to the point of zero potential. The first tube then gets an effective plate voltage of 45. The second tube only gets 43.9 volts, the third 42.8, and so on. The last tube gets 37.3 volts. This case is worse than the first, since not only is the order wrong but the voltages are less than the voltage of the B battery. Suppose we reverse the order of the tubes so that No. 1 is the last audio amplifier and No. 8 is the first tube in the circuit. Then if we connect the negative of the B battery to the positive of the A battery, the first tube in the circuit will get 46.1 volts on the plate and the last tube will get 53.8 volts. That is better. Instead of reversing the order of the tubes the A battery terminals could have been reversed and the rheostat moved to the new negative branch. That would have accomplished the same object. Of course, making this change does not alter the grid bias potentials that can be obtained.

Use of Other Tubes

Other tubes besides the peanuts may be

Drain Cut Astonishingly

connected in series in the manner shown in Fig. 1. Thus in Fig. 2 is shown a circuit comprising a series of five 199 tubes. These five require a total filament voltage of 15 which is nominally given by 10 dry cells connected in series. An extra cell is required to take care of the voltage drop of each cell as the battery runs down, the excess of 1.5 volts being taken up in the rheostat. When the voltage of each of the eleven cells has been reduced to 1.36 it will be necessary to add still another cell. The twelve cells are good until the voltage of each is 1.25 volts, when a thirteenth cell may be added. This should be the maximum number of cells, because if the voltage were boosted any further by adding new cells, the old cells would not contribute anything but would dissipate part of the energy of the good cells. The efficiency of the filament circuit when eleven cells are used is on the average 91 per cent.

Grid bias potentials may be obtained in this series in the same manner as in Fig. 1. In this case, however, the bias can only be varied by three volts at a time, since the voltage drop in each cell is 3 volts. Tube No. 5 can be given a grid bias of 12 volts exclusive of the voltage drop in the rheostat, which should not be used for the sake of definiteness of bias. What was said under Fig. 1 in connection with plate voltages holds equally well here.

Use of 5-Volt Tubes

The first tube may be given a plate potential of 15 volts by merely connecting the plate return lead to the positive terminal of the A battery. If tube No. 1 is made the last tube in the receiver and if a 45-volt plate battery is used and is connected with its negative terminal to the positive end of the filament of No. 6, the total plate voltage on No. 1 will be 60 volts. Tube No. 6 will only have 48 volts under the same conditions, while the other tubes will have intermediate values.

Even 5 volt tubes may be connected in series, but the only place where this might be done to any advantage is where a 32-volt storage battery is available, such as are used for farm lighting systems. Fig. 3 shows how a maximum of six tubes may be connected in series across such a storage battery. A smaller number of tubes of course, may be used, provided a suitably large rheostat be employed to cut down the excess voltage. Grid bias potentials in steps of 5 volts may be obtained in the same manner as explained under Fig. 1. All but the first tube may be given a bias of at least five volts.

The effect on the plate voltage in this case is much greater than in the preceding two cases. Thus tube No. 1 may be given a plate potential of 30 volts by merely connecting its plate return lead to the positive terminal of the storage battery. Tube No. 6 will only get 5 volts under the same conditions, and the intermediate tubes will get intermediate voltages in steps of five volts. Since it is desirable to have the highest voltage on the last tube in the receiver, tube No. 1 should be made that tube, as already explained.

Care Is Necessary

In farm lighting systems the positive

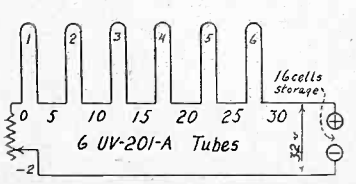


FIG. 3

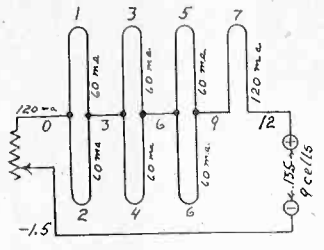


FIG. 4

side of the battery is usually grounded. Hence if a radio set is connected to it in the manner discussed above, the positive terminal of tube No. 6 will be grounded. Care must be exercised to see that no other point of the set is grounded simultaneously.

In Fig. 4 is shown a method of operating 199 and 120 tubes in series parallel on a six volt battery. Each of these tubes requires a filament voltage of 3. Therefore two of these tubes may be connected in series across a six volt storage or dry cell battery, and there will be no energy waste in a rheostat. That is, the filament circuit will be 100 per cent. efficient. A rheostat is merely inserted in this filament

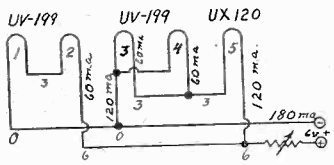


FIG. 5

circuit for controlling the current, that is, in case less than normal current is required. Of course, as soon as the rheostat is cut in the circuit is no longer 100 per cent. efficient, from a battery viewpoint.

When the voltage of each of four dry cells in this circuit is reduced to less than 1.5, and that is very quickly, the voltage must be boosted by the addition of another cell in series. These five cells are good until the voltage of each is reduced to 1.2. The average efficiency of the five cell circuit is 89 per cent. A small storage battery of three cells may well be used in place of the dry cells, even for portable use.

6 Tubes Draw Only .24 Amp.

The circuit in Fig. 4 which consists of six tubes, two of which are 120 and the rest 199, draws only 240 milliamperes at the filament. This is well within the allowable current drain of No. 6 dry cells, and hence four to five of these cells may be used for portable sets. For home use double the number should be employed in series parallel.

Negative bias voltages of 3 may be obtained for three of the tubes in Fig. 4, the three even numbered tubes. These tubes are on the high side of the line and therefore if the grid return leads of these tubes be connected to the negative end of the

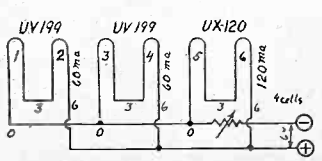


FIG. 6

filament of the odd numbered tubes, the grid bias on the even tubes will be three volts. The odd numbered tubes can only have a zero or positive bias unless an external grid battery be used.

A similar 5-tube circuit is shown in Fig. 5. In this circuit only one 120 tube is used, while the rest are all 199. The first two tubes are connected in series across the six volt battery as in the previous circuit. The next two 199 tubes are connected in parallel, and this parallel combination is then connected in series with the filament of the 120 tube. The latter tube requires 120 milliamperes but only 3 volts. The 199 tube requires the same voltage but only half as much current as the 120 tube. Hence two of the 199 tubes connected in parallel will require the same current as the single 120 tube. The voltage across the three tubes thus connected is 6. Hence, they may be connected across the 6-volt battery.

Another Economical Move

When the voltage of the battery is exactly six, normal current flows in all the tubes, 120 milliamperes in the 120 and 60 milliamperes in each of the 199 tubes. Thus the total drain is 180 milliamperes, a value so low that a single series of four No. 6 dry cells will supply the filament energy for a considerable period. When the voltage of each cell has fallen too low to give satisfactory results a booster cell may be added. When no rheostat is used in this circuit it is 100 per cent. efficient as regards the filament circuit, and it is the most efficient method of connection. The rheostat should only be used when the booster cell is fresh, or when the battery voltage is over 6.

A similar circuit is shown in Fig. 6. This consists of three pairs of parallel connected 199 tubes, each pair connected in series with an adjoining pair, and the last pair in series with the filament of a single 120 tube. The last tube draws 120 milliamperes and each pair of 199's draws twice 60 milliamperes, or 120, so that the total current in the filament circuit is just 120 milliamperes, since series connection adds the voltage but not the amperage. The total voltage drop across the seven tubes is four times three, or 12 volts. This will be given norminally by 9 dry cells with 1.5 volts to spare.

Grid and Plate Voltages

Grid voltages may be obtained in this circuit as in any of the series-connected circuits given previously, and the variation exclusive of the drop in the rheostat is from zero to 9 volts. The plate voltages are also affected in the same manner as in the previous circuits. Of course a circuit may be built in this manner with a fewer number of tubes than seven. For instance, one pair of 199's may be dropped. The required voltage would then be three less, and the required number of cells would be seven instead of nine.

The filament circuit shown in Fig. 6 has been especially designed for use with an A. B. and C. eliminator. Instead of taking the filament current from a battery it is supposed to be taken from the

(*Concluded on page* 10)

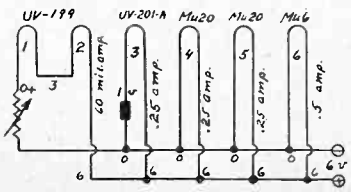
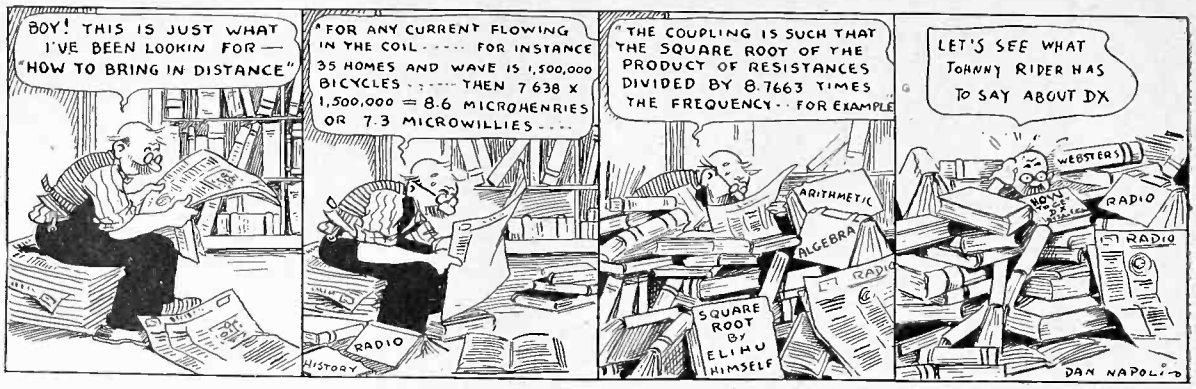


FIG. 7

The Road to DX Signals



By John F. Rider

Member, Institute of Radio Engineers

Why a Quiet Audio Channel Helps Tremendously in Making Distance-Getting Easier — Good Location a Prime Requisite—How C Batteries and Other Biasing Methods Help—Skill in Tuning an Absolute Requirement.

NO one can assure another of DX reception and no one can guarantee DX reception. But there are methods whereby one can strive for DX reception, whereby one can increase the possibilities of obtaining reception of stations located at distant points.

The subject of "distance getting" is more complex than one is wont to imagine after one glance or a short period of consideration, and fully to comprehend the subject, it is essential that we be truthful with ourselves. There are two paramount factors to be considered and they are in sequence of importance, location and sensitivity of the receiver. That location is by far the more important is being demonstrated daily, for there are innumerable super-sensitive receivers that are not accomplishing the results obtained with smaller and less sensitive receivers situated in localities more favorable for general reception. This situation however must be fully realized and understood. The fact that the super-sensitive receiver does not record the stations received with the weaker receiver in another location does not signify that the super-sensitive set is inferior or does not possess its rated degree of sensitivity. The reason for its failure is that the distant station does not penetrate with sufficient intensity in the locality wherein this super-receiver is located. If the signal wave does not strike the receiver aerial, the signal cannot be received even if a thousand stages of amplification were used. One should always remember that a receiver does not reach out for distance. And increase in sensitivity means just what the phrase denotes. The receiver is more sensitive to weaker signals, but this increase in sensitivity does not guarantee reception of the distant station, for perhaps the signal wave of a desired distant station is deflected before reaching the receiver. The weaker signal will be made audible providing the signal wave, as weak as it may be, is impinged upon the receiver aerial.

Were we to take the super-sensitive receiver and operate it in the location of the less sensitive receiver the superiority of the former would manifest itself immediately by the reception of signals which, while strong enough to actuate the detector tube of the super-sensitive receiver, would be far too weak to actuate the detector tube of the less sensitive receiver. This can best be explained by quoting certain values. Let us assume that the average hard detector tube requires about .02 of a volt incoming high frequency voltage so that the least audible signal be heard in a pair of phones connected in the plate circuit of the detector tube, without any radio frequency amplification or regeneration.

How It Works Out

A signal with a voltage value of .01 therefore would not produce an audible sound in the phones. Now if we place this detector tube in a certain location with respect to the transmitting station, so that the incoming signal voltage is .025 volts, an audible signal is heard. Suppose in a different location we have a receiver with a voltage of 10 obtained by the use of a stage of tuned radio frequency amplification preceding the detector tube. This means that a signal voltage of .0025 volts applied to the first tube will produce an audible signal in the phones, since the amplification power of the stage of tuned radio frequency amplification will boost this voltage so that the voltage applied to the detector tube grid will be of the required value, namely .025 volt. However, if this more sensitive receiver is so located that the incoming signal voltage as ap-

(*Concluded from page 9*)

output of a B battery eliminator and smoothing out filter. A practical filter and rectifier may be constructed which will deliver 120 milliamperes of steady current. This may then be used to heat the filaments of the tubes if they are connected as shown in Fig. 6.

The voltage drop of 12 across the seven filaments will be taken from the voltage intended for the plate voltage, but the rectifier may be so built as to deliver 12 volts more than will be required for the plate supply. Then the voltage drop in the filaments may be made effective on the plates on some of the tubes as has already been explained.

Constant Drop in Rheostat

The grid bias voltage may also be obtained in this filter-rectifier supplied circuit in the same manner as has been done in the previous circuits. No. 7 tube can get a maximum of 9 volts bias, exclusive of the drop in the rheostat. The first tube in the series can only get zero, so the bias for this tube must be obtained from the drop in the filament.

Now in this case the drop in the rheostat will be fairly constant, so that it may well be used for grid bias purposes. In fact the only object of the resistance is to obtain a bias for the tubes lowest in the series. It need never be touched after the first adjustment has been made, because the current may be regulated in the primary of the input transformer to the rectifier.

One advantage of taking the grid bias in this manner is that any residual fluctuation in the voltage supply is balanced out, provided the grid bias is accurately adjusted to match the plate voltage. The receiver which receives its plate and grid potential in this manner is therefore quieter in operation than one in which only the plate potential is taken from the rectifier-filter and the grid potential from a battery.

A Good Tube Plan

In Fig. 7 is shown an economical and sensible way of connecting up a circuit. Small tubes are used where the voltages are small, a large tube is used for a detector, voltage amplifier tubes where they should be used, and a power amplifier where it should be used. 199 tubes are good radio frequency amplifiers and they can handle all the voltage that is likely to be met in the R F end of the receiver.

The filaments of these tubes are connected in series across the six volt storage battery because each requires three volts or slightly less. A rheostat is connected in series with these two filaments for volume control. A 201 A is a pretty good detector and it can handle all the voltage that is likely to be met at this place in the circuit. This tube requires .25 ampere at 5 volts, or less.

Ordinarily it is not necessary to vary the current once it has been adjusted. Hence a fixed resistance may be employed, one in which the voltage drop is one to one and one-half volts. Any good audio frequency amplifier employs some form of direct coupling requiring high mu tubes. Mu20 are satisfactory. These tubes draw .25 ampere at 6 volts. Hence they are connected directly across the line. For power amplification in the last stage only a power tube should be employed. Mu6 is one of these power tubes which may be used. It also requires .5 ampere at six volts, so it is connected directly across the line. A master rheostat may be used for all these tubes to maintain the filament terminal voltage at six volts. The total current in this circuit is 1.31 ampere.

Value of a Variable Leak

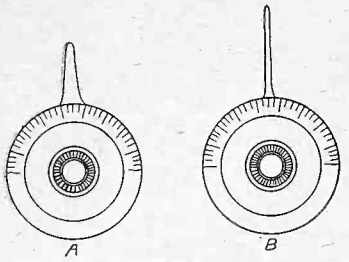


FIG. 1

Graphical representation of the resonance curve (A) on a dial of a multi-dial set and of a curve on a single-c control set (B). The sum of the selectivity quality of the circuits must be handled at one stroke at B.

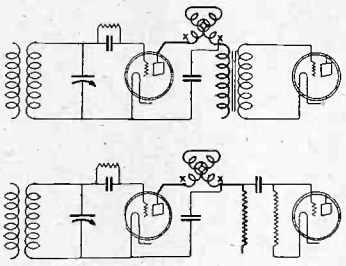


FIG. 3

How a variometer is connected in series with the plate of the detector tube. The top diagram shows transformer coupled audio, the bottom sketch resistance-coupled.

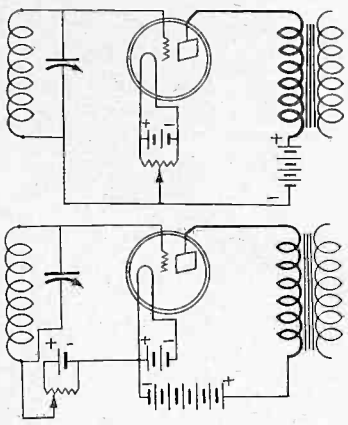


FIG. 4

plied to the first radio frequency tube is only .0015 volts, due to absorption of some of the signal's intensity by objects intervening between the transmitter and the receiver, the amplification power of this R.F. stage would be insufficient to produce the required signal voltage on the detector grid and no signal would be heard.

Relative to the methods of improving the chances of obtaining distant reception, let us start wiith receivers in operation; receivers which are housed in cabinets and with which one is reluctant to tamper to replace coils and condensers with equipment of lower losses. In fact, let us forget for a moment all losses in radio frequency circuits, inclusive of the aerial and ground systems, and devote our attention to the audio frequency amplification, not with the purpose of boosting the amplification by adding power tubes, C batteries and B batteries, but by striving—for quiet and noiseless amplification. .This does not mean a reduction in the amplification, but it does mean that the amplifier must be correctly operated. Excessive plate current flow through the primaries of audio frequency transformers will invariably result in the development of a leakage, which will be audible in the phones as continual crackles.

Where C Battery Helps

The same is true of excessive current flow in chokes in impedance coupled units. The use of the current C battery will not reduce the amplification but it will preclude the possibility of overloading the winding and causing the leak. This is occasioned by the reduction in the plate current drain due to the negative bias upon the grid. Care must be exercised to see that the coupling resistances in resistance coupled amplification stay put, and do not deteriorate under the applied voltage. This action occurs frequently with carbon strip coupling resistance, when the applied voltage is carried above 150. It may occur in mediocre units with plate potentials as low as 90 volts.

Another source of noise in audio amplifiers is non-uniform electronic emission from the filament. Each variance will cause a change in plate current, which when amplified by a succeeding stage will be made audible in the output circuit through phones or the loud speaker. Hence it is imperative that filament potentials remain constant. The same of course is true of the B battery voltage.

The B Battery

While it is understood that the voltage gradually decreases, the decrease should be gradual and not radically fluctuating due to the chemical action taking place within the cells. This means that the life of the battery is limited, if noiseless amplification is desired, to a terminal voltage of approximately 19 for each 22½-volt block. Under normal conditions 17 volts is taken as a standard, but at that value the battery may be what is termed "noisy." With correct operation of the tubes, and correct choice of the C batteries, satisfactory operating life will be obtained from the B batteries before the 19-volt level is reached.

Bypass condensers must be employed to bypass high frequency currents around all units which would tend to obstruct the flow of these currents. This means that bypass condensers must be placed across all resistance through which are otherwise forced to flow any high frequency currents. All batteries should be shunted with bypass condensers.

Care should be exercised to see that high plate voltages do not leak across defective insulation in sockets, jacks, plugs and condensers. If they do, there will be heard continual crackles in the loud speaker, too frequently interpreted as "static."

Another item is the overloading of the tubes, by excessive plate voltages with insufficient negative grid bias. In the quest for greater DX via greater audio amplification, the path of least resistance is chosen by the fan, and he adds plate voltage. While it does increase the overall amplification, it possibly injuries the tube and associated equipment. If the plate voltage is excessive, leakage may develop across the "mash" in the tube. The tube will be noisy and finally break down entirely by arcing across. This occurs most frequently in the last stage.

Avoids Drowning Out Signals

All of the above are detrimental to the reception of distant signals for they contribute to noisy audio amplification, and very often the inherent noise in the amplifier is sufficient to drown out a weak signal which would be audible with a quiet amplifier. The most prolific source of noise in an audio amplifier is the first stage of audio, due to the suceeding stages of audio amplification. Obtain audio amplification consistent with freedom from noise

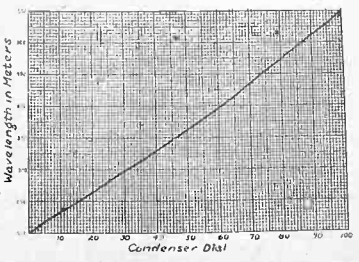


FIG. 2

and you have made a great stride toward DX reception.

In directions of how to obtain distant reception much has been said about inductances, condensers, aerial and ground systems. To discourse further upon that topic is necessary here. To advise the replacement of a variable condenser or a number of variable condensers, whose high frequency resistance is .1 of an ohm at 400 meters, with a set of condensers whose resistance is .085 of an ohm, would be somewhat out of reason.

True, the chances of obtaining distant reception are increased with increase in the electrical efficiency of the parts used in the receiver. If a fan is willing to chance improvement and wishes to change condensers or coils, all well and good. If he is not, for it necessitates much trouble in rewiring, he is not to be blamed. There are sufficient reasons for the lack of DX, other than slightly inferior condensers and coils.

Incorrect operation of the tubes is one. All amplifying tubes should be operated with a negative bias. All grid current must be eliminated. This is equally applicable to the radio-frequency side and the audio-frequency.

No doubt many fans have utilized potentiometer control and have noted how the output signal is reduced as the positive bias is applied to the grids of the radio-frequency amplifying tubes. This is due to a reduction in the amplification power of the radio-frequency tubes. And conversely, the amplification is increased as the lever is swung towards the negative side, applying a negative bias. It is therefore logical that an incorrect grid return connection which results in practically zero bias or slightly positive bias, is causing reduced amplification. The less the radio-frequency amplification, the less the chance for DX, since the received signal is weak enough, as it is, without reducing the receiver amplification.

The more sensitive the receiver the greater the DX; and the more stages of RF amplification added, the greater the sensitivity. That much stands to reason. A receiver utilizing three stages of tuned radio-frequency amplification and detector will be more responsive to distant and weak signals than a receiver consisting of one stage of tuned radio frequency. Suggestions to incorporate new units are not taken very favorably, and we will leave that to the last and continue to consider factors which do not involve additional financial expenditures.

Outstanding among these is tuning. It

(*Continued on page* 26)

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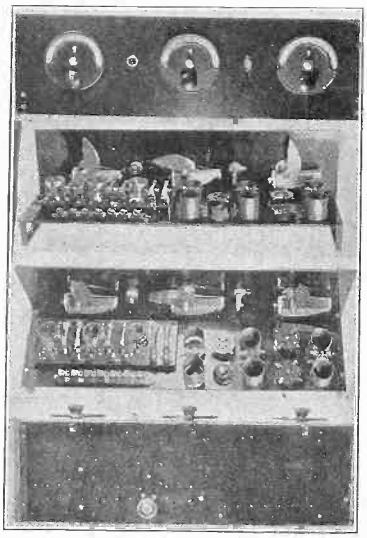


FIGS. 341, 342, 343 and 344 (Top to Bottom)

I HAVE two .0005 mfd. variable condensers, a RFT and a three circuit tuner, with 10 turn primaries and 45 turn secondaries wound on a 3¼" diameter tubing, with No. 22DCC wire, tickler consists of 36 turns of No. 26 SCC wire, and a low ratio audio frequency transformer. I would like to have a picture diagram of a 5-tube receiver, employing a non-regenerative tuned RF stage, a regenerative detector employing the 3-circuit tuner, a stage of transformer coupled AF amplification and two stages of resistance coupled AF amplification. The output of the last stage should be so arranged that no direct current can enter the magnet windings of the speaker. I would like to control the filaments of the RF and the detector tubes with rheostats, while the filaments of the three audio tubes are controlled by a ¾ ampere ballast resistor. I will want to use a loop and an antenna, etc., so an arrangement for switching is also desired. I have a 1-tube regenerative set, on which I will want to use the amplifier used in the above receiver. If this could be arranged, I would greatly appreciate it. Please give the constants of the resistors, condensers, etc.—Harvey Blanders, Atlantic City, N. J.

Fig. 345 shows the picture diagram of such a receiver. R1 and R2 are the 6 ohm rheostats controlling the filaments of the detector and the RF tubes. C4 is a bypass condenser, having a capacity of .001 mfd. J1 is the loop jack. J2 is a double circuit jack connected on the detector output, so that signals can be heard from only the RF and detector tubes. S1 is the switch arrangement whereby you can use another receiver with the same AF amplifier used for this set. R8 is the ¾ ampere ballast resistor. C5, C6 and C7 are .25 mfd. fixed condensers. R3, R4, R5 and R7 are .1 megohm resistors. R6 is a .5 megohm resistor. C2 is a .00025 mfd. grid condenser. R0 is a variable grid leak, which will increase the sensitivity of the detector tube.

* * *

I HAVE three Bodine Twin-Eight RF transformers; three .00035 mfd. variable condensers; three Amsco Universal sockets; a three stage resistance coupled audio frequency amplifier; a switch; three 4" Amsco dials; one Bruno Light Switch; one clip terminal strip; a rheostat, 6 ohm type; a zero to 200,000 ohm non-inductive resistance a 7x24" panel and a 6x23x¼" baseboard. I also have the circuit diagram, where these parts are used, but do not know how to place the parts. The circuit is a standard type, wherein two stages of tuned radio frequency amplification, a non-regenerative detector and three stages of resistance coupled audio frequency amplification are employed. The rheostat is used to light the filaments of all the tubes. The high resistance is connected so that it varies the voltage of the plate supply to the first and second tubes. The plate of the first tube is connected to one terminal of a .5 mfd. fixed condenser. The other terminal of this condenser is connected to the F minus post on the same socket. This applies to the plate filament connection of the detector tube also. All the F minus posts are connected to a terminal of a .5 mfd. fixed condenser, with the other terminal of the condenser going to the B plus 90 volt post. This seems to act as a bypass condenser. A panel, as well as a baseboard layout of the parts, etc., would be very much appreciated.—Sidney Rhamstein, Port Jervis, N. J.

The photographs shown in Figs. 341, 342, 343 and 344 give clear views as how to lay these parts out. Fig. 341 shows the panel layout. The pilot light is placed between the variable condensers, which shunt the secondaries of the second and third RFT. The switch is placed between the first and second condensers. No rheostats are placed on the panel. Fig. 342 shows the back view, while Fig. 343 shows the top view. Note that the coils are mounted parallel to each other. Due to the characteristic winding of this coil, it is possible to do this, e.g., enclose fields. The rheostat is mounted between the second and third RFT toward the rear. Fig. 344 shows the bottom of the baseboard view. Note the resistance wire of the rheostat. The high resistance rheostat is mounted near the resistance coupled AF amplifier and is hidden from view. Both these controls are not critical.

* * *

I HAVE two forms, both of which I wish to use in the Anderson Baby Super-Heterodyne described in the July 18, 1925, issue of RADIO WORLD. However, they haven't the same dimensions as those specified in the article. The 2" bakelite cylindrical disks are the end supports, these being ¾". Between the two disks is a cylinder ¾" in height and 1⅜" in diameter. This means that I have a 1⅜" diameter to wind with the coils on, instead of a 2" diameter, as per article. How many turns should I place on these

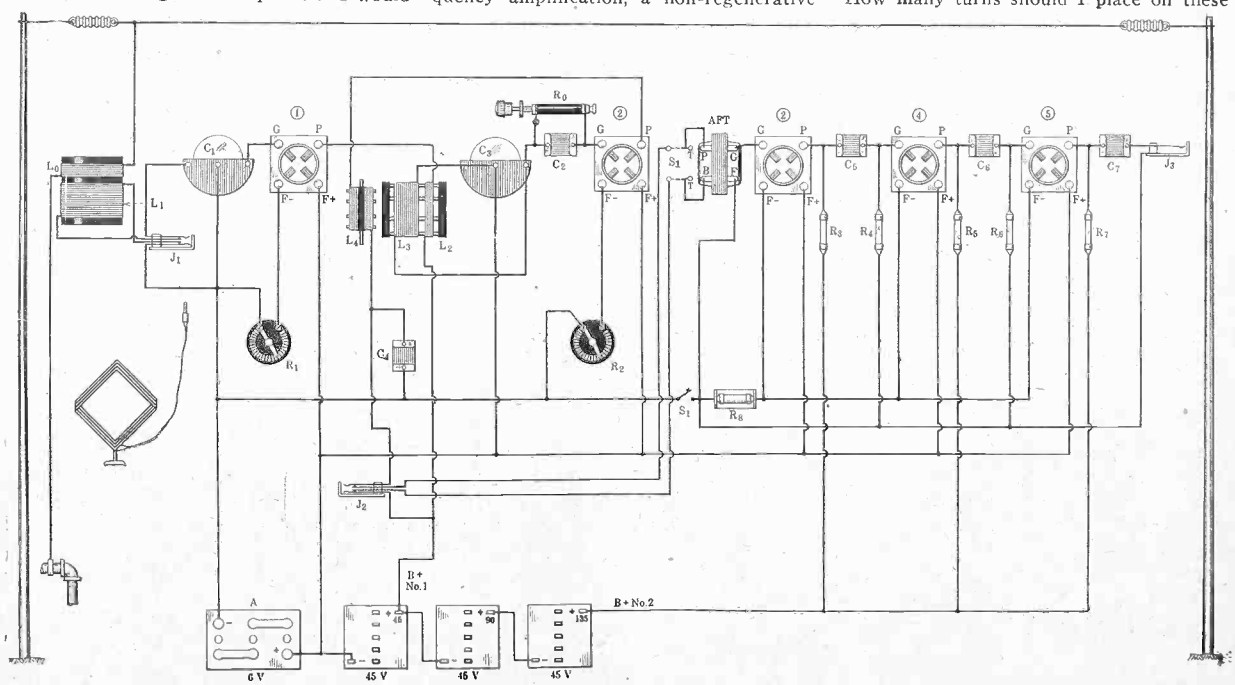


FIG. 345. The picture diagram of the receiver requested by Mr. Harvey Blanders.

forms to make up the intermediate frequency transformers, using No. 30 DCC wire? (2)—Can two .0005 mfd. variable condensers be used instead of the double condenser? (3)—I now have a Super in which the filter is placed after the first detector. Is it possible that the results may be superior if the filter is placed after the intermediate transformers or be before the second detector?—Joseph Hamata, Raymond, Nebr.

(1)—The primaries consist of 160 turns. The secondaries consist of 730 turns. The two windings are in the same direction. They are separated by two layers of heavy wrapping paper. The primary is wound right next to the core or tubing. (2)—Yes. (3)—Yes.

* * *

KINDLY INFORM me as to the number of turns to place on a tubing 2 3/4" in diameter to constitute the primary and the secondary windings of a radio frequency transformer, the secondary to be shunted by a .0003 mfd. variable condenser. (2)—I would also like to have a diagram of 6-tube receiver, employing two stages of tuned RF, a non-regenerative detector and three stages of resistance coupled audio frequency amplification.—A. E. Henderson, 3026 North 48th Ave., Omaha, Neb.

(1)—The primary consists of 10 turns. The secondary consists of 65 turns. Use No. 22 double cotton covered wire. (2)—Fig. 346 shows the electrical diagram of a set along the lines as you described. The audio portion is different. However, by following this description, you may obtain the wiring directions of the resistance AF stages. The wiring description of the RF and detector portion of the set can be obtained from the answer to Joyce Lucke's query. The plate post of the detector or third tube is brought to one terminal of a .1 megohm fixed resistor and to one terminal of a .001 mfd. fixed condenser, C5. The other terminal of the resistance is brought to the B plus 67½-volt post. The P post of this same socket also is brought to the one terminal of a .25 mfd. fixed condenser. The other terminal of this condenser is brought to one terminal of a .1 megohm resistor and to the grid post on the fourth socket. The other terminal of this resistance is brought to the A minus post on the strip. The plate post on the fourth socket is brought to one terminal of a .1 megohm fixed resistor and to one terminal of a .25 mfd. fixed condenser. The other terminal of this resistor is brought to the B plus 135-volt post. The other terminal of the .25 mfd. fixed condenser is brought to the grid post on the fifth socket and to one terminal of a .5 megohm fixed resistor. The other terminal of the fixed resistor is brought to the A minus post on the strip. The plate post on this fifth socket is brought to a terminal of a .1 megohm fixed resistor and a terminal of another .25 mfd. fixed condenser. The other terminal of this fixed resistor goes to the B plus 135-volt post. The other terminal of the fixed condenser goes to the grid post on the last socket and to a terminal of a .25 megohm fixed resistor. The other terminal of this resistor is brought to the minus post of a 6-volt C battery. The plate post of this socket is brought to the top terminal of a single circuit jack. The bottom terminal of this jack is brought to the B plus 135-volt post. Now all the F plus, as well as the F minus posts are connected together. The common negative terminal is brought to a terminal of a 3/4-ampere ballast resistor. The other terminal of this ballast resistor is brought to the A minus post on the strip. The plus terminals are brought to one terminal of the switch S2. The other terminal of this switch is brought to the A plus, B minus post on the strip.

* * *

I WOULD like to have a circuit diagram of a 5-tube receiver employing two stages of tuned radio frequency amplification, a non-regenerative detector and two stages of transformer coupled audio frequency amplification. The filaments of the RF tubes should be controlled by a single rheostat, the filament of the detector tube should be controlled by a rheostat, while the filaments of the audio tubes should be controlled by a ballast resistor. Some provision should be made for the control of volume on the second stage of audio. Complete data on the coils (basket weave type), condensers, resistances, wiring and operation are desired also.—Joyce Lucke, Tindall, Idaho.

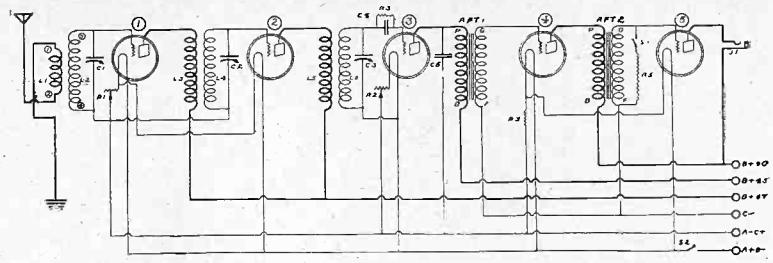


FIG. 346
The electrical diagram of the receiver requested by Mr. Joyce Lucke.

Fig. 346 shows the electrical diagram of this receiver. The primaries, L1, L3 and L5 consist of 10 turns. The secondaries, L2, L4 and L6, consists of 65 turns wound on a form 2 3/4" in diameter. Fifteen dowel sticks are employed. These are 1/4" in diameter. The under two and over two method of winding is employed. No. 22 double cotton covered wire is used. C1, C2 and C3 are .0003 mfd. variable condensers. If you wish to use .0005 mfd. variable condensers, then the secondaries should consist of 55 turns. R1 is a 10 ohm rheostat. R2 is a 15 ohm rheostat. R3 is a 1/2 ampere ballast resistor. R5 is a high resistance rheostat (0 to 5 megohms). C4 is a .00025 mfd. fixed condenser. R3 is a 2 megohm grid leak. C5 is a .001 mfd. fixed condenser. AFT1 and AFT2 are both low ratio type audio frequency transformers. S1 is a single throw, single pole, or simple filament switch. S2 is a filament control switch. J1 is a single circuit jack. The radio frequency transformers may be placed on the end plates of the condensers or on angle irons mounted directly on the baseboard. When mounted, the second RFT should be mounted erect, with the windings of the other two RFT bending away from each other, (V shape formation). The primary windings may be wound in the regular fashion, e. g., 1/4 or 1/8" separation between the primary and the secondary windings, or 27 turns of the secondary are first wound, then 10 turns of the primary winding and 10 turns of the secondary winding are wound. This is followed by the remaining 28 turns of the secondary winding. A 7x24" panel can be used. The rheostat can be placed in between the condensers. The switches can be placed at the extreme bottom portions of the panel. The single circuit jack can be placed underneath the dial on the shaft of the second variable condenser. Now as to the wiring. The beginning of the primary winding, indicated by 1, in L1, is brought to the ground post. The end of this winding, indicated by 2, is brought to the antenna post. The beginning of the secondary winding, indicated by 3 in L2, is brought to the grid post on socket 1 and to the stationary plates of the variable condenser, C1. The end of this winding, 4, is brought to the rotary plates of C1 and to the arm of R1, which incidentally also goes to the A minus C plus post on the strip. The beginning of the primary winding, L3, is brought to the plate post on the first socket. The end of this winding is brought to the B plus 67½ volt post. The beginning of the secondary winding, L4, is brought to the rotary plates of C2 and to the arm of R1. The end of this winding is brought to the stationary plates of C2 and to the grid post on socket 2. The beginning of the primary winding, L5, is brought to the plate post on socket 2. The end of this winding is brought to the B plus 67½ volt post. The beginning of the secondary winding, L6, is brought to the rotary plates of C3 and to the F plus post on the third socket. The end of this winding is brought to the stationary plates of C3 and to a terminal of the leak-condenser combination, C4, R3. The other terminal of this combination is brought to the grid post on the third socket. The plate post on this socket is brought to the P post on AFT1 and to one terminal of C5. The other terminal of this condenser is brought to the A minus C plus post. The B post on this AFT is brought to the B plus 45 volt post. The G post on this AFT is brought to the grid post on the fourth socket. The F post is brought to the C minus post. The P post on AFT2 is brought to the plate post of the fourth socket. The B post is brought to the B plus 90 volt post. The G post on AFT 2 is brought to the G post on the last socket and to one terminal of the switch, S1. The other terminal of this switch is brought to one terminal of the variable resistance, R5, although not shown in that fashion in the diagram. The other terminal of this resistance is brought to the F terminal on AFT2, which also is brought to the C minus terminal. The plate post on this last socket is brought to the top terminal of the single circuit jack, J1, while the bottom terminal is brought to the B plus 90 volt post. Now as to the wiring of the filament circuits. The F minus posts of the RF tubes are connected together. They then are brought to one terminal of the rheostat, R1, holding the resistance wire. All the F plus posts are connected together and then to a terminal of the filament switch, S2. The other terminal of the switch is brought to the A plus, B minus terminal. The resistance terminal of R2, is brought to the F minus post of the third socket, holding the detector tube, while the arm of this rheostat is brought to the A minus, C plus terminal. The two F minus posts of the audio sockets are brought to one terminal of R3, while the other terminal is brought to the A minus, C plus terminal post. All —01A type tubes should be employed. If it is found that the RF tubes oscillate beyond control, decrease the amount of turns in the primaries, L3 and L5, e. g., take 3 turns off, or you can place a high resistance rheostat (2000 ohms) in series with the grid returns of the RF tubes, e. g., the arm of the rheostat to the grid returns of the RF tubes and the resistance terminal to the A minus terminal. Of course, when doing this, be sure to disconnect the grid return of these tubes from the rheostat, R1. The fixed condenser, C5, should not impair the signal strength. If it does, the condenser is leaky, etc. Be sure that the rotors of the variable condensers are connected to the filament sides. Otherwise, you will

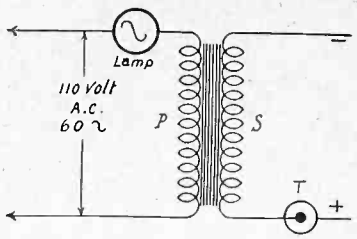


FIG. 347
The electrical wiring diagram of the S-tube B battery charger.

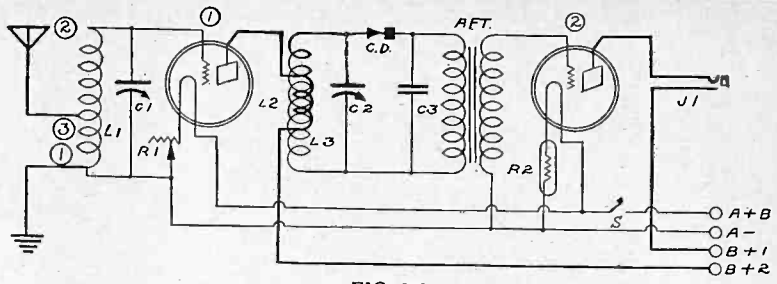


FIG. 349
The electrical diagram of the quality set.

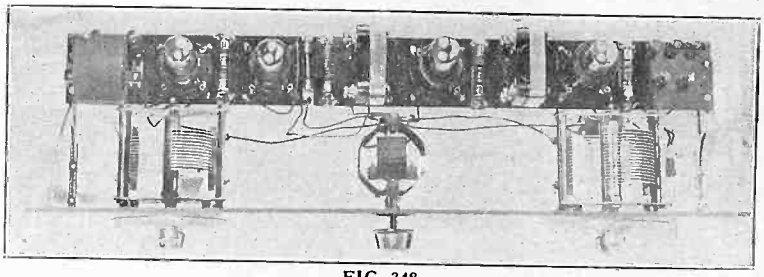


FIG. 348
The photographic layout of the set asked for by Roland Starck.

be troubled by body capacity. Also be sure that the low and the high potential sides of the coils are kept together. With the coils specified and the condensers having their proper minimum as well as maximum capacity, there ought to be no trouble in covering the entire wavelength of from 200 to 550 meters, using a 100 foot antenna, including the lead-in, and a 20 foot lead from the set to the ground.

* * *

I HAVE an S-tube and a step-up transformer. The secondary of this transformer delivers 550 volts passing 1/2 ampere, operating from the 110 volt, 60 cycle line. I would like to use this transformer and tube to construct a B battery charger. The diagram of such an instrument is therefore requested. I would also like to know how to increase or decrease the charging rate. I have six 22½ volt storage batteries, which I may wish to charge at once, or individually.—Thomas Fredericks, Mt. Zion, Ill.

Fig. 347 shows the wiring diagram of such a charger. The charging current is regulated by the lamp, which is connected in series with the primary side of the line. A resistance, which is equal to that of the lamp, may be used instead of the lamp. The lamp should be of the carbon or the tungsten type. The rate of charging as, you probably know, is stated on the cover of the battery by the manufacturer. The following table shows how, with different sizes of lamps, the charging rate may be increased or decreased:

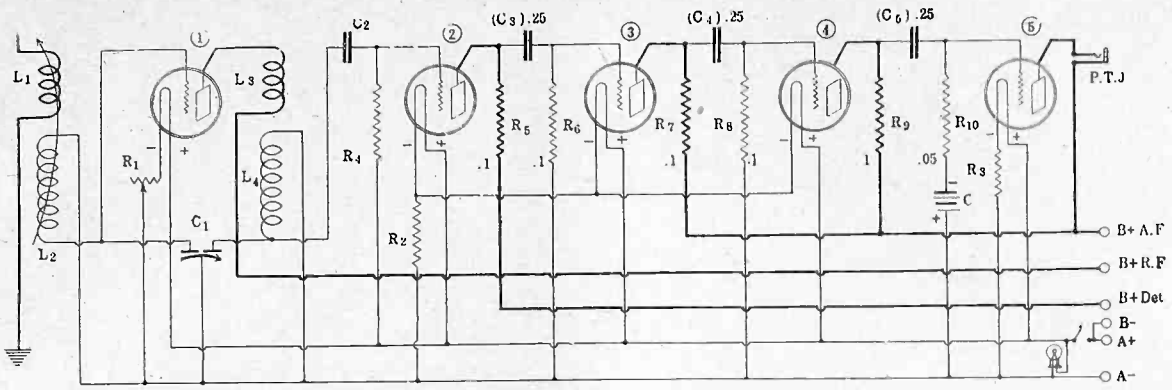
Rating of Lamp in Watts	Charging Rate
100	.046 amperes
150	.068 amperes
200	.89 amperes
250	.995 amperes

Incidentally, when you insert this lamp, the voltage of the charging source is greater also. For obtaining an intermediate number of watts place the lamps in parallel to those already in the circuit.

* * *

I HAVE two .0005 mfd. variable condensers, which I would like to use in a 4-tube receiver, employing a tuned stage of radio frequency amplification, a regenerative detector with the inductive method of coupling the grid and plate and two stages of transformer coupled audio frequency amplification. The filaments of each of these tubes should be controlled by a ballast resistor. I have octagon forms, more commonly known as pickle bottle forms, which I wish to use for winding coils. One of these is 3 1/4" in diameter, while the other 2 3/4" in diameter. However, I have no directions as to the winding of coils on this form which is solid and resembles a solenoid tubing, except that it has eight sides. The method of winding on these forms as well as the number of turns, etc., wiring directions and a picture layout of the parts would be very much appreciated. I am going to use —99 type tubes.—Roland Starck, West Sterling, Mass.

The primaries, which will be known as L1 and L3, consists of 10 turns. The secondaries, which will be known as L2 and L4, consists of 45 turns. The tickler, which will be known as L5, consists of 36 turns. Now as to the method of winding. Pieces of adheseive or plain tape twice as long as the tubing is placed on each one of the eight sides, before the wire is put on. If the winding is 4", then the tape should be 8". If the tape is 8" long, then it should be so placed that a 4" portion lies upon a side, with a 2" portion overlapping on each side of the form. Thus, when the 2" portions are doubled up, they will form another 4" portion, falling over the entire length of the coil. The tape is so placed that the sticky side is face up. The windings are then put on the form. The dangling portions of the tape on either side of the form are then lapped over the winding. When doing this, it will be noted, that the sticky side will fall here. The winding is then slid off the form without squashing the coil. It might be difficult to get this winding off, if wound too tight. Therefore underneath each piece of tape, place some paper. This will give a smoother surface. It will also give some space between the coil and the form. Thus if the paper is pulled out, it will become easier to pull the winding off. No space need be left between the primary and secondary windings. No. 24 single cotton covered wire should be used for winding the primary and the secondary windings, while No. 26 single silk covered wire should be used for winding the tickler. These secondaries are wound, so that your .0005 mfd. variable condenser may shunt and cover the entire wavelength band. Strips of hard rubber, ⅛ or ¼ in. in width are placed on front and back of two of the sides and bolted together. Holes should be drilled preliminary to this on one part of strips and binding posts inserted. The beginnings and ends of the coils are then brought to these posts. The coil wherein the tickler is to be mounted should have one of its pair of strips (where posts are absent) ¼ in. longer, so that a hole can be drilled and the tickler shaft inserted. The strips of hard rubber should be also placed on the tickler winding and the beginning and end of the winding, thereto. In the exact center of these strips, holes should be drilled. This is for the passing through of the shaft. The end of this shaft is either bolted down, with the aid of a screw soldered in the hollow center of the shaft, or soldered down, the solder acting as a nut and preventing the shaft from slipping through. The ballast resistors, which control the filaments of the tubes, will be known as R1, R2, R3 and R4. These are all ¼ ampere type. The variable condensers will be known as C1 and C2. The grid condenser, .00025 mfd. type, will be known as C3. The grid leak, which is variable and of the plunger type, will be known as R5. The audio frequency transformer will be known as AFT1 and AFT 2, respectively. The jack on the output will be known as J1. This is of the



THE SCHEMATIC diagram of a 5-tube quality receiver. The secondaries of the RFT are tuned by a double condenser, C1. Each section of this condenser has a capacity of .0005 mfd. The primary in the first RFT is variable. In this manner we are able to tune the antenna, which gives us a greater DX range than otherwise. The filament of the first tube is controlled by a single rheostat. The detector and first two audio tubes are however, controlled by a ¾ ampere ballast resistor. The filament of the last tube is controlled by a single ballast resistor. This facilitates use of a power tube.

single circuit type. A switch will be known as S. The tubes are called thus: RF-1; Det-2; AF-3 and 4. Now as to the wiring. As was stated time and time again in these columns, when following these directions always follow the circuit out with a pencil and paper, marking all the coils and condensers. Then wire the set from the diagram. Confusion results otherwise. The beginning of the primary of the antenna RFT, L1, is brought to the antenna binding post, while the end of this same coil is brought to the ground post. The beginning of the secondary of this RFT, L2, is brought to a binding post terminal, which should be marked 1. Another binding post, placed directly adjacent and marked 2, should be connected to the rotary plates of C1 and to the A minus post. The end of this winding is brought to a binding post, marked 3. Another post also adjacent and marked 4, is connected to the stationary plates of C1 and to the grid post of the first tube. The beginning of the primary winding, L3, is brought to the plate terminal on the first tube socket, while the end of this winding is brought to a B plus 67½ volt post. The beginning of the secondary winding, L4, is brought to the rotary plates of C2 and to the F plus post on socket 2. The end of this winding is brought to the stationary plates of C2 and to one terminal of the grid leak, condenser combination, C3 and R5. The other terminal of this combination is brought to the grid post of the second socket. The beginning of the tickler winding, L5, is brought to the plate post on this same socket, while the end of this winding goes to the P post on AFT1. The B plus post on this AFT is brought to the B plus 45 volt post. The G post on this AFT is brought to the grid post on the third socket. The F minus post of this AFT is brought to the A minus post. The P post on AFT 2, is brought to the plate post on socket 4, while the B post is brought to the B plus 90 volt post. The grid post of this AFT is brought to the grid post on the last socket. while the F minus post is brought to the F minus post on the socket. The plate terminal of this socket is brought to the top terminal of the single circuit jack, J1, while the bottom terminal is brought to the B plus 90 volt post. This is the same post, the B plus post on AFT2 was connected to. All the F plus posts are connected together. This common lead is connected to one terminal of a switch. while the other terminal of the switch is connected to the A plus, B minus post. One terminal of each of the ballast resistors, R1, R2, R3 and R4, is connected to the F minus post of each socket. The other terminals of these resistors are connected to the A minus post. It will be remembered that when connecting up the secondary of the RFT, no direct connections from the coil to the condenser were made. This is due to the fact that provision is made for a loop, which may be used successfully. When the antenna and the ground are to be used, strips of bus bar are connected across the binding posts adjacent to each other, viz., 1 and 2; 3 and 4. When the loop is to be used, the terminals from the loop are brought to posts marked 2 and 4, e.g., those connecting with the stator and rotor of C1. The strip is of course, taken off, thereby disconnecting the primary and the secondary windings, as well as the antenna and the ground from the loop circuit. By allowing them to be in the circuit, the efficiency of the loop is nil, except that it acts as an inductance, to bring in higher wavelength stations, etc. This method of connecting a loop or an antenna-ground is much more efficient than the jack method. In the latter case, the plug or the prongs of the jack seldom make proper contact. At times, when the plug is inserted, the secondary winding becomes shorted, due to the plug touching those terminals of the jack which are connected thereto. The terminals of the jack, sometimes, do not break contact, when the plug is inserted. This again, causes the shorting of this winding. Of course, when this happens no signals can be heard resulting in the condemnation of the set with a loop. Although the AF transformers used here had the familiar P, B, G, F, markings, you or someone else, desiring to construct this same receiver, may have those with such markings as P1P2; S1S2. In this case, P1 is the P post; P2 is the B post; S1 is the G post; and S2 is the F post. Fig. 348, shows the layout of the parts used in this set, photographically. The variable condensers are mounted on both sides of the tuner. A 7x24 in. panel is used. The sub-panel idea is used for mounting the sockets, transformers, ballast resistors, and RFT, etc. The RF coil may be seen at the extreme left on this sub-panel, with the following arranged in order: RF tube, R1, detector tube, R5 and R2, AFT1, first AF tube, R3, AFT2, last AF tube, R4 and the battery binding posts on the side. The antenna and the loop posts are behind the RFT. Brackets hold the sub-panel to the panel proper. The filament switch is placed directly underneath the tickler knob. The jack is placed a little to the right of the second variable condenser, at the bottom of the panel. There should be no difficulty attached to the operating of this receiver upon completion. The tubes are first inserted. The antenna and the ground or the loop are then connected. The A battery is then connected and the switch pulled. Upon the lighting of the filaments, the tubes should be taken out of the sockets. An old tube having a good filament, should be inserted in any one of the sockets, and the B batteries connected. This same tube should be placed in each of the sockets. If she lights O. K. in each of the sockets, etc., then the good tubes can be inserted with safety. A tube having a good filament, but no other value is of great use, as in the case just mentioned, the lives of any number of tubes being saved, if wrong B connections, etc., have been made. The phone plug should now be inserted. A sort of whispering power sound will indicate that the "set has life." That is, it is in proper working condition. Thereupon the condenser dials are turned both in step. The tickler knob is brought around to about 50. When the station is tuned in and the signals are too loud or distorted, or the set is erratic or squealy this knob is turned, so the dial numbers read less or so that the magnetic relationship between the secondary winding and the coil nears minimum. The loop used with this set, should consist of 14 turns of No. 18 bare copper or double cotton covered wire, wound on a two foot frame. The antenna should be approximately 100 feet in length, including the lead-in, using No. 14 enameled or stranded wire as the conductor.

* * *

I WISH to build a receiver, for use on local stations, to be received with headphones, but with absolute quality of reproduction. Please give the electrical diagram of such a set, stating the constants of the parts and any special operating advice which may be necessary. I would like to use spider weave coils, as they take up very little room. Please tell also, how to make the forms, etc.—Jack Granville, Newburgh, N. J.

Fig. 349, shows the electrical diagram of this set. The antenna coil, L1, consists of 50 turns, tapped at the 8th turn. The primary of the RFT, consists of 8 turns, while the secondary, L3, consists of 42 turns. The form can be made from a piece of cardboard or hard rubber, 5 in. in circumference. Dots are made at every 15/16 in. point on this circumference. A 2 in. center hub is made. Dots are made at every 2/5 in. point on this circumference, lines are then drawn from the 15/16 in. portion down to the 2/5 in. portion. The pieces between the lines are then cut out. You will then have 5 triangle shaped projections. Two forms are required, one for the antenna coil and the other for the RFT. The beginning of the antenna coil is started near the hub, etc. When winding the RFT, the primary winding is placed in between the secondary winding. That is, this latter winding is divided into two 21 turn windings, with the 8 turn primary between. The secondary winding is not wound with the primary winding, though.

(*Concluded on page 28*)

Educators Debate Extent The Radio May Help Them

Dr. Joseph M. Sheehan, Associate Superintendent of Schools, New York City, in charge of public lectures under the Board of Education, told of a plan to create community receiving stations in the central schools in the city, where people may gather to hear lectures by radio and other forms of educational entertainment.

The project, said Dr. Sheehan, was still in the "state of consultation" by the Board of Education and may be definitely taken up for consideration and action in the fall.

Dr. Sheehan made known the plan while speaking on the future of the public lecture system, in which he said the Board of Education was deeply interested and for which it had the profoundest admiration.

"No institution is saved from the ravages of time," he continued, "nor can it fail to keep abreast of the march of events and invention. Why may you not ally your powers with the radio and send your message to hundreds of thousands instead of to hundreds?"

This method he said would make greater use of the radio for educational purposes, and spoke of the people who could not afford receiving sets who would benefit by these community receiving stations.

It would mean a more active program, with inspirational messages perhaps for mothers during the morning hours, and musical selections.

To devise some means to advance the public lecture system, preliminary negotiations, he went on, have already been entered into with the city authorities, in connection with placing the radio at the disposal of the system.

Dr. Ernest L. Crandall, Director of Lectures, said it was the opinion of many that radio was bound to supplant their work, and told of broadcasting 200 lectures over WNYC station in the last year.

"While the radio may stimulate interest and arouse curiosity," he said, "when it comes to the art of teaching, it can do mighty little."

It was equally deficient in preaching, he said, and spoke of the "arm-chair Christians" who listened in on sermons at their homes instead of attending public worship, adding that it was generally conceded that no souls had been saved by that process. "You can't get enthusiasm over the radio," he added.

Dr. Crandall predicted that the radio wave was bound to recede, and that there were certain things in spoken words that could not be replaced by radio. The public forum constituted the best and most valuable part of the public lecture system, he went on, and this could never be replaced by radio.

"Man is gregarious, and the gregarious habit will bring people to sit at the feet of some teacher as they did long ago in the hills of Judea," he continued. His message to the 300 members of the association assembled at the luncheon was not to become disheartened in their work, and "to keep alive the flame of the spirit that is within you."

Coolidge Will Be Heard With Crown Prince

A ceremony which cannot be seen except by a limited number of persons in the nation can be enjoyed by thousands Saturday afternoon, May 29, beginning at 3:30 p. m., when WEAF and WCAP will broadcast the proceedings of the official ceremonies in connection with the unveiling of the statue of Leif Ericsson in Washington, D. C.

WEAF's audience will again have the opportunity of hearing President Coolidge make an address. There will also be an address by the Crown Prince of Sweden, which will be in the nature of an official response to the recognition by Americans of the explorations of the hardy Norseman who is generally supposed to have visited this country before the voyage of Columbus. It is possible that a few brief remarks will be made by the Crown Princess of Sweden. A brief addrss will also be delivered by Congressman Carl R. Chindblom of Illinois.

LOVE ALL

"Secretary Hubbard, of the Bureau of Standards, may be right," George Rothwell Brown observes, "in saying that the transmission of letters by radio is at hand, but we fear he doesn't know much about billet doux."

SUCH IS FAME

Poor old Gilbert and Sullivan—how their fame has been dimmed! After the WEAF Light Opera Company had presented "Pirates of Penzance" before "mike" an epistle arrived at WEAF with favorable comment for "the fine opera by Ginsberg and Solomon."

Death Penalty Fixed For Radio Burglar

Judge Frank F. Adel in the Queens County Court, New York, sentenced Paul E. Hilton, the "radio burglar," convicted of murder in the first degree for killing Patrolman Arthur Kenny, to die in the electric chair during the week of June 20.

"You have been a menace to society for several months," Judge Adel declared. "It is a fortunate thing that you did not kill more people. I am not in sympathy with your desire to be relieved of your responsibility."

Hilton was taken to Sing Sing immediately after sentence by Deputy Sheriffs William Desmond and William Stuart.

William F. Lyons, counsel for Hilton, moved that the verdict of guilty be set aside and for a new trial. Both motions were denied.

THE OBJECT OF TUNED RF

By amplifying the signal at radio-frequencies sensitivity is obtained. The amplifier should be of the tuned type. This is selective, keeping out signals of a different frequency than the desired one. The amount of amplification in this unit should be sufficient, when adjusted to maximum, to build up the signals even only a bit stronger than the background level, to a point where the detector gives normal headphone output.

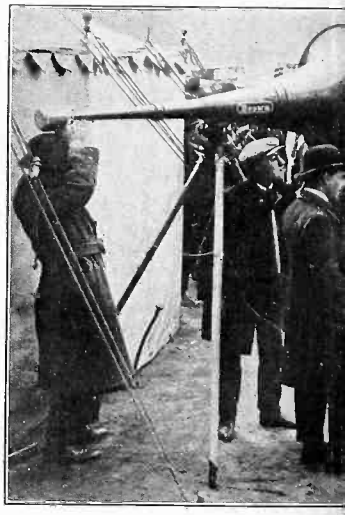
THE ADULT CORRECTIVE

The Boy (tuning radio)—I wonder who's at the mike.

Grandmother—Don't say Mike, dear—it's Michael.—"Life."

How Strike News

DURING ENGLAND'S recent econ paper presses were stopped, a portal a motor car to receive strike news f relayed to



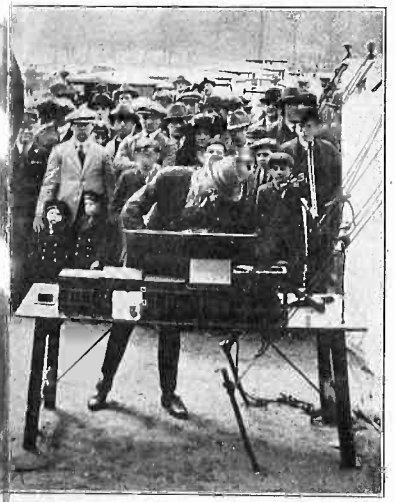
BRITISH GOVERNMENT authorit the general strike to assembled cr several stages of radio-frequency an audio-frequency power amplifier. T struction, made to

WGN French Class

Almost 1,000 pupils are enrolled in t radio French class of Prof. Henri Cr zard, who broadcasts the French lesso each Thursday afternoon from WG The professor, who is an experienc teacher, never ceases marveling at th extent his radio class has developed. Hu from students seeking special informatio

Was Heard in Britain

war, in which all of the leading news-
et as shown above was carried around in
the broadcasting stations. The news was
the countryside.



operated the receiver for giving news of
. A super-sensitive receiver, employing
ication, was used in conjunction with an
nit of the speaker is of a special con-
tand a terrific volume.

as Nearly 1,000 Pupils

When the idea of broadcasting French lessons was first proposed, the WGN officials were frankly skeptical. They said that it could not be done. The professor was given an opportunity to demonstrate. Hundreds of queries come to him every week and the results have surprised even himself.

Air Piracy Is Growing, Says Chicago Supervisor

CHICAGO.

E. A. Deane, district supervisor of radio, Department of Commerce, announced that air piracy is continuing in several sections of the Ninth Radio District. Recommendations for issuances of the new broadcasting licenses are being withheld pending final action by the Senate in radio legislation.

The Chicago Federation of Labor, which is completing a new station on the municipal pier, faces the prospect of being denied a license on the same basis that other applicants have been refused recommendation for six months, Mr. Deane said, due to the congestion of the air in the Chicago district.

Station WJAZ, which defied Secretary of Commerce Hoover's allocation of wavelengths and defeated the old wireless communication law, continues to violate the regulations, Mr. Deane said, adding that he has received reports of similar infractions in various sections of his district and the whole country. The pending legislation, he explained, would provide for the issuance and revocation of licenses on the basis of necessity and public service. It is reported that fans are showing great interest in air piracy.

First Radio Parish Begins Its Career

A non-sectarian radio parish, believed to be the first one, has been established by the Rev. Howard O. Hough at Portland, Me. The station is WCSH.

The Rev. Mr. Hough has been broadcasting a weekly service since November and because of the responses received has resigned as pastor of the Advent Christian Church to assume the pastorate of the Radio Parish.

Business men and others interested have pledged financial support. A violinist, a pianist and a mixed quartet assisted at the first service.

Odd Sources of Trouble

It seems that almost anything is capable of causing radio interference, as is shown by the following additional trouble makers recently unearthed by a Federal radio supervisor in Oregon:

A sign on a street corner peanut roaster in an Oregon city caused trouble fifteen blocks away.

A small but active motor with a dirty commutator and improperly fitted brush.

Twelve defective flour bleachers equipped with electrical arcs in an Oregon flour mill.

Faulty insulators and other power line equipment on a high voltage transmission line carrying 66,000 volts were found to be causing considerable interference to radio fans in western central Oregon.

In its desire to cooperate with the fans of that section the power company has appropriated money with which to purchase an auto equipped with a trouble-finding set, and has appointed a radio expert to patrol its lines to locate and eliminate trouble as it occurs.

INTERESTING FACTS

Amateurs are responding to the War Department's request for aid in strengthening the country-wide radio net.

Radio, Va., is the home of NAA at Arlington.

The fire departments of Amsterdam and Vienna are apparently the first to equip their apparatus with radio.

Prices Neck, R. I., radio compass station now transmits bearings to vessels using alternating continuous waves.

By means of radio a New York man located his daughter, last seen when but a year old. She is now grown and married.

Another radio show appears on the horizon with the announcement that the Boston Exposition will be held during the week of September 27.

Six Stations Put on Frequency Honor List

WASHINGTON.

According to measurements by the Bureau of Standards, the following stations have been found sufficiently constant in their frequencies to be used in the calibration of sets and wavemeters:

WJR, Detroit, Mich.; WEAF, New York; WCAP, Washington; WRC, Washington; WSB, Atlanta, Ga., and WGY, Schenectady.

May in Radio History

1827, May 19.—Savary found that a steel needle could be magnetized by the discharge from a Leyden jar.

1872, May 6.—Highton made various experiments across the River Thames with Morse's method.

1879, May 22.—Hughes discovered the phenomena on which depend the action of coherer. The coherer was later used practically by Marconi.

1889, May 10.—Thompson suggested that electric waves were particularly suited for the transmission of signals through fogs and material objects.

1894, May 28.—Rathenau experimented with a conductive system of wireless telegraphy and signaled through three miles of water.

1915, May 12.—In Battery Park, New York City, the mayor unveiled the monument in memory of wireless operators who had lost their lives at the post of duty.

1916, May 20.—The determination of the difference in longitude between Paris and Washington with the aid of radio which had been in progress since October, 1913, was completed.

1925.—During May the radio compass (direction finder) came into use on board vessels.

THE FIRST BROADCASTING

From the Columbia Phonograph laboratories in 38th Street, New York, Dr. Lee DeForest placed on the air what will be known as the first regular broadcast program. It consisted chiefly of records and was picked up in the ball-room of the Hotel Astor, where a number of celebrities had gathered to grace the occasion.

A dinner table was set, and at each cover there was a pair of regulation telephone receivers with head-bands. The program came in strong and clear. The following morning the daily press heralded the feat far and wide.—"Radio News."

Board Plan Un-American, Coolidge Warns Congress

WASHINGTON.

Four major developments served to impair the chances for the enactment of radio legislation before the end of the present session of Congress:

1 The announcement that President Coolidge is not in favor of the creation of an independent commission for the regulation of radio.

2 The decision of the Senate Interstate Commerce Committee, of which Senator Watson, of Indiana, is chairman, to fight hard for the Dill bill which would establish an independent commission to regulate radio.

3 The announcement of House leaders that they would stick by the White bill, which has the approval of President Coolidge, Secretary Hoover, and the industry generally.

4 The insistence of Secretary Hoover that radio legislation is imperative in view of the Chicago decision which denies the right of the Department of Commerce to assign wavelengths to stations.

Coolidge Fears Bureaucracy

President Coolidge let it be known that he believed independent commissions which are not under executive control tend to create bureaucracy. For this reason, the Chief Executive is more favorable toward the White radio bill which leaves the details of administering the radio law in the Department of Commerce.

The White House view is that an independent commission, responsible to no government authority, and with the entire control of radio regulation, might create a situation distasteful to the American people.

In addition, the White bill is more economical in that it requires less money to put into operation, which is a feature that appeals to the President.

In spite of the announcement of the President, Republican and Democratic members of the Senate Interstate Commerce committee voted solidly to report out the independent commission bill.

Commission Plan Goes Forward

Unless revamping is done, the bill reported will provide for an independent commission with five commissioners, each with a term of seven years and with a salary of $12,000 per annum. This commission would take over the present radio personnel of the Department of Commerce. The commission would have general blanket authority to handle almost any radio problem that arose.

Congressman White does not believe that this is the time for an independent radio commission. He believes his bill provides adequate safeguards against "one-man" control of radio.

Under the White bill, a semi-judicial commission is provided which would have the power to review any decision of the Department of Commerce. This commission, which would be appointed by the President with the consent and approval of the Senate, would have final authority to uphold or revoke any decision of the Secretary of Commerce in connection with radio regulation.

Hoover's Statement

Mr. Hoover indicated his resentment of statements which have been current alleging his anxiety to retain control of radio regulation. The Secretary pointed out that the White bill, which has his indorsement, would completely deprive the Department of Commerce of authority finally to pass upon any regulatory matter.

"The White bill," said he, "leaves to us only the details of administering the radio law. I think this is an administrative function and should rest in some existing Government Department. Whether it is the Department of Commerce, or any other Government department, is immaterial to me."

DRILL a hole for a leadin insulator tube so that the hole slants upward from the outside. When it rains the water will not drop into the house.

Senators Fear Danger If One Man Rules Radio

WASHINGTON.

"The probable influence of radio on the social, political and economic life of the American people, and the new and complex problems its administration presents, demand that Congress establish an entirely independent body to take charge of the regulation of radio communications in all its form."

This is the outstanding statement of the committee report on the Dill radio bill which has been favorably reported to the Senate for passage. It is expected that the bill will be taken up for consideration in the Senate within a short time and passed with few changes. It is believed that no attempt will be made to change several features which are considered objectionable until the bill reaches conference between the House and Senate.

Too Much Power For One Man

Outlining the great possibilities of the use of radio as a means of distributing information or propaganda, and the power which would be held by the regulatory authorities of radio, the committee report on the Dill bill says:

"The exercise of this power is fraught with such great possibilities that it should not be entrusted to any one man nor to any administrative department of the Government. This regulatory power should be as free from political influence or arbitrary control as possible. A commission which would meet only occasionally would gain only a cursory and incomplete knowledge of radio problems. It would necessarily be largely dependent on the administrative authority, namely, the Secretary of Commerce, for expert knowledge it would require.

Defense of the Extra Expense

"Your committee recognizes there are many important objections to the establishment of additional commissions under the Federal Government, but the relation of radio communication to the Government makes it absolutely necessary that some bureau, board, or commission under the Government shall administer the law regarding radio.

"If the channels of radio transmission were unlimited in number the importance of the regulatory body would be greatly lessened, but these channels are limited and restricted in number and the decision as to who shall be permitted to use them and on what terms and for what periods of time, together with the other questions connected with the situation, requires the exercise of a high order of discretion and the most careful application of the principles of equitable treatment to all the classes and interests affected. For these and other reasons your committee decided that all power to regulate radio communication should be centered in one independent body, a radio commission, granting it full and complete authority over the entire subject of radio.

"It therefore amended H. R. 9971 (the White bill) by striking out all reference to the Department of Commerce as provided in that bill and enlarging the powers of the commission already provided for therein. In order to secure the service of men of big ability and to make the commission of equal dignity with other bodies of that kind, the bill provides for a commission of five members, at a salary of $12,000 per year, to be appointed by the President, by and with the advice and consent of the Senate, for terms of five years, and subject to removal only for neglect of duty or malfeasance in office.

"Such a body will soon become an expert authority on radio communication. Its members will study every phase of the subject, and as a governmental body will be able to assist and encourage the development of the art of radio communication. The tremendous growth of radio during the past five years and the probable development of the art in the transmission of pictures and electric power within the comparatively near future, make it highly desirable that the Government have such a body to administer this law."

A bulletin of the National Association of Broadcasters says:

"Just what will happen to the Dill bill is entirely a matter of speculation. Senator Dill made an effort to gain unanimous consent for consideration of the bill, but was unsuccessful. It is understood that Senator Curtis has promised to help bring the matter up at an early date. There is little doubt but what many forces are at work behind the scenes in this important piece of legislation. The administration is against the establishment of another commission; yet the Senate Committee felt by writing the bill so that it could be reported out unanimously, it would pass the Senate easily despite the administration's wishes. It is believed that considerable discussion will come forth on the floor as soon as the bill is considered, resulting in several changes, and perhaps no action until late in the session, if at all.

Stations Are Plentiful For DX Tests World Over

Fans who boast of logs showing reception of 200 American stations are hitting around .350 in the Broadcasting League—and that average would give any balltosser a star rating in the National or American League.

Batting even .200 in the International Radio League (counting all the stations of the world) would be fair enough, because there are no less than 922 broadcasters, sending at all hours, due to the difference in time, and until daylight reception at 10,000 mile range becomes possible foreign results will be a negligible factor in American radio.

There are 356 transmitting stations outside of the United States, of which about 100 are in Canada. Others are scattered in remote regions, as far as the chance of hearing them is concerned.

It is expected that by 1927 there will be 1,000 stations in operation. In addition, many foreign stations will go on much higher power. Russia and Japan are leaders in the establishment of new broadcasters.

Some Strange Names

Greetings from practically every station in the world will be displayed at The Radio Show in Grand Central Palace, New York City, September 10-17, the first world collection of such cards.

Some of the new stations are to be located in places that are new names to most persons, particularly those which the Soviet Republic is to operate.

Canada is very active in radio, most of its stations sending programs regularly. There are 13 stations in Toronto, 11 in Calgary, 9 in Vancouver, 8 in Montreal, and 5 in Winnipeg.

The lowest number is accredited to the far away Canary Islands, Iceland, Peru and Venezuela. They have one each. OAX, in Lima, became quite well known during the 1926 international tests.

Great Britain has 21 stations, one the high power Daventry station. Nine of the stations are on what is popularly rated as substantial power, the others being comparatively low-power relay stations.

Now 20 Stations in Germany

Today Germany possesses 20 stations, but in a very short while will have in Berlin one of the world's highest-powered stations.

France has 19, Spain has 23, but soon will possess others.

Several very high powered stations are included in the Russian broadcasting program, and there will be 30 in all by December 31.

Sweden has 14 and a new one is being added. Norway has 2 and more to follow. The list gives Czecho-Slovakia 9, Holland 5, Finland 4, Jugo-Slavia 4, South Africa 4, Chile 2, Uruguay 2, and extensive China only 2, but 4 soon to start activities.

India, with all its millions of people, like China, is backward in broadcasting, having only 3 stations, but 2 others will be ready in a few months.

Australia has 8 stations and Ceylon, far smaller in extent, has 10. Japan boasts 3 but will have 30 shortly. American experts are in Japan now installing many fine stations.

Cuba Does Well

Cuba has 36 stations, of which 18 are in Havana, including the well-known PWX. The others use very little power.

Mexico has 16; 7 in Mexico City, Brazil has 9. The Argentine Republic possesses 12 stations, of which all but one are in Buenos Aires.

Italy is building a number of new stations, supplementing those in Rome and Milan, and Switzerland has 7 prominent stations, one in Berne with 6 kilowatts.

Austria has 2 with 3 under construction. Denmark has 3 with 2 relay stations. Belgium has 5.

Carlin a Daddy

(*Foto Topics*)

PHILLIPS CARLIN, one of WEAF's popular announcing sextet, with a new member of his family, Virginia Claire Carlin.

Frequency Signals May be Discontinued

Since other means of disseminating the Government standards of radio signals of definitely announced frequencies have become increasingly available, the Bureau of Standards is considering the termination of these transmissions. This is in part due to the increasing use of Piezo oscillators and the wide availability of reliable standards testing service from a number of laboratories that do commercial testing of frequency meters. None of these means were at hand when the standard frequency transmissions were inaugurated three years ago.

The frequency schedules extending through June, will be carried on as published. The Bureau of Standards is now announcing the possible termination of the service after that date in order that persons who depend upon the service in any special way may inform the bureau of any objection to its termination.

The bureau will be especially glad to hear from persons in the western part of the United States who have been utilizing the signals from Stanford University, since the listing of standard frequency stations on the west coast has not yet been begun. Any letters on this subject should be addressed to Bureau of Standards, Department of Commerce, Washington, D. C.

GENERAL SIGNALS ASSIGNED

The following general call signals have been assigned by the Government:

NOB, for any or all warships: NQO, for all naval coast stations: WKW, for merchant vessels, and WTM, for commercial coast stations.

Thomas Again Loses Chance to Broadcast

Norman Thomas, former Socialist candidate for governor and mayor, has no luck in his attempts to speak over the radio.

At the time set for his speech the voice of Donald Flamm, an official of station WMCA atop the Hotel McAlpin, from which Mr. Thomas's remarks were to have been broadcast, announced over the air instead that because of the "controversial nature" of Mr. Thomas's proposed speech, it had been deemed "only fair" to postpone it. Arrangements may be made for another speaker to present the opposite view.

When Mr. Thomas was seen at his home he said that it was the third time within a month he had been refused permission to express his views over the radio.

Mr. Flamm, who is described officially as critic of station WMCA, when questioned about the refusal, declared that the proposed speech of Mr. Thomas had been found to be "too radical."

Mr. Thomas, he said, wanted to "slam" WEAF, and WMCA had to depend upon WEAF.

Organist Needs 4 Hours To Prepare for Recital

Four hours of preparation a day is required of Arsene F. Siegel, organist of the Uptown Theatre, Chicago, in order to put on his radio "request" concert which lasts just forty-five minutes.

From 1:15 to 2 p.m. daily, except Saturdays and Sundays, Siegel plays an organ program made up of numbers requested by his theatre and radio audiences. The program is broadcast direct from the theatre by the Edgewater Beach Hotel-Chicago Herald and Examiner station, WEBH, with the announcer Carl F. Strodel, on the stage in full view of the audience.

The reading of requests, which average 150 a day, selection of the program, acknowledgment of mail, rehearsal of selections and preparation of notes take much time.

WGY On Daylight Time

WGY, the powerful General Electric broadcasting station, located in Schenectady, N. Y., is also operating on Daylight Saving Time (Eastern). This policy is adopted because Schenectady and New York City, in which most of WGY's program originate, are both on this time. Those living in sections where D.S.T. does not prevail, will find the WGY programs one hour earlier than heretofore.

CALL SIGNAL CHANGES

The call signals of station KFVW, San Diego, Calif., have been changed to KFSD; KOP, Portland, Ore., to KOIN; WCBQ, Nashville, Tenn., to WBAW; WGWY, Minneapolis, Minn., to WDGY; WHAV, Wilmington, Del., to WDEL, and WWGL, Richmond Hill, N. Y., to WMSG.

The location of WMSG was changed from Richmond Hill to New York City and the owner of the station is Madison Square Garden Broadcasting Corporation.

WATCHING THEIR STEP

Middle Western stations which have recently been equipped with Peizo crystal oscillators to keep them on their assigned frequency and to perfect transmission are:

WEBQ, Harrisburg, Ill.; WENR, Chicago, Ill.; WGN, Chicago, Ill.; WIBO, Chicago, Ill.; WLIB, Elgin, Ill.; and WOC, Davenport, Iowa.

A THOUGHT FOR THE WEEK

RADIO is showing universal expansion in its usefulness to the world at large. It now takes in the entire gamut from amusing the baby in the cradle and the bedridden shut-in to serving great scientific purposes, such as airship trips to the North Pole.

RADIO WORLD

REG. U.S. PAT. OFF.

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

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

TELEPHONE BRYANT 0558, 0559
PUBLISHED EVERY WEDNESDAY
(Dated Saturday of same week)
FROM PUBLICATION OFFICE
HENNESSY RADIO PUBLICATION CORPORATION
145 WEST 45th STREET, NEW YORK, N. Y.
(Just East of Broadway)
ROLAND BURKE HENNESSY, President
M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
European Representatives: The International News Co.
Breams Bldgs., Chancery Lane, London, Eng.
Paris, France: Brentano's, 8 Avenue de l'Opera
San Francisco: Lloyd B. Chappell, 656 O'Farrell St.

EDITOR, Roland Burke Hennessy
MANAGING EDITOR, Herman Bernard
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Looking at the subject negatively, the collapse of the criticism made against advertising programs, the silence that now reigns amid ranks that formerly were so noisy, and which silence is shared the country over by non-participants in the earlier outcry, must be taken as an expression of general approval.

The radio audience takes no offense at the fact that the announcer simply tells them that that particular "hour" is broadcast by the National Carbon Co., makers of Eveready radio and flashlight batteries. Mention of Atwater Kent, maker of radio receivers and speakers, is not taken as an unwarranted intrusion of the privacy of one's home. Indeed, one gladly accepts the mention of the trade names, for the excellent program concerns the listener most, and he is utterly willing to be made familiar with the nature of the business of the company that foots the bill. The Happiness Boys, the Gold Dust Twins and all the others who have met with high favor are welcomed into one's home, indeed missed when they take a vacation.

Once it seemed to be a problem to determine who was to pay for broadcasting. Naturally the stations could not bring before their microphones, at their own expense, such artists as John McCormack, Lucrezia Bori, Frances Alda, Albert Spaulding, Claudia Muzio, Reinald Werrenrath, Maria Jeritza and the rest of the stars of the music world whom it has been the great joy of radio audience to hear. It was left to the great enterprises that have some substantial and material reason for paying these artists, these concerns, without philantropic motive, it must be admitted, have done more for radio than any group (even philantropists) within the radio industry itself.

Now many stations also pay artists. Also there are what are known as studio artists, who have steady jobs as such and who stand ready to fill gaps in programs. Often announcers with piano-playing or singing ability are in this group, too. A step farther and all artists who appear before the microphone will be paid. This will put broadcasting on a sounder basis, for no industrial branch could long survive on gratuitous work.

There must be some incentive besides publicity, otherwise the rule of the wretched will prevail. While many of undoubted talent have volunteered their services, and even endured an audition, in most cases free talent has not represented that high degree of quality which radio should command.

As the advertising feature is working out now, stations are not showing any financial profit. It is not necessary that they should. Gradually the income will amount to such a figure that it will defray the cost of operation and amortization. The real profit will be rated in good will that the station commands for the products or objects of the station owner, be it a radio company, a telephone company, a church or a hardware store.

The Appetite for Distance

WHETHER the desire for receiving distant stations is abating considerably is a question that only a canvass could settle to the satisfaction of all. The general assumption is that owners of receivers are very keen for DX—the abbreviated designation for distance—when these persons are new to radio, but that in about a year they get over this and settle down to the reception of local stations. As against this is the undoubted proof that there are many radioists who fish for distance quite assiduously, although this is their fifth year in radio. Also dealers know that prospective purchasers, including radio veterans, frequently inquire about the DX capabilities of receivers they have in mind.

It is probably true that for a long while to come there will be enough division of desire on the score of DX to make distance-getting sets attractive to large numbers of persons. Certainly complaints of "no DX" do not come from fans who have no interest in distance reception, and such complaints are heard on every side.

Is it well to attempt to educate the public that it should not strive for DX? It is a hard and probably thankless task to try to convince persons to refrain from striving for the things they want.

Where DX is desired it has a charm hard to define. Although the quality of the reception can not be compared to that obtained from local stations, yet DX is an appeal to the pride of possession and accomplishment. To receive many distant stations is a tribute not only to the distance capabilities of the receiver but to the tuning skill of the fan. Log sheets that run as long as roller towels repose in thousands of homes, and as long as these logs are kept and proudly exhibited, who can say that DX has become meaningless? To catch only the call letters, so as to distinguish them, though the music is blemished beyond redemption, is a source of exultation to many, and it does not seem sound to initiate propaganda for the sole object of convincing persons that they should not like what they enjoy intensely.

Let DX have it appeal so long as any natural impulse creates or sustains that appeal. And if the appetite for distance shall die, let fond roses be placed upon the resting place of the thing that gave radio its outstanding lure in the early days of broadcasting and helped to carry it along in the trying days that followed.

WHBH BECOMES WCMA

WASHINGTON.

The call signal of WHBH, Culver Military Academy, Culver, Indiana, has been changed to WCMA.

Music Fees Are Debated By Buck and Harkness

Arguing the question of how much the broadcaster shall pay the composer for the privilege of using copyrighted musical numbers, Gene Buck, president of the American Society of Composers, and W. E. Harkness, of the newly formed Broadcasting Company of America, express themselves in the May issue of "Singing."

"Those for whom I speak," Mr. Buck declares, "as well as myself, feel a certain bitterness of spirit when we consider how these great corporations—whose aggregate capitalization amounts to some $2,000,000,000—twist the freedom of the air for their private ends into a fallacious argument for making the radio-users and lovers throughout the United States believe that men who ask no more than their constitutional rights, the protection of their own property, are trying to rob the American public, instead of enriching it, taking from it instead of giving to it. The freedom of the air, as interpreted by the great electric trusts, would justify the use of the phrase 'the freedom of floor' on the part of the huge baking trust combine recently ordered dissolved by the Government.

Must Have Music

"Broadcasting is a business, a tremendously profitable one. The great corporations controlling it sell the public of the United States, on conservative estimate, receiving apparatus—without which the public cannot enjoy the music broadcast—to the tune of more than $500,000,000 a year. Broadcasting could not exist without music and the words to which music is written. This music and these words are the bulk of the actual goods the radio delivers, but the men who wrote them asked a decent, reasonable fee for the exploitation of these creations of their own minds from radio companies which draw vast profit from their use. And at once the cry was raised that we were extortioners.

"I feel that any man, farmer, mechanic, inventor, salesman, writer, painter or other is entitled to get all he can out of the gifts God has given him, whether those gifts be manual or mental.

Sliding Scale Prices

"The representative broadcasters have recently attempted to arrive at an understanding with the Composers Society as to the amounts to be paid for license fees for stations of different powers, but without success," Mr. Harkness argues. "The fees paid have varied to a wide degree for stations of the same power and, further, the fees per year during the past three years have been increased at abnormal rates—as an illustration $500 the first year, $2,500 the second year, and $25,000 the third year, with no assurance that they have reached a limit. What the future demands may be, no one can predict, nor will the Society state.

"There has been much misunderstanding as to the relation of the broadcaster to the radio industry as a whole, and attempts have been made to show that the broadcasters are benefited directly by the sales of radio receiving equipment. This is not true. There are comparatively few broadcasters who have any direct or indirect connection with the manufacture of radio equipment. Thirty-six stations out of a total of 536 are operated by radio manufacturers.

Broadcasting Doesn't Pay Yet

"The gross radio business of the United States for the year 1925 is estimated at $450,000,000. This includes the total business done by manufacturers, jobbers, and dealers in complete sets and parts. Less than one per cent. of this amount is devoted to the support of broadcasting. This sum is but a small part of the annual cost of operating the total number of stations throughout the country, most of which are supported by the owners or those using their facilities in an endeavor to create good will toward those who supply the programs.

"Broadcasting in the United States is not on a paying basis. What the ultimate means of supporting it will be has not yet been determined, and this will be further deferred if the music situation remains unsettled and subject to such major fluctuations as have occurred in the past. What the broadcasters desire is some assurance of stability in their raw material—music. For that stability they stand ready to pay generously, but upon some definitely organized price list or price plan."

Brooklyn Radio Show Set For Oct. 30 to Nov. 6

Brooklyn is to stage its Third Annual Radio Exposition, October 30 to November 6, in the 23d Regiment Armory.

The decision to hold the Radio Exposition this year was made following requests by several leading radio manufacturers and others for a show, so that they may get in closer touch with the radio owner and builder, and in view of the fact that there is estimated to be more than 350,000 radio sets in operation in Brooklyn and the rest of Long Island.

The Exposition this year will cover over 60,000 square feet of floor space. A broadcasting booth will be erected in the center of the Exposition hall which will provide entertainment for both afternoons and evenings.

The exposition will be under the personal management of Stephen T. Rogers, Room 513, Albee Bldg., Brooklyn, N. Y.

New Thomas Loop

The new Thomas collapsible box type loop is now ready for distribution. This loop should prove popular among fans, meeting all their needs for economy of space, efficiency and beauty. It requires only a 6" space for a turning radius, thus allowing its use in confined spaces. It also has the advantage of being quickly dismantled and set up. It has good pick-up and inductance and is scientifically stagger wound, insuring proper spacing. It is handsomely finished in dark walnut. It has three taps and thus can be used on regenerative Super - Heterodynes. Three 36" leads are furnished and it is fully guaranteed by the makers. Full information on this loop can be had from the W. I. Thomas Co., 215 North Desplaines Street, Chicago, Ill. Mention RADIO WORLD.

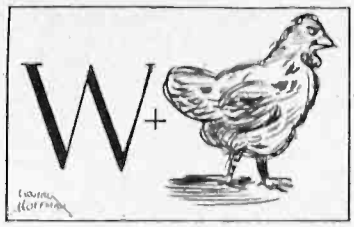
NEW CORPORATIONS

May Radio Broadcast Corp., Newark, N. J., $100,000 preferred and 2,500 shares common, no par value; D. W. May, Harry Green, Samuel Green, Newark. (Attys., Green & Green, Newark, N. J.).

Howards Radio House, Inc., Paterson, N. J., $50,000; Lillian Kanter, Barney Hughes, Walter Bligh, Lillian Tracey, Paterson, N. J. (Atty., Samuel Raff, Paterson, N. J.).

Radio Printing Co., N. Y. City, $10,000; J. H. R. Littman, S. Backlar, H. Barshay. (Atty., J. Nemerson, 261 Broadway, N. Y. City).

The Rebus



WHAT station does this represent?

Used Set Exchanges Prophesied by Boyd

ATLANTIC CITY, N. J.

The establishment of used radio set exchange marts likely will come in every city in the United States before long, said Carl Boyd, newly elected first vice-president of the Radio Manufacturers' Association.

"Just as the handling of used automobiles is an important part of the automobile business, so the sale of used radio sets will become an important part of radio sales," he said.

"More than 7,000,000 radio sets have been sold in the United States since radio became a business and approximately 5,000,000 of them are in condition that makes them useful today.

"These sets are being retired by their present owners as they are replaced by receiving sets of modern cabinet design, and more modern circuits. The retired sets are still in good condition and will find a ready market among beginners in radio as the used set markets develop."

New Amsco Resistor Handles 1 Watt Safely

The definite trend toward the improvement of resistors for use in resistive coupled amplifiers has developed the Metaloid resistor, a new product manufactured by Amsco Products, Inc.

This resistor, which has been designed with the rather special requirements of resistive coupled amplification in mind, will dissipate over one watt of energy continuously without appreciable variation in its electrical characteristics. The Metaloid is made entirely of glass and metal, the resistive material being deposited on an interior glass tube. Absolute permanance and noiselessness are guaranteed by the manufacturer as well as accuracy to within five per cent. on either side of the rated resistance.

While the Metaloid may be clipped into the conventional mountings, its diameter is greater than that of the "leak" type unit, permitting sufficient conducting area to permit 100% power overload without other than practically negligible temporary variations in resistance values.

This new resistor can be supplied in any desired resistances, from the comparatively low values employed in B battery eliminator circuits to the leak values measured in megohms.

Business Opportunities Radio and Electrical

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

WELL-KNOWN FURNITURE INSTALMENT HOUSE DESIRES TO LEASE OUT ITS RADIO DEPARTMENT; PERMANENT WINDOW DISPLAY AND AMPLE FLOOR SPACE; ONLY EXPERIENCED RETAIL RADIO MAN WILL BE CONSIDERED; NO BEGINNERS; RESPONSIBLE PARTY WITH PERSONAL CREDIT RATING; CASH GUARANTEE WILL BE ESSENTIAL; VICTOR AGENCY INCLUDED. BOX 292, 228 WEST 42D, N. Y. C.

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Looking at the subject negatively, the collapse of the criticism made against advertising programs, the silence that now reigns amid ranks that formerly were so noisy, and which silence is shared the country over by non-participants in the earlier outcry, must be taken as an expression of general approval.

The radio audience takes no offense at the fact that the announcer simply tells them that that particular "hour" is broadcast by the National Carbon Co., makers of Eveready radio and flashlight batteries. Mention of Atwater Kent, maker of radio receivers and speakers, is not taken as an unwarranted intrusion of the privacy of one's home. Indeed, one gladly accepts the mention of the trade names, for the excellent program concerns the listener most, and he is utterly willing to be made familiar with the nature of the business of the company that foots the bill. The Happiness Boys, the Gold Dust Twins and all the others who have met with high favor are welcomed into one's home, indeed missed when they take a vacation.

Once it seemed to be a problem to determine who was to pay for broadcasting. Naturally the stations could not bring before their microphones, at their own expense, such artists as John McCormack, Lucrezia Bori, Frances Alda, Albert Spaulding, Claudia Muzio, Reinald Werrenrath, Maria Jeritza and the rest of the stars of the music world whom it has been the great joy of radio audience to hear. It was left to the great enterprises that have some substantial and material reason for paying these artists, these concerns, without philantropic motive, it must be admitted, have done more for radio than any group (even philantropists) within the radio industry itself.

Now many stations also pay artists. Also there are what are known as studio artists, who have steady jobs as such and who stand ready to fill gaps in programs. Often announcers with piano-playing or singing ability are in this group, too. A step farther and all artists who appear before the microphone will be paid. This will put broadcasting on a sounder basis, for no industrial branch could long survive on gratuitous work.

There must be some incentive besides publicity, otherwise the rule of the wretched will prevail. While many of undoubted talent have volunteered their services, and even endured an audition, in most cases free talent has not represented that high degree of quality which radio should command.

As the advertising feature is working out now, stations are not showing any financial profit. It is not necessary that they should. Gradually the income will amount to such a figure that it will defray the cost of operation and amortization. The real profit will be rated in good will that the station commands for the products or objects of the station owner, be it a radio company, a telephone company, a church or a hardware store.

The Appetite for Distance

WHETHER the desire for receiving distant stations is abating considerably is a question that only a canvass could settle to the satisfaction of all. The general assumption is that owners of receivers are very keen for DX—the abbreviated designation for distance—when these persons are new to radio, but that in about a year they get over this and settle down to the reception of local stations. As against this is the undoubted proof that there are many radioists who fish for distance quite assiduously, although this is their fifth year in radio. Also dealers know that prospective purchasers, including radio veterans, frequently inquire about the DX capabilities of receivers they have in mind.

It is probably true that for a long while to come there will be enough division of desire on the score of DX to make distance-getting sets attractive to large numbers of persons. Certainly complaints of "no DX" do not come from fans who have no interest in distance reception, and such complaints are heard on every side.

Is it well to attempt to educate the public that it should not strive for DX? It is a hard and probably thankless task to try to convince persons to refrain from striving for the things they want.

Where DX is desired it has a charm hard to define. Although the quality of the reception can not be compared to that obtained from local stations, yet DX is an appeal to the pride of possession and accomplishment. To receive many distant stations is a tribute not only to the distance capabilities of the receiver but to the tuning skill of the fan. Log sheets that run as long as roller towels repose in thousands of homes, and as long as these logs are kept and proudly exhibited, who can say that DX has become meaningless? To catch only the call letters, so as to distinguish them, though the music is blemished beyond redemption, is a source of exultation to many, and it does not seem sound to initiate propaganda for the sole object of convincing persons that they should not like what they enjoy intensely.

Let DX have it appeal so long as any natural impulse creates or sustains that appeal. And if the appetite for distance shall die, let fond roses be placed upon the resting place of the thing that gave radio its outstanding lure in the early days of broadcasting and helped to carry it along in the trying days that followed.

WHBH BECOMES WCMA

WASHINGTON.

The call signal of WHBH, Culver Military Academy, Culver, Indiana, has been changed to WCMA.

Music Fees Are Debated By Buck and Harkness

Arguing the question of how much the broadcaster shall pay the composer for the privilege of using copyrighted musical numbers, Gene Buck, president of the American Society of Composers, and W. E. Harkness, of the newly formed Broadcasting Company of America, express themselves in the May issue of "Singing."

"Those for whom I speak," Mr. Buck declares, "as well as myself, feel a certain bitterness of spirit when we consider how these great corporations—whose aggregate capitalization amounts to some $2,000,000,000—twist the freedom of the air for their private ends into a fallacious argument for making the radio-users and lovers throughout the United States believe that men who ask no more than their constitutional rights, the protection of their own property, are trying to rob the American public, instead of enriching it, taking from it instead of giving to it. The freedom of the air, as interpreted by the great electric trusts, would justify the use of the phrase 'the freedom of floor' on the part of the huge baking trust combine recently ordered dissolved by the Government.

Must Have Music

"Broadcasting is a business, a tremendously profitable one. The great corporations controlling it sell the public of the United States, on conservative estimate, receiving apparatus—without which the public cannot enjoy the music broadcast—to the tune of more than $500,000,000 a year. Broadcasting could not exist without music and the words to which music is written. This music and these words are the bulk of the actual goods the radio delivers, but the men who wrote them asked a decent, reasonable fee for the exploitation of these creations of their own minds from radio companies which draw vast profit from their use. And at once the cry was raised that we were extortioners.

"I feel that any man, farmer, mechanic, inventor, salesman, writer, painter or other is entitled to get all he can out of the gifts God has given him, whether those gifts be manual or mental.

Sliding Scale Prices

"The representative broadcasters have recently attempted to arrive at an understanding with the Composers Society as to the amounts to be paid for license fees for stations of different powers, but without success," Mr. Harkness argues. "The fees paid have varied to a wide degree for stations of the same power and, further, the fees per year during the past three years have been increased at abnormal rates—as an illustration $500 the first year, $2,500 the second year, and $25,000 the third year, with no assurance that they have reached a limit. What the future demands may be, no one can predict, nor will the Society state.

"There has been much misunderstanding as to the relation of the broadcaster to the radio industry as a whole, and attempts have been made to show that the broadcasters are benefited directly by the sales of radio receiving equipment. This is not true. There are comparatively few broadcasters who have any direct or indirect connection with the manufacture of radio squipment. Thirty-six stations out of a total of 536 are operated by radio manufacturers.

Broadcasting Doesn't Pay Yet

"The gross radio business of the United States for the year 1925 is estimated at $450,000,000. This includes the total business done by manufacturers, jobbers, and dealers in complete sets and parts. Less than one per cent. of this amount is devoted to the support of broadcasting. This sum is but a small part of the annual cost of operating the total number of stations throughout the country, most of which are supported by the owners or those using their facilities in an endeavor to create good will toward those who supply the programs.

"Broadcasting in the United States is not on a paying basis. What the ultimate means of supporting it will be has not yet been determined, and this will be further deferred if the music situation remains unsettled and subject to such major fluctuations as have occurred in the past. What the broadcasters desire is some assurance of stability in their raw material—music. For that stability they stand ready to pay generously, but upon some definitely organized price list or price plan."

Brooklyn Radio Show Set For Oct. 30 to Nov. 6

Brooklyn is to stage its Third Annual Radio Exposition, October 30 to November 6, in the 23d Regiment Armory.

The decision to hold the Radio Exposition this year was made following requests by several leading radio manufacturers and others for a show, so that they may get in closer touch with the radio owner and builder, and in view of the fact that there is estimated to be more than 350,000 radio sets in operation in Brooklyn and the rest of Long Island.

The Exposition this year will cover over 60,000 square feet of floor space. A broadcasting booth will be erected in the center of the Exposition hall which will provide entertainment for both afternoons and evenings.

The exposition will be under the personal management of Stephen T. Rogers, Room 513, Albee Bldg., Brooklyn, N. Y.

New Thomas Loop

The new Thomas collapsible box type loop is now ready for distribution. This loop should prove popular among fans, meeting all their needs for economy of space, efficiency and beauty. It requires only a 6" space for a turning radius, thus allowing its use in confined spaces. It also has the advantage of being quickly dismantled and set up. It has good pick-up and inductance and is scientifically stagger wound, insuring proper spacing. It is handsomely finished in dark walnut. It has three taps and thus can be used on regenerative Super - Heterodynes. Three 36" leads are furnished and it is fully guaranteed by the makers. Full information on this loop can be had from the W. J. Thomas Co., 215 North Desplaines Street, Chicago, Ill. Mention RADIO WORLD.

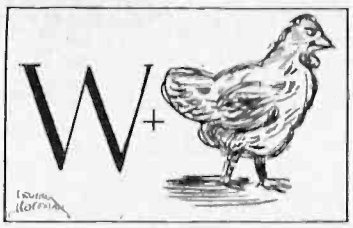
NEW CORPORATIONS

May Radio Broadcast Corp., Newark, N. J., $100,000 preferred and 2,500 shares common, no par value; D. W. May, Harry Green, Samuel Green, Newark. (Attys., Green & Green, Newark, N. J.).

Howards Radio House, Inc., Paterson, N. J., $50,000; Lillian Kanter, Barney Hughes, Walter Bligh, Lillian Tracey, Paterson, N. J. (Atty., Samuel Raff, Paterson, N. J.).

Radio Printing Co., N. Y. City, $10,000; J. H. R. Littman, S. Backlar, H. Barshay. (Atty., J. Nemerson, 261 Broadway, N. Y. City).

The Rebus



WHAT station does this represent?

Used Set Exchanges Prophesied by Boyd

ATLANTIC CITY, N. J.

The establishment of used radio set exchange marts likely will come in every city in the United States before long, said Carl Boyd, newly elected first vice-president of the Radio Manufacturers' Association.

"Just as the handling of used automobiles is an important part of the automobile business, so the sale of used radio sets will become an important part of radio sales," he said.

"More than 7,000,000 radio sets have been sold in the United States since radio became a business and approximately 5,000,000 of them are in condition that makes them useful today.

"These sets are being retired by their present owners as they are replaced by receiving sets of modern cabinet design, and more modern circuits. The retired sets are still in good condition and will find a ready market among beginners in radio as the used set markets develop."

New Amsco Resistor Handles 1 Watt Safely

The definite trend toward the improvement of resistors for use in resistive coupled amplifiers has developed the Metaloid resistor, a new product manufactured by Amsco Products, Inc.

This resistor, which has been designed with the rather special requirements of resistive coupled amplification in mind, will dissipate over one watt of energy continuously without appreciable variation in its electrical characteristics. The Metaloid is made entirely of glass and metal, the resistive material being deposited on an interior glass tube. Absolute permanance and noiselessness are guaranteed by the manufacturer as well as accuracy to within five per cent. on either side of the rated resistance.

While the Metaloid may be clipped into the conventional mountings, its diameter is greater than that of the "leak" type unit, permitting sufficient conducting area to permit 100% power overload without other than practically negligible temporary variations in resistance values.

This new resistor can be supplied in any desired resistances, from the comparatively low values employed in B battery eliminator circuits to the leak values measured in megohms.

Radio Promenaders Grace the Boardwalk

FOLLOWING a session of the Radio Manufacturers' Association at Atlantic City recently, these five men of the trade promenaded the boardwalk. Left to right, A. Irving Witz, of the Gray Sales Co., Philadelphia; Richard Barnett; Sidney E. Finkelstein, sales manager of the Bruno Radio Corporation; Louis Lager, president and general manager of the B. C. L. Radio Service Co., and Joseph Barnett. The Barnett Brothers hail from the Keystone Radio Co., Philadelphia. Evidently Mr. Lager was stuck for the cigars.

THE RADIO TRADE

Radio Now the Delight of Fastidious Musicians

By James H. Carroll

A short time ago it was almost impossible to interest a real music lover in radio. Orchestra leaders, pianists, singers, and other music lovers turned deaf ears to the blares of the rattling horn roaring away outside of inferior radio stores. A great many were at fault for this condition, chiefly, we regret to say, the average fan who demanded quantity and not quality—in other words, the demand was for lots of "volume." Give them that and all else was overlooked. It was this condition that must have prompted the English cynic's definition of broadcasting as the art of transmitting the worst possible music to the greatest possible distance.

Fortunately, with the great advance of radio, the conditions are reversed, real tone quality has been achieved by many improvements, and music lovers turn to radio not only as a recreation but also as a means of enjoying music and advancing their own musical education. Radio is a boon to education, for when one can listen to the great masters of song and instrument it is the best mode of improving one's individual technique.

Advances In Many Fields

Now, let us consider the various means of actual reproduction. Tubes, transformers and audio hook-ups have all been improved to a great degree and many have done their share in this direction. In the speaker field great advances have also been made. We have progressed from the horn to the cabinet type and from the cabinet to the cone. There are many types of cones and many schools of cone experts. A great divergence of opinion exists between the advocates of the bound edge cone, those who hold out for the free edge cone, the paper diaphragm, the pleated diaghragm and so on ad infinitum.

Let us first consider the horn and compare the advantages of the cone over the horn. Let us remember, however, that we must have a faithful amplifier circuit, for we can only take out of the output end of the circuit what quality we put into it; no more. No speaker, however good it may be, will iron out all faults of distortion or poor amplification. In fact, the better it is the more strongly it will bring out the faults.

The horn functions as an air resonator in this way: the volume of air inside the horn resonates in very much the same way as a tuned aerial resonates electrically but, to carry out the analogy, the speaker very often suffers from the defect that its wavelength is too short, or in other words it will not bring out clearly the bass notes, losing many, because in order to take care of these satisfactorily the speaker should be at least six feet long. For the same reason many of the higher frequencies are also lost and only an apparent all-scale reproduction is accomplished.

To prove this, listen how many instruments in an orchestra you can pick out.

Acme Double Free-edge Cone, Type K2

In a symphony, listen to pick out the deep brasses, the cellos, the piano and the drums. On the other hand, even the most indifferent cone will reproduce a greater part of the musical scale with extreme fidelity. On a good cone speaker, and particularly on the free edge type, the low tones are adequately released, while the high ones are produced in the proper frequency, thus striking the right balance, and the organ notes become rich and booming instead of flutelike and thin; realism is achieved and the room may be filled with music without any musician present protesting that it is "too loud." This cry is the unconscious protest of the person with a true musical ear when distortion is heard. Extraneous noises and static seem to be somewhat dampened out also, for the accomplished realism helps to offset the disturbing factors. The victory of improved reproduction is therefore thoroughly accomplished.

Pioneers in radio since its inception, the Acme Apparatus Company, whose motto from the beginning has been, "Amplification without Distortion," set its engineers to work on the accoustic problem many years ago.

The Final Idea

Years of experimenting and the destruction of hundreds of models which fell hort of the ideals sought, brought forth he Acme Double Free-edge Cone, the ast development along these lines. One et of experts worked exclusively on the problem of magnets, another group on diaphragm materials and still others on the factors of shape and form. Many forms of magnet were tried, only to be discarded. The single cone was developed to a high degree only to be thrown out upon the inception of the idea of the double cone. This was brought out in many forms and finally perfected in its present style which was the final answer to difficulties in the way of perfect tone reproduction.

The Acme reproducer in its present form was developed primarily for high quality reproduction of sound, but as it was necessary to have it very sensitive, to bring the volume up to a level which sounded natural without overloading, a large amount of development was required to make the reproducer sensitive with no sacrifice of quality.

Demands Were Exacting

To do this, it was found necessary to design the reproducing device with a large effective sound radiating area and at the same time to enable this large area to be vibrated without the use of mechanical reproduction of the motion such as by the levers usually used with cone speakers.

This result was accomplished by using two free cones, each mounted on its own armature, the armatures being so disposed as to form a single air gap which is in the center of the winding. The armatures are carried on flexible, permeable members mounted on the opposite poles of a permanent magnet. By this arrangement, the variation in the length of the air gap is twice the amplitude of each armature giving in effect a 2:1

mechanical reduction. The use of two free cones gives a very large effective radiating area for the over-all dimensions of the device. The design is such that the length of the air gap can be accurately adjusted to a small valve, thereby insuring the fullest degree of sensitivity and since the dynamic balance is inherently perfect it has been found literally impossible to overload the reproducer. It has given splendid reproduction, without trace of distortion from the output of two 5-watt tubes operating push-pull with 400 volts on the plate.

The speaker is designed to operate with a direct current component in the winding of 4 to 5 milliamps. It will, however, operate well with no direct current or with as much as 20 milliamps. These operating values, therefore take care of any system of amplification; the better it is the greater the volume and the more perfect the tone quality.

Constants of Speaker

The ohmic resistance of the winding is around 400. The inductance runs from about 2 henries at low frequency to 1½ at high, and the AC resistance will run from 4,000 to 8,000 ohms, depending on the frequency and the motional impedance. The total impedance at 1,000 cycles is therefore about 15,000 ohms.

The two free edge cones are of special Japanese parchment, impervious to atmospheric changes, practically puncture proof and mounted in such a manner as to allow for all changes of tone. These pass all vibratory tests, responding in a perfect degree to the sand test. The means of adjustment allows for matching all forms of plate impedance and an unlimited number of tube combinations.

We have been asked to illustrate for the beginner in plain language the difference in sound reproduction. This is hard to do, even with diagrams and pictures. However, let us imagine that the musical notes of the orchestra came from the horn or speaker in the form of smoke rings. Let us take for example, as a standard of comparison, a 6-foot smoke ring as the perfect, rounded fully timbred musical note. From the horn this might issue as a 4-foot ring, hazy and indistinct and not quite a perfect circle.

Maintaining the Rings

As the others follow in fast or slow tempo, they will be observed to vary greatly from the circular shape. Occasionally one will dance forth perfect in every way, size, shape and thickness. But the others will rush into and through it, some will stagger drunkenly, others will flatten out or stretch into straight lines; some shooting straight up to the ceiling, others to corners of the room. A weird impressionistic nightmare, if it could be made visible. Now then, if this would be the effect of visibility, imagine the effect in sound.

Now, take the single conventional cone and turn the sound waves into smoke rings. We see the rings coming forth in nearly perfect standard 6-foot rings, fairly good in thickness and vigor but perhaps dwindling as they travel across the room till some become only about a couple of inches in diameter, maintaining a fairly good balance and distance apart, but, nevertheless failing to fill our room in orderly array and in every corner. A big difference is claimed for the free-edge cone. Here the rings trip sprightly, in orderly ranks, every one six feet in diameter, perfectly rounded, each taking its appointed place, like a well-drilled army under the command of a good general.

A BUILT-IN SPEAKER SET, by Herbert E. Hayden, appeared in RADIO WORLD dated May 22. 15c per copy, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

COMING EVENTS

JUNE 1 to DEC. 1—Sesqui-Centennial, Industrial Arts Bldg., Philadelphia, Pa., with concurrent radio exposition.

SEPT. 10 to 17—National Radio Exposition, Grand Central Palace, New York City. American Radio Exposition Co., 1560 Broadway, New York City.

SEPT. 13 to 18—Third Radio World's Fair, Madison Square Garden, New York City. G. Clayton Irwin, manager, Times Bldg., N. Y. City.

OCT. 11 to 17—Fifth Annual Chicago Radio Show, Coliseum, Chicago, Ill. G. Clayton Irwin, manager, Times Bldg., N. Y. City.

OCT. 25 to 30—Second Annual Indianapolis Radio Exposition of the Central States, State Fair Grounds, Indianapolis, Indiana. Management of Indianapolis Radio Exposition Corp., 1,407 Merchants Bank Bldg.

OCT. 30 to NOV. 6—Cleveland Radio Industries Exposition, Public Auditorium, Cleveland, O. G. E. Bodenhoff, manager, 511 Guarantee Title Bldg., Cleveland, O.

Rouse in New Post With Research Concern

R. Louis Rouse has been appointed general manager and chief engineer of the United Research Laboratories of Cincinnati, specialists in radio and electrical research and designing. Mr. Rouse is a graduate of Pennsylvania University and The Radio Institute of America. He has been actively interested in this line of work for the twelve years and has a number of inventions to his credit.

Mr. Rouse designed and built the WHBR station and was manager and announcer for over a year. He was the first person successfully to use grid modulation in a broadcasting station. He holds the design for an improvement known as master grid modulation.

Pittsburgh Show

Pittsburgh will have a big radio show beginning Saturday, September 25 and ending Saturday, October 2.

Although Pittsburgh is the home of pioneer broadcasting station, KDKA, and one of the pioneer cities in the radio industry, it has never had a real radio show. H. R. Eleyet, care Pittsburgh Press, is secretary of the Pittsburgh Radio Show Company.

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 .....

E. S. Broadfoot, 774 West 7th Ave., West Homestead, Pa.
Geo. W. Gribbling, 912 East 8th St., North, Portland, Ore.
Walter Radio Service, R. 4, Iola, Kan. (Dealers).
Charles T. Kirk Radio Service, 3441 Island Ave., Toledo, O. (Dealer).
Leonard Poll, 1301 Alpine Ave., N. W., Grand Rapids, Mich.
Hyam Yamins, 367 Whipple St., Fall River, Mass.
W. H. McCumsey, Ft. Wayne, Ind.
C. E. McKeever, Bradford, Ill.
Jack Evaden, 705 South Washington, Iola, Kan.
Arthur C. Lasey, Newcomerstown, O. (Dealer).
J. Tenenty, 596 Ave. A, Bayonne, N. J.
E. E. Kane, 1013 S. W. Court St., Miami, Fla. (Dealer).
H. M. Aldrich, 115 Congress St., Portland, Me. (Dealer).
L. Armstrong, 6315 Marsden St., Philadelphia, Pa.
C. Wale, 322 Fourteenth St., Buffalo, N. Y. (Dealer).
F. J. O'Brien, Box 2086, Philadelphia, Pa.

LOS ANGELES SHOW

The exposition committee of the Radio Trades' Association of Southern California, under whose guidance the successful 1925 radio show was held, announce September 5 to 11, inclusive, as the dates for the 1926 radio show, which will again be held in the Ambassador Auditorium. The managing director is at Los Angeles.

FARMERS RESPONSIVE

County Agent B. G. Southwick of Hartford County, Conn., Farm Bureau, reports that the farm radio talks from WTIC have resulted in more comment and inquiries than any other thing he has ever tried.

Eric Palmer Appointed Exploiter of Radio Show

Harold Bolster, managing director for the Radio Exhibition Corporation of The Radio Show (Grand Central Palace, New York, Sept. 10 to 17), announces the appointment of Eric H. Palmer to be in charge of exploitation. The corporation's office is at 1560 Broadway, New York.

Mr. Palmer is well-known in radio by his frequent writings on popular radio subjects and by his arrangement of special features of nationwide importance. He conducted the radio exploration tour of the United States during May and June, 1925, emphasizing the improvement in summer reception and radio's service as an all-year-round entertainment. During the 1926 international tests Mr. Palmer acted as official American observer in Europe, returning with the first message of the League of Nations on the importance of radio as a factor for universal peace and as an instrument in battling disease, ignorance and bigotry. Last year, while engaged in a similar capacity with the Radio World's Fair, he inaugurated the Radio Diana contest in which the fair listenerers of the United States and Canada competed for the title of Miss Radio—which idea strikingly illustrated women's intense interest in radio.

Mr. Palmer, who was at one time publicity commisisoner for the United States abroad, promises some international features for The Radio Show.

He resigned from the Radio World's Fair a few days ago to take up his duties with the manufacturers' own exposition.

Prior to his advent in radio, Mr. Palmer was a star political reporter and the incumbent of important executive posts in the city, state and Federal Government. During the war he was intelligence chief for the United States in the Nordic countries.

DX Crystal Sets Reality In Britain, Editor Reports

"American radio is absolutely different from English wireless."

That is the conclusion of Bernard E. Jones, editor of two English publications dealing with amateur wireless and broadcasting.

Mr. Jones has returned to England after a five weeks tour of principal American broadcasting centers.

"In America, radio is individualistic," is the opinion of Mr. Jones. "In England, the Government controls it. All over America we find broadcasting stations erected and conducted by private enterprise, providing attractive programs of which there seems to be no end.

Lauds American Sets

"With the right kind of receivers, operated by those who understand them, there seems to be little or no interference in America, despite the very large number of stations.

"The powerful set, with its two, three or four radio-frequency tubes to bring in the long-distance stations, can bring the American listener a fresh station every minute if he so wishes, and the listener can continue his radio explorations for hours without repeating the fare or straying far outside his national boundaries.

"In Great Britain, the sole right to send or receive a radio communication is vested in the Postmaster General, and in issuing a license for either purpose, he inserts whatever conditions he deems advisable. He has issued 1,750,000 licenses to receive but only one license to broadcast—and that one is to the British Broadcasting Company (we call it the B. B. C.). Nobody else in Britain may put a program on the air, and publicity and advertisement as Americans understand them can have no place in the British programs.

Has Twenty Stations

"Great Britain has about twenty broadcasting stations, all built, equipped and maintained by the B. B. C. which, originally, a committee of the radio trade, is now developing into a public utility body. It started with a tiny capital. Then how does it get money to found and maintain twenty stations? From the Post Office. And the Post Office gets it directly from the public.

"Every listener must buy at the local Post Office a ten shilling license ($2.50) and this must be renewed every year. It is easy to evade taking out the license, but public opinion is against the mean man who does so, and there is now a penalty for the offense. Of the $2.50 paid for the license, part is kept for expense of collection, and the balance, about $1.80, is passed to the B. B. C. which has an annual income of at least $2,500,000 with which to erect and equip new stations, improve existing ones and maintain a series of almost wholly professional programs, often costly. With only twenty stations, there are yet considerable differences between the wavelengths, London (2LO) being 364, and its nearest neighbors, Bournemouth, 386, and Birmingham, 479. There is scarcely any interstation interference.

Surprised at Daventry

"Great Britain possesses in the B. B. C. Station Daventry (5XX), in the Midlands, what is probably the highest-powered purely broadcasting station in the world. It operates at 1,600 meters, and I am surprised that it is not better heard in America. The reason for the poor reception of British broadcasting in the U. S. A. is not yet apparent.

"A large proportion—perhaps 65%—of the British public listens on crystal sets, a type of receiver which appears to be smiled upon in America as belonging to history. I have myself listened on a crystal set to Daventry in a rock-bound bay on the coast of Cornwall, a distance of about 230 miles. The B. B. C. has set itself out to provide crystal reception for the bulk of the population. Of course, more and more people use tube sets, and in my opinion, the proportion of home-built tube sets is larger than in America. Our tube set (we call it the valve set) is not yours. The conditions that produced it are different. The need for combined critical selectivity and long-distance reception is felt to a less degree and has not existed long enough to influence the design of the everyday set. We do not in general use six or eight tubes. Three or four are more usual, and there are thousands of 2-tube reflex or feed-back sets that can at a distance of 80 to 100 miles from Daventry give good loudspeaker reception. With three or four tubes (a straight circuit one radio-frequency, detector and one or two audio-frequency) I can listen to any British station on the loudspeaker.

The Rule About News

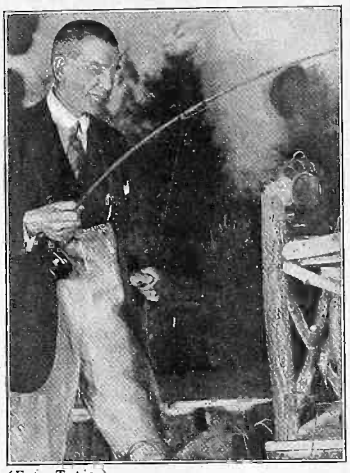
"All the B. B. C. stations are linked

up at certain hours each day for the simultaneous broadcasting of the Greenwich time signal and of the day's news. This news is supplied in the form of a summary from an Association of the Press, and the Postmaster General's license, under which the B. B. C. operates, forbids the broadcasting of news obtained in any other manner. Technically, for example, if there was a slight earthquake under the B. B. C. studio, the fact would not be available for the broadcast until the Press had collected the news and passed it to the B. B. C.—rather a humorous situation."

Mr. Jones told Eric H. Palmer of the Freed-Eisemann Radio Corp.:

"The British listener has a big neighbor—the European continent—every country in which maintains a broadcasting service. Such famous stations as Rome (425 metres); Radio Toulouse (443); Berlin Vox Haus (505); Hilversum (1,050); Konigswusterhausen (1,300); Radio Paris (1,750), and Eiffel Tower (2,650), are all easily heard on a 3-or-4-tube set. The 80 or 90 more important Continental stations provide remarkable variety."

Hooks 'Em and Explains



(Foto Topics)

WILLIAM DICK, veteran champion angler, hooking a trout in the trout pool at a department store exhibit in New York, and telling the radio audience of his experiences and sensations. This pool was installed as a part of a spring camp exposition.

Better Announcers

ANNOUNCING is difficult work. It requires education, poise, versatility, vocal attraction and personality. The announcer bears as important a relationship to a station as does the sales manager to his company. It is assumed excellent sales managers are excellently paid. It is known that excellent announcers are none too excellently paid. Also, not enough is offered to make announcing attract the best talent and brains that would be available for the purpose.

To-day announcing has not risen to an art, but is rather on a hit-or-miss basis.

Some day announcing will rise to the position its importance justifies. Ability to read, write and speak the English language, and murder all other tongues, especially foreign titles of music, no longer will be the prime requirements for an announcer's job. Indeed, schools will spring up. "Be An Announcer! Make $10,000 a Year!" the advertisements will read. At upper right will be a picture of the owner of the school, emphasizing his advice by bringing the fist of one hand hard upon the palm of the other. At lower left will be a testimonial from a plumber's helper stating that, due to having taken the course, he increased his income from $30 a week to $125 a week. "The work is pleasant, the pay is big."

It is pleasant indeed, if one is sufficiently wrapped up in it to make it pleasant. Such enthusiasm is necessary in any line of work, but none too much of it is found in announcing as it is done to-day. While an announcer's voice may be cheery, for gloom would cost the man his job, the reading of titles becomes a dull ritual, and the filling of a short gap with nothing but conversation becomes a silly performance that tires any audience very quickly. A man alert enough to talk entertainingly for a few minutes, although the exigency was never dreamed of, is not likely to have risen suddenly from plumbing to announcing. A college education, fluency in foreign languages, a knowledge of music, both technical and historical, a pleasing voice, excellent enunciation and constant alertness, with the gift of a romantic touch, are advantages worth considering. Not all are requisites, but there is enough in the list to disclose that the typical announcer of to-day will not measure up to the demands that broadcasting will develop in the early future. Indeed, the need for improvement is here now, but the process of producing it is retarded.

Why Variable Leak Improves DX Results

(*Continued from page 11*)

is an art in itself and cannot be acquired by the beginner in a week or a month. And the first requisite of tuning for distant stations is the use of head phones instead of the loud speaker, as the response medium. This is so, irrespective of the sensitivity of the loud speaker. It should be realized that response is greatest when the unit is adjacent to the ear, and while the final signal after being tuned in correctly will be audible on the loud speaker, the fan tuning with the loud speaker as the response device invariably passes over many stations.

The next item in tuning is that of slow manipulation of the dial, especially when more than one circuit is tuned from one point. The cumulative effect upon the final resonance curve when three or four tuning condensers are controlled from one point is such that the base of the curve is only a fraction of the width of the resonance curve for one of the individual circuits. Expressed in figures and diagrammatically as shown in Fig. 1, the resonance curve for a station may cover six divisions on a theoretical dial for one of the individual circuits (A), but only one and a half divisions on the major dial controlling all the circuits (B). The necessity for slow tuning is very evident. With a single dial control receiver, tuned hurriedly, many stations are passed over.

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In addition to careful, slow tuning, keep a log of stations received. The dial settings will prove beneficial in the hunt for additional DX, as any desired station will be reduced to a certain area upon the dials, and the curve will disclose the location. An example of a graph of logged stations is given in Fig. 2, representing wavelengths plotted against dial settings. It is not unnecessary to plot a curve, and good use can be made of an enumerated list, if the stations are arranged in sequence, starting with the lowest wavelength and progressing to the highest.

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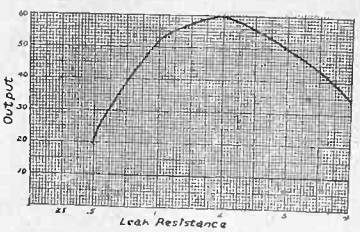

HOW correct leak setting improves the power output.

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Put Power Tube in First And Last Fenway Sockets

For radio with a certainty of satisfaction the Fenway combination 4 and 9-tube receiver is in a class by itself, says Leo Fenway. "Fenway—for DX" has come to mean more than merely a catch phrase, as thousands of satisfied builders realize. Since its first appearance in RADIO WORLD on February 6, fans have voiced their approval of the circuit, and back numbers of this magazine, containing the entire Fenway data, are in great demand. Fenway blueprints have been sent to all corners of the world.

Mr. Fenway has now come forward and told us that a power tube, of the —X112 variety, should be placed in the first radio frequency stage—that is, the first socket in the first can. No change in the circuit is necessary to do this. The tube is placed in the socket—that's all. The —X112 tube in the first socket is responsible for coast to coast reception on the Fenway almost any time of the year.

RADIO WORLD readers who have already constructed the Fenway are urged to use a power tube in the first and last sockets as the results will more than discount the extra filament consumption.

The fellow who is experiencing some difficulty with excessive oscillation on the first tube can eliminate all his trouble by placing another Royalty resistance, type B, on his Fenway. This should be in series with the rotor of the special coupler and the B battery 90 volts. Do you understand this? One side of the Royalty will go to the front end of the coupler (where the shaft comes through to the panel, the other side of the Royalty goes to the plus 90. Naturally, the other side of the coupler still connects to the plate of the first tube. By increasing or decreasing the resistance, regeneration on the first tube is controllable from 35 meters to 600 meters.

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variable grid leak on hand. A glance at the curves shown in Fig. 5 will bring to light the effect of the variable grid leak and bias upon the signal intensity output obtainable with the detector tube. It is very evident that one value of bias is conducive to maximum signal output. In addition the regeneration obtainable with the tube and the position of the regeneration control are governed to a great extent by the value of the grid leak. If the leak is excessively high in ohmic value, regeneration is critical and very unstable. If the grid leak value is too small, regeneration necessary to produce a certain condition will be difficult to obtain. And since the signal intensity is a prime factor in determining the correct value of the leak, it stands to reason that for greatest sensitivity a variable leak or bias is necessary.

Another pertinent item pertaining to leaks is that of the position of the leak. The two possible methods of connecting a grid leak are familiar. Consider A the condenser shunt method and B the grid-filament method. I conducted a series of tests which showed that the method A was superior to that in B over the entire range of grid leak values, and especially when receiving powerful signals and low values of grid leak were employed. The effect of a low value of grid leak directly across the grid and filament, as in B, was increased difficulty of obtaining regeneration in the detector tube. Not that regeneration was impossible, but that it was necessary to advance the regeneration control beyond the point necessary with the A position of the same leak.

Incidentally, the setting of the variable leak will usually vary the tuning of the secondary circuit, and when in the quest of DX stations, accurate resonance in the secondary circuit is imperative. Hence retuning of the secondary circuit when the grid leak is varied may be tried. Another item with respect to retuning of the secondary circuit is that it is necessary when the tickler regeneration system is used.

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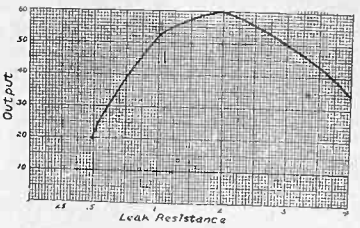

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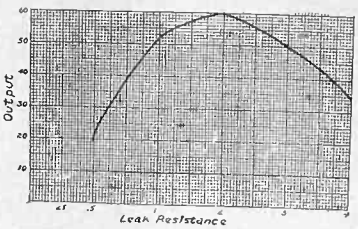

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Another item is the use of a variable bias on the grid of the detector tube. This consideration in the majority of cases is entirely overlooked. This means the use of a fixed leak with a variable bias or a variable leak with a fixed bias. Other methods are illustrated in Fig. 4. Varying the bias on the detector tube will greatly increase sensitivity. The systems A and B in Fig. 4 are preferable if any doubt is entertained as to the efficiency of the

(*Concluded on page 27*)

KILOCYCLE-METER CHART, appeared in RADIO WORLD dated May 1. Sent on receipt of 15c. or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

CHANGES OF ADDRESS

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

Good Back Numbers of RADIO WORLD

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

1925:

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

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

Sept. 19—Diamond of the Air (Part 2), by Herman Bernard. A Tube B Battery Eliminator, by Louis Winner.

Oct. 24—A Phonograph Cabinet Set, by Lewis Winner. The Thoroughbred, by Herbert Hayden (Part 2).

Oct. 31—The 4-Tube Pathfinder, by S. E. Finkelstein. How to Make a Simple Loop, by Herbert E. Hayden.

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

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

Dec. 5—A Toroid RF Set, Using Crystal, by Lewis Winner. The Diamond of the Air (in Text and Diagram), by Herman Bernard.

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

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

1926:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Any copy, 15c. Any 7 copies, $1.00. All these 31 copies for $4.50, or start subscription with any issue. RADIO WORLD, 145 W. 45th St., N. Y. C.

Put Power Tube in First And Last Fenway Sockets

For radio with a certainty of satisfaction the Fenway combination 4 and 9-tube receiver is in a class by itself, says Leo Fenway. "Fenway—for DX" has come to mean more than merely a catch phrase, as thousands of satisfied builders realize. Since its first appearance in RADIO WORLD on February 6, fans have voiced their approval of the circuit, and back numbers of this magazine, containing the entire Fenway data, are in great demand. Fenway blueprints have been sent to all corners of the world.

Mr. Fenway has now come forward and told us that a power tube, of the —X112 variety, should be placed in the first radio frequency stage—that is, the first socket in the first can. No change in the circuit is necessary to do this. The tube is placed in the socket—that's all. The —X112 tube in the first socket is responsible for coast to coast reception on the Fenway almost any time of the year.

RADIO WORLD readers who have already constructed the Fenway are urged to use a power tube in the first and last sockets as the results will more than discount the extra filament consumption.

The fellow who is experiencing some difficulty with excessive oscillation on the first tube can eliminate all his trouble by placing another Royalty resistance, type B, on his Fenway. This should be in series with the rotor of the special coupler and the B battery 90 volts. Do you understand this? One side of the Royalty will go to the front end of the coupler (where the shaft comes through to the panel, the other side of the Royalty goes to the plus 90. Naturally, the other side of the coupler still connects to the plate of the first tube. By increasing or decreasing the resistance, regeneration on the first tube is controllable from 35 meters to 600 meters.

This is quite an advantage.

(*Concluded from page 26*)

variable grid leak on hand. A glance at the curves shown in Fig. 5 will bring to light the effect of the variable grid leak and bias upon the signal intensity output obtainable with the detector tube. It is very evident that one value of bias is conducive to maximum signal output. In addition the regeneration obtainable with the tube and the position of the regeneration control are governed to a great extent by the value of the grid leak. If the leak is excessively high in ohmic value, regeneration is critical and very unstable. If the grid leak value is too small, regeneration necessary to produce a certain condition will be difficult to obtain. And since the signal intensity is a prime factor in determining the correct value of the leak, it stands to reason that for greatest sensitivity a variable leak or bias is necessary.

Another pertinent item pertaining to leaks is that of the position of the leak. The two possible methods of connecting a grid leak are familiar. Consider A the condenser shunt method and B the grid-filament method. I conducted a series of tests which showed that the method A was superior to that in B over the entire range of grid leak values, and especially when receiving powerful signals and low values of grid leak were employed. The effect of a low value of grid leak directly across the grid and filament, as in B, was increased difficulty of obtaining regeneration in the detector tube. Not that regeneration was impossible, but that it was necessary to advance the regeneration control beyond the point necessary with the A position of the same leak.

Incidentally, the setting of the variable leak will usually vary the tuning of the secondary circuit, and when in the quest of DX stations, accurate resonance in the secondary circuit is imperative. Hence retuning of the secondary circuit when the grid leak is varied may be tried. Another item with respect to retuning of the secondary circuit is that it is necessary when the tickler regeneration system is used.

(This concludes a series of these articles on "How to Get DX." The others were written by Capt. Peter V. O'Rourke (April 3 issue) and J. E. Anderson (April 10, 17 and 24 issues).

RADIO UNIVERSITY

(*Concluded from page* 15)

The secondary winding is begun near the hub, then at the 21st turn, the lead is brought through a small hole, not broken though. The primary winding is then wound. The left off portion of the secondary winding is then continued. The under one and over one flap method is used in winding. No. 22 double cotton covered wire is used. The beginnings and the ends of the coil can be brought through small punchings, which can be made in the form. Through the center hub a large hole should be drilled. This is for placing angle irons for mounting the coil on the baseboad, one of which should be placed at right angles to the other. C1 and C2 are both .0005 mfd. variable condensers. R1 is a 10 ohm rheostat. R2 is a ¼ ampere ballast resistor. C3 is a .001 mfd. fixed condenser. CD is a fixed crystal detector. J1 is a single circuit jack. AFT 1 is a low ratio AFT. As to special wiring data. The beginning of the antenna coil, L1, 1, is brought to the ground post. The tap, 3, is brought to the antenna post. The end of this winding is brought to the grid post of the socket and the stationary plates of C1. The end of the primary winding, L2, goes to the plate post on the first socket. The beginning of this coil goes to the B plus 67½ volt post, (B plus 2). The beginning of the secondary winding, L3, goes to the rotary plates of C2, while the end of this winding goes to the stationary plates of C2. C3 is experimental. R1 is a very important control. The low potential side of the of crystal is brought to the P post on the transformer, while the high potential side is brought to the end of the secondary winding, L3 No. C battery is required. Both the variable condenser should tune in step. A .001 mfd. fixed condenser across the output may help to increase the volume or prevent any muffling of the voice, etc. A 7x12 in. panel should be used for mounting the condensers, rheostat, crystal detector and jack. The coils, ballast resistor, sockets and terminal strip should be mounted on a baseboard, 6x11 in.

COMPARISON OF TUBES

The Sodion was an alkalai-metal tube, with an extra filament resistance in the tube itself, and the new Donle has this feature, too. The 5 volts at the terminals are reduced to 1.1 volts at the filament proper. The tube requires no rheostat, nor even grid leak and condenser, although all may be used thereon. Donle claims the Donle tube is the most sensitive detector in the world and exceeds others in statements on the extra RF amplification obtained.

The R. C. A., through its experimental and manufacturing allies, Westinghouse and General Electric, is working on some new dry-cell tubes that will have —01A characteristics, except that the filament voltage is about 3, instead of 5, thus enabling dry cell operation.

The tube market promises competition of an order not previously experienced. The "gyp" tube manufacturers—irresponsible makers of inferior products—disappeared during the past season.

Elmer B. Myers' name is in the tube field with a specialized line of tubes—separate ones for RF, detection and AF—and promises to make things lively, as he is an experienced tube man of a high order. The expiration of the tube patent eased matters up for the independents, including Myers, who, by the way, had been frozen out of the American market on patent grounds, though his tube was made in Canada.

Another phase of the tube situation is the arrival from Germany of David L. Loewe, of the great Loewe-Audion Co., with a tube that is three tubes in one. It consists of a detector and 2-step amplifier, all in one glass envelope, including all wiring and parts, excepting, of course, the tuner. Another multiple tube of his is two steps of resistance coupled RF in one envelope. These tubes he will try to market here, unless he sells the patent rights.

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

CONSTRUCTION OF RADIO PHONE AND TELEGRAPH RECEIVERS by M. B. Sleeper, sent on receipt of 75c. The Columbia Print, 145 W. 45th St., N. Y. C.

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

COMPLETE LIST OF BROADCASTING STATIONS appeared in RADIO WORLD dated May 1. Sent on receipt of 15c, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

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

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

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

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

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

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THE CONTROL OF FEEDBACK, by Barney Feete, appeared in RADIO WORLD dated April 24. Sent on receipt of 15c, or start sub. with that issue. RADIO WORLD, 145 W. 45th St., N. Y. C.

THE AERO ALL-WAVE SET, by Capt. P. V. O'Rourke, appeared in RADIO WORLD dated April 24 and May 1. Sent on receipt of 30c. RADIO WORLD, 145 W. 45th St., N. Y. C.

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

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

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

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Proof of Ionized Layer Convinces British Experts

WASHINGTON.

The British National Committee for Radio-Telegraphy at the recent International Radio-Telegraphy meeting at Washington received direct proof of the existence of an ionized layer in the upper atmosphere.

"The results provide direct experimental proof," says the British National Committee, "in that interference phenomena have been shown to exist both by day and by night, while for the nighttime phenomena it has been proved that the interfering rays come down from the upper atmosphere and do not travel in a horizontal plane.

"The differences observed between day and night phenomena are adequately explained by a theory of diurnal variation, itself based on Larmor's theory, according to which the under-boundary of the deviating layer is higher at night than during the day.

"In connection with the electrical processes by means of which rays are deflected by the layer, mention may be made of the extension of the ionic refraction theories of Eccles and Larmor made by Appleton and by Appleton & Barnett in which the effect of the earth's magnetic field on the phase-velocity of wireless waves is taken into account.

"It is shown that if the negative carriers in the atmosphere are electrons as seems most probable, the formulae for the phase-velocity given by Eccles and Larmor require considerable modification, the terms arising from the recognition of the magnetic field being of importance except in the case of ultra short waves.

"It is found that the atmosphere acts to wireless frequencies as a quartz crystal does to optical frequencies in that there is a rotation of the plane of polarization for transmission along the magnetic field and double refraction for transmission at right angles. In the general case it is found that the ray deviated by the upper atmosphere should be of elliptical polarization, so that we have here a possible theoretical basis for the explanation of direction-finding errors originally advanced by Eckersley and Bellini.

"It may be mentioned that the investigations of Smith-Rose have shown that directional errors are obtained with a vertical transmitting antenna so that the atmosphere must be responsible for the production of abnormal polarization of the waves. Further experiments made by Smith-Rose and Barfield on the Adcock system of direction-finding show that lateral deviation of the waves, such as would be produced by a tilted ionized layer, does not exist so that we must regard the influence of the earth's magnetic field on the properties of the layer as largely responsible for the complex polarization.

"A more detailed investigation of the magneto-ionic theory shows that such complex polarization is produced only when the time between two collisions of an electron and gas molecules is long, so that directional errors should be most pronounced at night when the layer is high and in a region of low pressure."

Proud of Vagabondage

(*Herbert*)

JUNE LEE, called the "Vagabond of the Air," because of her broadcasting from stations on both coasts and in between, is shown wearing her radio log dress. The dress has on it the call letters of all of the stations from which she has broadcast. Miss Lee is in London for a single appearance at 2LO. She is a gifted singer.

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"Drops of water wear away the hardest granite." Even a small advertisement in RADIO WORLD brought to our readers' attention week by week, fifty-two times a year, wears away trade resistance and brings a brand or trade-mark to the buyers' attention so persistently it creates real demand. RADIO WORLD gives you a service that no other publication can, because it is a radio *service* publication.

Fiction magazines of general circulation supply the best fiction; newspapers, even small-town papers, give good radio programs, but only RADIO WORLD gives real weekly radio service information—the newest things in radio, the latest and best hookups, the last word in battery service and elimination, etc. In other words, RADIO WORLD is the only national radio weekly, and its 100,000 weekly fan readers who are constant buyers of radio can give you the biggest result for your advertising dollar.

RADIO WORLD is dated each Saturday, is on the news-stands the previous Wednesday, and closes each Wednesday noon, ten days in advance of date of issue. Results are quicker from RADIO WORLD than any other radio publication. A single inch message can be delivered in RADIO WORLD to the 100,000 people most interested in radio throughout the United States in ten days for ten dollars.

RADIO WORLD gives its advertisers every possible editorial co-operation. The set builder as a rule follows as closely as possible the laboratory models of radio tuned circuits in which the manufacturer's article is specified, and in this way it is constantly creating a demand, and new users for radio parts and accessories.

In regard to factory-made sets, we take various leading sets from week to week, giving full and detailed information regarding each particular set, creating not only a demand for the goods but showing the buyer in advance how to get the best possible results from the set, making the buyer a pleased and satisfied customer that will recommend your set to his friends. To get any real joy out of radio, one should know something about radio. RADIO WORLD fifty-two times a year is putting joy into radio reception by giving useful radio information—nothing else—no programs, no fiction—*just all radio.*

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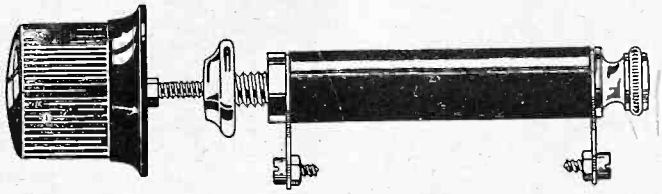

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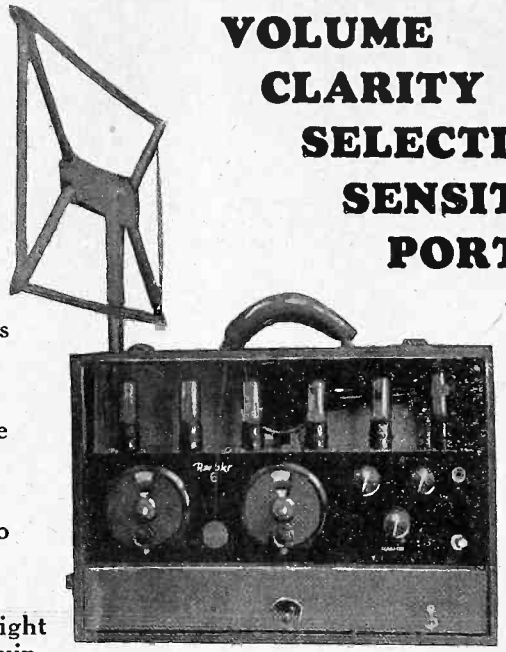

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