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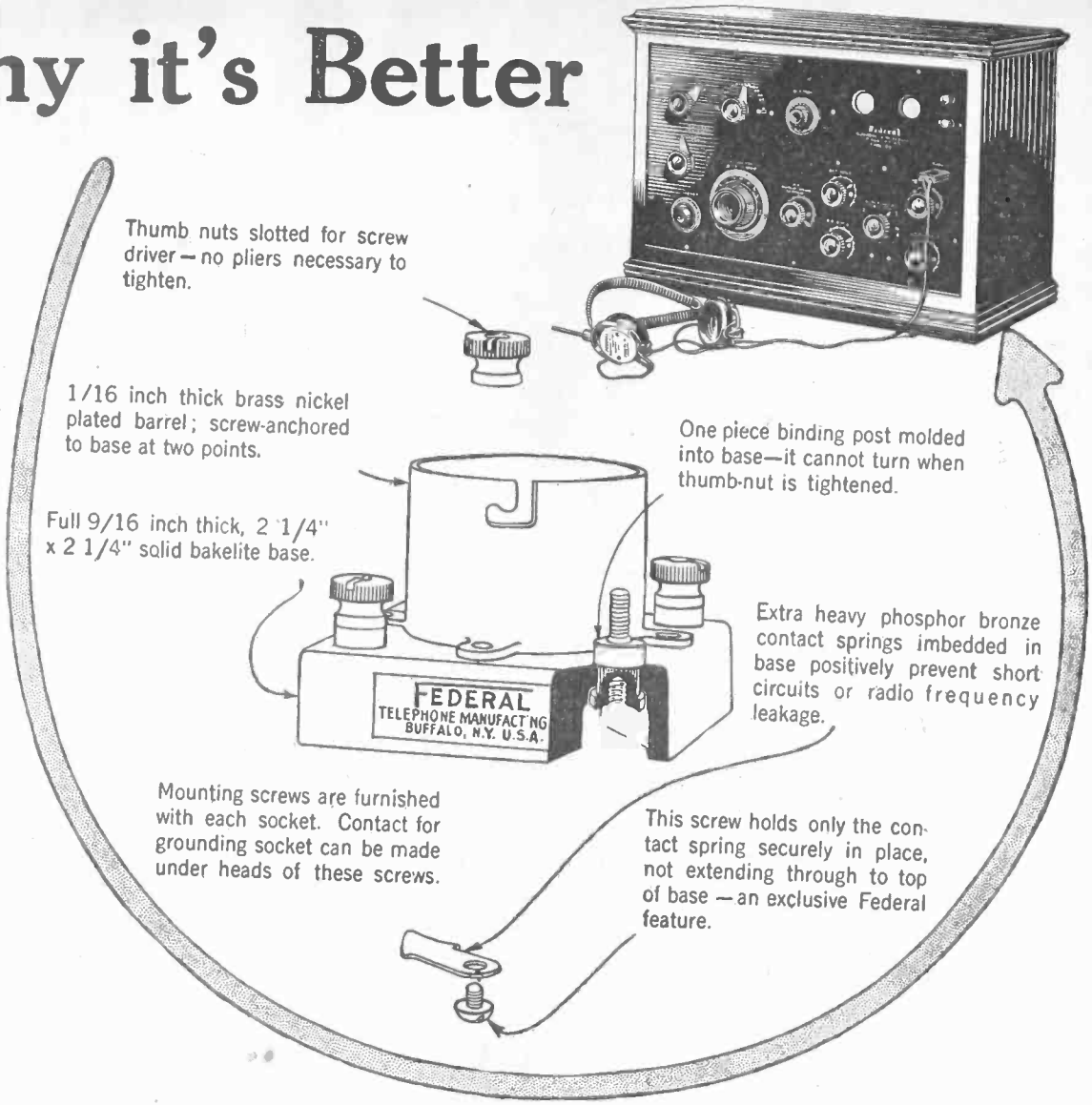

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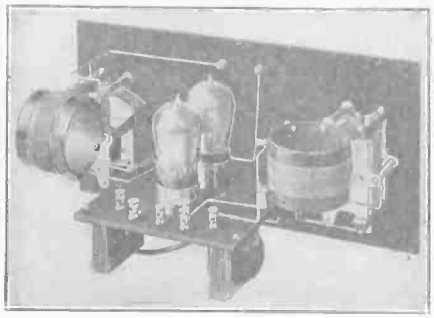

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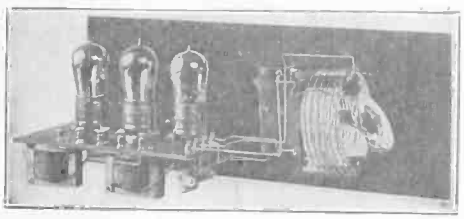

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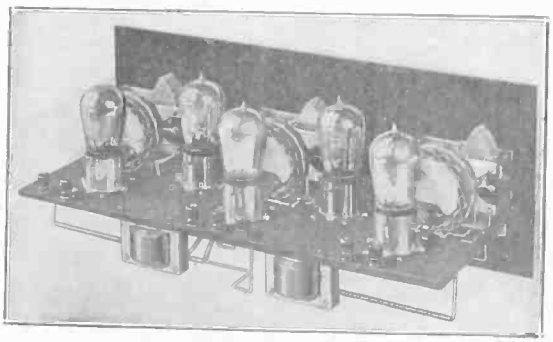

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Reflexing the 3-Circuit Tuner

One RF Stage Successfully Obtained from First Audio Tube of 3-Tube Set

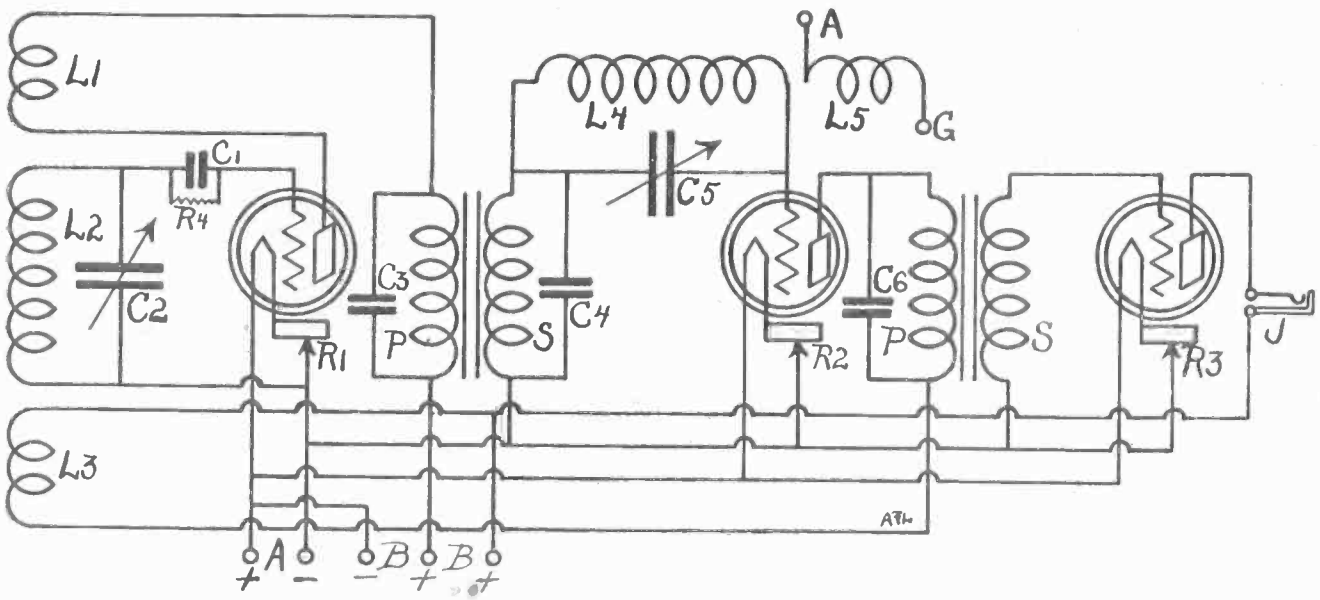


FIG. 1, a regenerative set that will not radiate. The set is comparatively easy to operate as it will not pick up a signal while oscillating, therefore, before tuning is attempted, all oscillations must be checked. There are three controls: secondary, tickler and radio-frequency. L1, L2, L3 are, respectively, the tickler, secondary and primary of a standard 3-circuit variocoupler, the tickler being the rotary coil. L4 is 45 turns of No. 22 SCC wire, wound on a 3" cardboard or bakelite tubing. L5, an untuned primary, is composed of 10 turns wound on the same tubing. It is not necessary radically to change your present 3-circuit tuner to incorporate this non-radiating reflex idea. Merely connect one side of L3, which was formerly the primary of the coupler, to one prong of the jack, the other side to the B+ on the primary of the first AF transformer. The new coil, L4, connects to the G of the secondary of the same AF transformer, the other side to the grid of the second tube. C5, a 23-plate variable condenser, is shunted across L4. L5, the 10-turn coil which is inductively coupled to L4, connects to the aerial and ground.

By Thomas W. Benson

TO overcome the necessity of adding an extra tube to make a regenerative set non-radiating I tried reflexing one stage of the audio amplifier and met with great success.

As will be seen in Fig. 1, all the additional apparatus required is a variable condenser of .0005 mfd. capacity and a small inductance consisting of 45 turns of No. 22 SCC magnet wire wound on a 3" cardboard tubing with no taps. An untuned primary of ten turns of the same wire is wound on the tubing.

The circuit shown depicts a set employing an untuned primary circuit, reflexed. The RF coil and the condenser are connected into the grid lead of the first audio-frequency amplifier tube. The aerial and ground wires are connected to the ten-turn coil on the tube, so the incoming signals are first fed into the amplifier.

The plate circuit of the first audio stage is opened up as shown and the original untuned primary of the set is connected into the plate. By this arrangement the signals are first amplified in the first audio tube and then fed back into the regenerative detector tube, where they are further amplified and detected, thence going through the two stages of audio.

It will be noted that bypass condensers are shown, to permit the radio-frequency currents to pass around instead of through the audio-frequency amplifying transformers. The values of these condensers are usually .001 mfd., but will vary with the transformers, so it is advisable first to try the arrangement without condensers and then to add them as found necessary.

The same principle can be applied to the various types of regenerative receivers. Where a single-circuit regenerator is in use it will be necessary to wind a fixed primary winding on the stator of the variocoupler or other tuning device and to connect the aerial variable condenser across the stator winding. In a standard short-wave receiver with a tuned aerial circuit it is advisable to eliminate the tap switches and use a fixed winding of ten turns in place of the present stator winding on the coupler.

By the above simple changes the range of a set is increased, radiation is effectively checked and selectivity is improved. It is impossible to pick up signals with the set oscillating, so the operator will immediately check the oscillations.

In operating the set it will be found that the amplifier rheostats are very critical. When a quiet condition is reached the rheostats can be left there. The signals can be cleared up nicely by adjusting the tickler and detector filament rheostat.

New Wave Band Revolutionizes Use of Variable Condensers

No Fixed Inductance, Combined Even with a 23-Plate Condenser, Will Cover the Range, Says Expert, Saying 43-Plate Type Is Necessary in a Periodic Priming Circuits—Prophesies the Advent of the 35-Plate Condenser, Which Will Do the Trick, as 43 Plates Introduce Too Much Unused Capacity in the Circuit

By Chester Charlton

THE question of accommodating receivers to the new wavelength band of 200 to 545 meters, decided on by the Third National Radio Conference called by Secretary Hoover, has received the attention of the Bureau of Standards, which suggests the tap switch and aerial condenser method of regulating antenna wavelength. But many experimenters will not care to include tap switches of any kind, and besides many use aperiodic primaries, whereby the antenna wavelength becomes of little importance. The secondary coil is the thing. In cases like the Neutrodyne it would necessitate a tapswitch for each of the two Neutroformers in the radio-frequency stages and for the one in the detector stage.

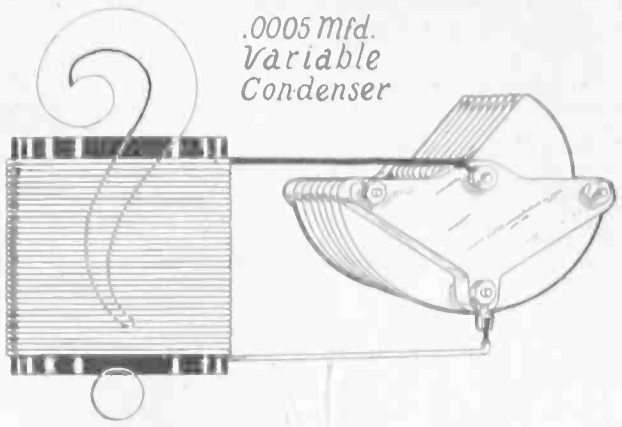
Effect on Manufacturers

Obviously the change in wavelength, which amounts to reducing the minimum to 200 meters, whereas it is now 220 meters, will have a serious effect on manufacturers. In my opinion, the 13, 15 and 17-plate variable condensers, found in Neutrodynes throughout the country, both in manufactured products and in home-made sets, will become a thing of the past, for there is no fixed inductance which, combined with any such condenser, will cover the new band.. Indeed, in most, if not nearly all cases, it cannot be done with 23-plate condensers, including the low-loss ones. That is due both to the distributed capacity that each coil must have, even if it be regarded as minimum, and to the capacity present in the variable condenser when it is at zero dial setting. This sum of the self-capacity of the coil and condenser is added all along the line, it being equivalent to a fixed condenser of that capacity bridged across the coil if the coil-and-condenser self-capacity were actually zero. With an aperiodic primary, which means this is true in the case of every tuned radio-frequency transformer, the inductance is constant and the capacity alone is varied. Hence, with the maximum effective capacity setting of the condenser there is less maximum capacity in the circuit than practical because the zero setting of a condenser that will bring in 545 meters at 95, which is as high a setting as should be used, will not bring in 200 meters, at 5, which is as low a setting as should be used.

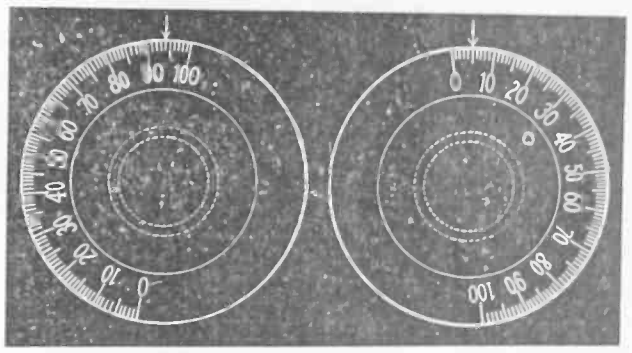
Stations Missed Both Ways

Indeed, still considering the 23-plate or .0005 mfd. variable condenser, even if 545 meters were brought in at a dial setting of 100, the 200-meter stations still would be missed; in fact, about 230 meters is virtually as low as the combination would normally reach. Figured the other way, if the combination at lowest setting bring in 200 meters, then 515 would be the highest wave reached.

The natural conclusion is that variable condensers of higher capacity will have to be employed. The 23-plate condenser, which is the most popular one today, will



WHAT fixed coil with a 23-plate variable condenser will cover the new wave band?



HOW the dial should read for 545 meters (left) and for 200 meters. These readings are approximate.

have to be supplanted for the time being with the 43-plate variable condenser, .001 mfd. capacity, and the inductance reduced. In this way the band can be covered.

Too Much Minimum Capacity

Of course, makeshifts may be used to accomplish the same results in about the same way. One would be the placing of a fixed condenser across the variable, but this will not prove generally satisfactory. The reason is that if you use a fixed condenser that way you will need some switching device for cutting it in and out, else the minimum capacity of the fixed-variable combination will be the minimum capacity of the variable plus the capacity of the fixed condenser. If .00025 mfd. were used for the fixed condenser you would have a minimum capacity of about .000256 mfd. And that does not include the self-capacity of the coil. On the other hand, a 43-plate variable condenser of the low-loss type has about the same minimum self-capacity as a 23-plate condenser.

However, 43 plates is more than would be necessary, hence use of such a condenser would include unused capacity, and the fundamental idea is to favor inductance against capacity. No other course seems open except the introduction of the .00075 mfd. variable condenser. Hence, an invitation is extended to the 35-plate condenser to make its bow.

The correct capacity obtains in the Bruno Ultra-Variable Condenser, which consists of one rotor and four stators, actuated by a single shaft. If three of the sections are connected the correct capacity of .00075 results; the fourth stator is not then used, but if .001 is desired all four are connected.

The World's Simplest Tube Set

Easy to Make, Easier to Tune and Costs $14.25

Only a Single Coil Used, in Conjunction With a Single Dial, Yet the Set Tunes Sharply Enough to Bring in DX and Produces Great Volume.

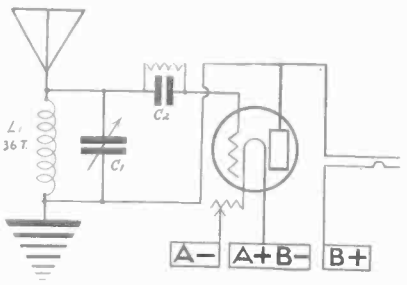
LOW-LOSS APPARATUS USED

By Lieut. Peter V. O'Rourke

[THE RADIO PRIMER]

FOR the person who has never built a tube set it is well to start with the one herewith described, the simplest tube hookup. It cost me $14.25 to build, complete. It is on the Ultra-Audion style, a designation used where the aerial goes to the plate of the tube by a direct wired connection. This lead may be traced in the circuit diagram by noting the aerial, the symbol of which is the triangle, and pursuing this line right through the coil L1, designated by the series of ellipses, and on to one side of the variable condenser C1 and thence to the plate of the tube, symbolized by a parallelogram. This method of connection by uninterrupted wiring is known as conductive coupling. The other methods of coupling are known as inductive, where two coils are placed close to each other without any wired or other metallic connection, and capacitative, where the connection is interrupted by a condenser, fixed or variable, the disjoined wire being connected to the respective sides of the condenser. In the case of both inductive and capacitative coupling the radio currents leap through the small air space. This is something that often confounds beginners. But a realization of the existence of magnetic fields or high-frequency currents about coils and condensers makes possible an understanding of the fact. In the case of a condenser, and also when two coils are close together, these fields, known as flux, intermingle.

In the present circuit, however, no inductive coupling is used. In every case there is a drop in volume when inductive couping is employed, although usually this is accompanied by a gain in selectivity. However, one should not be too eager for selectivity. One should expect just enough of it, not too much of it. Especially must the beginner not concern himself with the construction of a very selective set, for he may encounter distorted reception, and wonder what is the matter. The answer is that a set may be too selective.



THE SIMPLEST 1-tube set in the world. Lieut. O'Rourke describes how to build this set on low-loss lines. The set as he built it cost $14.25, complete, including everything. The circuit is fair for DX but great for volume. It is very easy to tune.

Panel and Assembly

The panel should be 7x7", preferably hard rubber. Draw a line through the middle, parallel with the horizontal, and in the center of the panel drill the hole for the condenser shaft. The two or three holes for the condenser screws will be drilled according to the template furnished by the manufacturer. Under the dial mount the rheostat, which, for the 11 or 12 type tube to be used in this circuit, should be 6 ohms. Be sure that the rheostat is mounted so that when the knob is put on it will not strike the dial of the condenser, and also that a ½" space is left between the bottom of the rheostat, when mounted, and the bottom of the panel. This leaves room for screwing the panel to the baseboard. These precautions can easily be taken by mounting the condenser first, and then holding the rheostat and knob in position to determine the best point for drilling the rheostat shaft. The drilling will be done on a perpendicular line with the condenser shaft hole. To the right of the rheostat, and on a horizontal line with it, mount a single-circuit jack, 1" from the right-hand end of the panel. These three parts—condenser dial, rheostat knob and front of jack—are all that are seen on the front of the panel, the external connections being made from the rear, that is, aerial, ground and batteries.

The coil is mounted on 6x7" baseboard. See Herman Bernard's article in this issue and follow that. The 6" will run along the front and the 7" will constitute the depth of the baseboard. The tube will be mounted near the back of the baseboard, not less than 2" from the back or any other part of the variable condenser. The grid leak, if it is such that renders this advice possible, will be mounted directly on the G post of the socket. Otherwise a wire will be connected to one side of the grid condenser and this wire connected to the socket. The wire at the socket post may simply be looped tight and the socket post nut screwed down hard.

Winding the Coil

Take a piece of wood, 4" square, at least 1" thick, and draw a 3" circle. Mark 15 points on the circumference of the circle, at equal distances. If you are using a pair of dividers or compass, you can determine these points most readily by setting the dividers at ⅝", and measuring off this distance by alternating the points of the divider around the circumference, leaving an identifying point at each stopping place. Thus if a straight line were drawn between each pair of adjacent points on the circumference you would have a 15-sided figure. Now drill a hole at each of the points of the circumference. Into each hole a 4" dowel rod is to be inserted. Therefore drill the hole the diameter of the dowel to be used. Dowel sticks may be purchased in the hardware store in lengths of 3 ft. or so, and easily cut to 4" lengths. They are very inexpensive. Now you will press the dowel sticks into the holes drilled for them. These drill holes, by the way, should not go all the way through the wood, but the drill should be stopped just after it has bored a little more than half way through. As an extra precaution two of the 4" square blocks might be screwed together at the corners, one block atop the other, and thus the drill holes made deeper, facilitating better support for the rods. However, the object is simply to have these rods strictly perpendicular to the base. Do not make the mistake of thinking that this coil will be wound on a form like the spider-web, where the arms that correspond to the rods radiate from a central hub. In the present case, the rods are at right angles to the base, while in the spider-web the arms are on the same plane as the hub, that is, the form is flat.

If the rods of your form do not readily sit upright, then you may apply glue to the drill holes and secure the rods therein. If you let the glue stiffen you will then be able to force the rods into a permanent upright position. Let the glue harden. You will now have a form that may be used over and over again, in conjunction with the making of a low-loss coil. The coil will be removed from the form and still you will have the form left, whereas in the spider-web you can remove the form only by destroying it, the

(*Continued on page 23*)

PACIFIC coast stations have been heard in Washington, D. C., on this 7-tube portable Super-Heterodyne. It is wholly self-contained. Brent Daniel, formally an engineer of the Bureau of Standards, has the honor of being the one who built it. (Harris & Ewig.)

A Set That Covers the New Band of Wavelengths

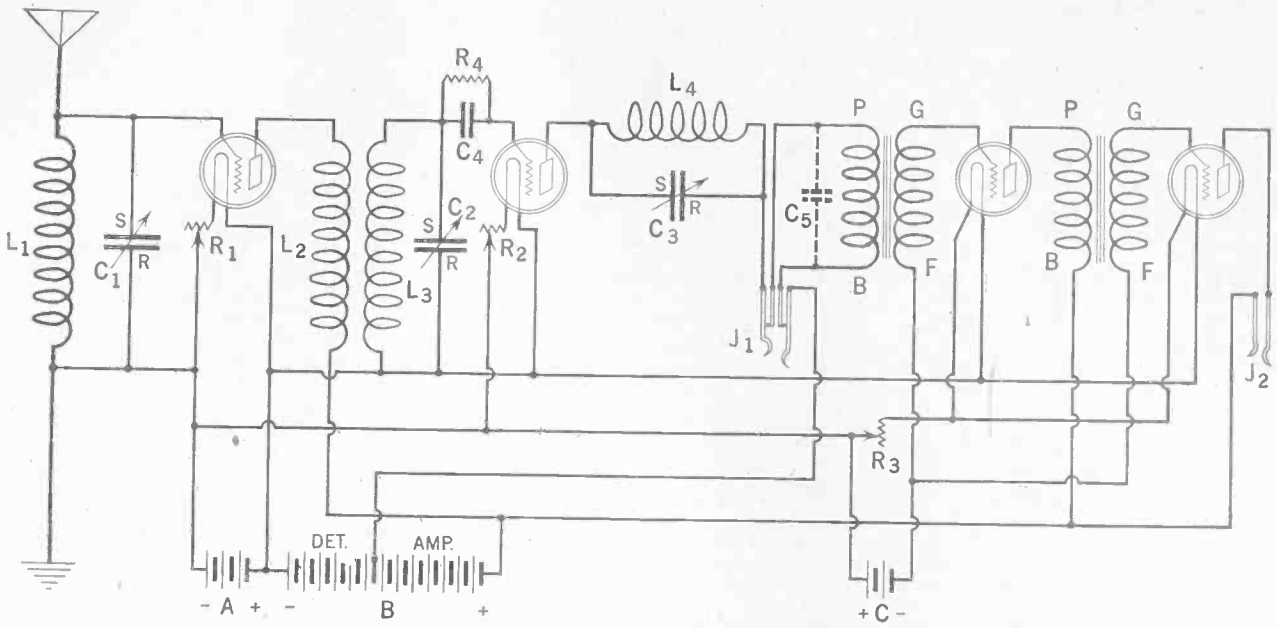


FIG. 1, the wiring diagram of the DX regenerative set preceded by a stage of impedance tuned RF. The fixed condenser C5, which is optional, anyway, preferably should go from the end of the plate coil L4 to B+ amplifier. The condenser may be soldered on the outside leaves of the jack J1.

One Stage of Tuned Impedance RF, Regenerative Detector and Two Audio Stages Comprise 4-Tube, 3-Control Set That Can Be Logged — Fully Explained by a Master of Lucid Exposition of Radio Technique

By Herman Bernard

WHILE the extension of the use of low-loss parts is very recent, the duolateral coil, which is one of the veterans in the radio family, is a low-loss inductance. This is due to the nature of the winding and to the absence of any insulating form to support the coil. The duolateral coil is virtually self-supporting, only the thin shell of cardboard, on the inside, being used, and even this shell may be removed, if desired.

The honeycomb coil is the ancestor of the duolateral coil and is an efficient form of inductance, too, the only difference being that the duolateral coil has a somewhat smaller distributed capacity. This improvement is accomplished by winding the coil so that one layer of turns, instead of being directly on top of the preceding layer, is between turns of the previous layer. Thus one layer of winding is directly over the second preceding layer. The closer relationship existing in the honeycomb variety creates a larger capacity effect, since the turns of wire are like the plates of tiny condensers, the air between wires being the dielectric. By keeping the parallel layers two turns apart (instead of next to each other) the distributed capacity is lowered, just as if the distance between the plates of a condenser were widened, and we have a duolateral coil. Therefore the duolateral coil is preferable. In any case, duolateral or honeycomb, you will have a small, convenient and efficient inductance that makes DX reception easier to get. In fact, in the "old days"—only three years ago, but time seems to travel faster in radio, due to its rapid advance—the three honeycomb set was the most popular. Many are in use today. Results are obtained that equal those obtained from the use of any known form of inductance, no matter how new or how wound.

Avoiding Coil Shifting

But the old-style 3-honeycomb sets usually had mountings in which the coils were placed. By turning knobs or levers one varied the inductive relationship of the coils. One set of coils was used for the lower and mid-wavelength stations and the other set to get stations in the upper range of wavelengths. That necessitated changing coils. Today radio fans do not cherish the idea of shifting coils about. If it was necessary in other days and is necessary today with the demountable type of duolateral coil, it will be still more necessary, if such a thing is possible. The new wavelength band, scheduled to go into effect some time after January 1, will be from 200 to 545 meters, a range of 345 meters. Today the band is from 220 to 546 meters, a range of 326 meters. In other words, the set must have a range of at least 19 meters more than previously. An excellent solution of the problem lies in the use of variable condensers for tuning. That method affords excellent selectivity and also enables one to cover the new wavelength band.

Effect of the RF Stage

The addition of a stage of tuned radio-frequency amplification to the circuit improves the quality of the received signal and also enlarges the possibility of getting distance. Not in every case will the reception of much greater distances result, but at least the DX obtained without the RF will be heard, and with much better quality. Very often in a regenerative set distance reception is rather husky. The RF stage has a clarifying effect upon such signals.

Great volume is obtainable from this circuit, comprising a tuned RF stage, regenerative detector and two stages of audio. The manner in which the RF is incorporated tends greatly to increase volume. Some local stations may be heard on the loudspeaker without any audio amplification whatsoever. This form of RF, consisting of a single coil tuned by a variable condenser, is known as tuned impedance. If a variometer were used instead of this combination it would be the same form of RF. The impedance coil is L1 in Fig. 1. The circuit, as shown in Fig. 1, is selective enough for the needs of probably 95 per cent. of the population of the United States. But for those living only a very few miles from a powerful broadcasting station greater selectivity may be necessary, and how to obtain that will be discussed later in this article. However, the use of impedance RF in this circuit is strongly advised for all those not falling within the class needing greater selectivity, for greater selectivity than that obtained from the circuit in Fig. 1 may be obtained at a sacrifice of quality. A set may tune so sharply that the harmonics of voice and music are attenuated or choked. True resonance requires that the set tune broadly enough to pass not only the carrier wave but also side bands on which the harmonics travel, and that means a latitude of 4,000 cycles. The best manufactured sets take that into consideration with great fidelity.

DX Results Obtained

Just what DX may be obtained depends on local conditions as much as on the set. With the circuit shown in Fig. 1 it was possible to get 800 miles on the loudspeaker under good conditions with reasonable constancy and with good quality. Probably 500 miles is a safe expectation under good conditions. An outdoor aerial should be used, about 80 feet having

Clear DX on 4-Tube Circuit

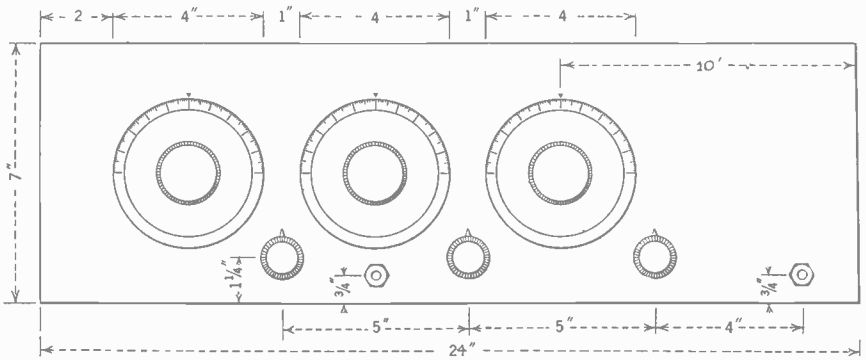


FIG. 2, panel layout. The panel is 7x24" to allow plenty of room so there will be no stray coupling. The rheostat at left controls the RF tube, that in the center the detector tube and the rheostat at right the two audio tubes.

proved excellent, with a 15-foot leadin. But the total leadin and aerial length should not exceed 100 feet. The reasons are that too much volume and extraneous noises will result and the wavelength values will be changed perhaps too greatly and some selectivity lost. The aerial goes right into the grid, and the ground goes to the grid, also, through L1, and that is the best way to get volume. However, in most hookups that do not include RF the aerial-to-grid method would not give sufficient selectivity to separate stations 20 meters apart.

The circuit is shown with two stages of audio-frequency amplification and includes two jacks, a double-circuit one for the detector (earphones) and a single-circuit jack for the last audio stage (loudspeaker). Those desiring only earphone service may construct the set as far as the first jack, J1, and omit the rest.

Simplicity of Construction

The set is very simple to construct. Especially will those who never before built a radio-frequency stage find it inviting. Anybody who has ever built any set can build this one. Aside from the RF stage it is a standard regenerative circuit, with regeneration, obtained from a tuned plate, instead of from inductive feedback from a tickler coil to the grid coil L3. A coil is introduced in the detector plate lead and is tuned by a variable condenser. When the plate inductance-capacity is the same as that to which the grid coil L2 and the RF coil L1 are tuned, regeneration takes place because the resonance in the plate element of the tube causes the similarly resonant grid element to grasp the impulses from the plate. This is capacitative coupling, the grid and plate elements in the tubes functioning as the two plates of a condenser.

The Coils

All the coils used are manufactured products, excepting L2, part of which is home-made. This part is the primary of a radio-frequency transformer. A home-constructed coil is placed inside a 75-turn duolateral coil from which 15 to 17 turns have been removed. Sometimes it is not quite enough to take off 15 turns, 17 or more producing the desired result, but it is safe to take off 15; then, if the set does not tune down low enough, turns may be removed, one at a time, until 200 meters come in fine. From L1 and L4, 50-turn duolateral coils, remove 5 to 7 turns.

Condensers

The three low-loss variable condensers, C1, C2 and C3, are .001 mfd. maximum capacity, normally 43 plates. On the low waves it might be advisable to have vernier on all three condensers, but if one is patient or skillful at tuning this will not be necessary even on the low waves. For the higher wave stations it will never be necessary to use vernier. It is therefore safe to omit vernier but better to include it in all three instances if the somewhat extra cost is not burdensome. If plain condensers are used with vernier adjuncts it is always better to have a vernier dial of the approved style, such as Univernier, Accuratune or A. C. H.

No fixed condensers are required, although if regeneration does not take place satisfactorily a .001 mfd. fixed mica condenser should be connected across the detector output. It is better to place this condenser with one side connected to the end of L4 and the other side to B+ 22½ volts, if the detector plate voltage is that. Fig. 1 shows this fixed condenser so placed that it is in use only when the second audio stage is plugged in. This fixed condenser may be soldered to the outside right-angle and outside spring of the jack for correct placement.

Tubes

The 12 type tube was used in the original circuit with fine results. This tube is an excellent detector and a good amplifier. While it does not amplify as well as the 201A or 301A, it enables operation from dry cells, four 1½-volt dry cells being connected in parallel, that is, all four minus posts on the cells being connected together and all the plus posts connected together. Thus an A plus lead may be taken off any plus post and an A minus lead from any minus post.

Sockets

Any standard socket will work, but use low-loss sockets. These have as much of the insulation removed as is feasible, and insulation is a robber of efficiency and an enemy of DX.

Rheostats

Three rheostats are used, one for the RF stage, one for the detector stage and one for simultaneous control of both audio stages. The two for the RF and detector stages, R1 and R2, should be 6 ohms for the 12 type tubes. The other, R3, should be 3 ohms, but it is next to impossible to buy such, hence 6 ohms may be used, or, if desired, that rheostat may be omitted altogether and in its place a battery switch inserted. This switch would be hooked up just as if it were a rheostat, one side going to the F— post of the two audio tube sockets (extreme right, Fig. 1) and the other side of the switch direct to A— on the battery. The switch should be mounted on the panel instead of the rheostat shown second from right in Fig. 2. Instead of a wire-wound rheostat for R2, in the detector stage, a compression type, such as the Fil-Ko-Stat may be used to advantage. This gives fine regulation of filament heating, and besides the new Fil-Ko-Stat has a battery switch, which would enable both the RF and detector tubes to be turned off by simply pushing the switch. Those deciding to use a battery switch in place of the third (audio) rheostat, as explained, should not mistake the switch on the Fil-Ko-Stat as a substitute for the other switch. The audio switch would simply govern the two audio tubes, while the other switch would be used for the remaining tubes. The rheostat in the RF stage still remains important, for it, like the one in the detector stage, must be nicely adjusted. Once that position is obtained it may be left that way, if a switch is used in the RF and detector stages, the two tubes being lighted simply by pulling the switch. Otherwise, the two rheostats in the RF and detector stages would have to be turned off and the correct adjustment made each time the set is used. This, however, is the work of only a few moments.

C Battery

A C battery is included in the audio stages only. It serves to bias the grids of the two audio tubes. The object is to avoid distortion and reduce the drain on the B batteries. The C battery may have any voltage from about 1½ to 3½ and the voltage in any given case is to be determined by experiment. Try 1½ first. The C battery may be disposed inside the set in any convenient place. Its position is left to the experimenter and hence the C battery is not shown in the assembly plan (Fig. 3). It is important to remember that the A— goes to the F— of both audio tubes, either through the rheostat, or direct, depending on whether switch or rheostat is used, but that the F posts of the two audio transformers connect to C—. The leads from the F— on the sockets do NOT go to C— and the leads from the AFT F posts do NOT go to A—. An extra 1½-volt cell may be used as the C "battery."

Audio Transformers

Both audio transformers may be 5-to-1 ratio. Many experimenters prefer AFT of different ratios, the higher ratio always going in the first audio stage. The original set had two Federal No. 65 audio transformers in it. Those desiring a lower ratio in the second stage, on the theory that distortion may thus be further minimized, may use 3½-to-1 or 3-to-1 there. However, there was no distortion in the original set.

B Batteries

Two 45-volt B batteries are used. They are connected with the minus of one to the plus of the other. The voltages then vary upward (counting from the battery whose minus is unconnected), as indicated on the battery. On the next battery add 45 to the voltage reading on the binding posts of that battery. For the three amplifier tubes—one radio-frequency and two audio-frequency—try voltages from 45 to 90. In the original set 90 worked best on the plate of the RF tube and 67½ on the plates of the AF tubes. The higher the amplifier B voltage, the higher the C battery voltage.

Making the RF Transformer

Remove 15 turns from the primary of a 75-turn duolateral coil. This is done by breaking the sealing wax and pulling the turns off the coil. Hold the coil firmly, lest other turns spring loose, for you will find it impossible properly to restore turns that come off that way. After the twelve turns are unwound leave 5" of the excess for connection later, then cut the wire and tie a piece of string firmly around the winding to hold the winding in place. Now get a form of slightly smaller diameter than the inside diameter of the duolateral coil. A small vaseline bottle, about 1¾" diameter, is just the thing. See that the outside of the bottle is perfectly clean;

Bernard's Set for Great Volume

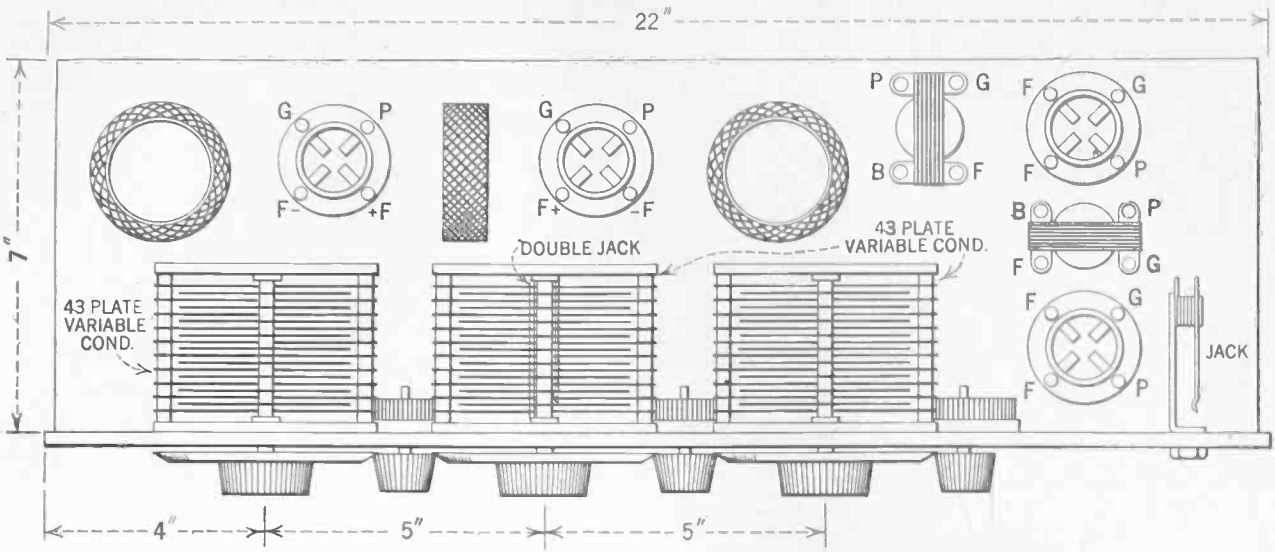


FIG. 3, constructional layout. The baseboard is 7x22". The audio transformers are mounted at right angles. The coil at left is L1 and the next coil, at right angles to it, is L2L3, which couples the RF stage to the detector. L4, the plate coil, is between the detector tube socket and the first stage AFT.

cut five or six ¼" wide lengths of adhesive tape, about 5" long, and lay them on the outside of the bottle, gummy side up, and equally distributed around the circumference, also parallel to one another. Now wind L2, leaving 5" excess wire for later connection. It makes no difference in what direction you wind this wire. After all except a new 5" excess is wound, turn the tape back on the winding. This is done first with the part of the tape at one end of the bottle or other form. These strips will greatly overlap the coil. Cut the tape at the far end of the coil. Then turn back the remaining strips and cut them so that they, too, just go to the end of the winding. Thus the gummy side of the second strip ends may be pressed firmly against the uncoated sides, and in this way the coil is kept together. It is then inserted in the hollow of the duolateral coil and four or five lengths of twine further secure the two coils. The twine is passed through the inside of the coils and back to the outside, where it is knotted and cut. The operation is repeated until four or five such tie-strings are evenly distributed around the circumference. This makes a mighty good radio-frequency transformer for use on any circuit and may even be used with a 23-plate condenser, although in that case the entire new wavelength band could not be covered without the use of some switching device in conjunction with a loading coil or an extra condenser.

Mounting the Coils

Factory made mountings for duolateral or honeycomb coils may be used. These mountings are for baseboard service. They must not be confused with the variable mountings so popular in other days, and which normally were mounted on the panel. If the constructor desires to make his own mountings, the following advice may be followed:

Cut six strips of hard rubber or fiber or dry wood, 3" long by ¼ or ½" thick. Measuring ½" from the top of two of these, bore a hole. The size of this hole will depend on the size of screw to be used in fastening two strips together. Usually 3/16 will be correct. Drill also holes the same distance from the bottom of these two strips. Through each pair of holes pass a 1" long machine screw. Satisfied that the screws pass the holes, remove the screws. Now place a duolateral coil between two strips. Pass a screw through a hole in one of the brass angles and through a pair of holes in the two strips. Put a nut at the end of this screw. Insert a screw through the top holes. Put a nut on the screw. Now tighten both nuts. Another nut may be placed on each screw to serve as a lock-nut, but that is not vital. The brass angle may be mounted on the baseboard with a woodscrew. Repeat the operation for the two other coils.

It is advisable to place one of the coils at right angles to two others, to reduce interplay of radio currents among them. This is easily accomplished by placing the detector circuit coil (L2L3) at right angles to the others, all that is necessary being an extra brass angle. This brass angle is mounted on the baseboard in the usual style and to it the brass angle helping support the coil is fastened. The process of fastening the coil's brass angle to another brass angle, instead of directly to the baseboard, leaves the coil mounted perpendicular to the baseboard, instead of parallel with it. The coil mounted perpendicular to the baseboard is the radio-frequency transformer including the home-made primary. In this instance, although it is an RFT, it is used to couple the RF circuit to the detector circuit.

Another method is to clamp the coil in between the strips with the coil at right angles to the baseboard.

Grid Leak

A variable grid leak is advisable, because in a regenerative set the leak must be just right for best results and an easy way to determine this resistance is by adjusting a leak until the right value is found.

Grid Condenser

A capacity of .00025 mfd. for the grid condenser is normally correct, although some advantage may be gained by getting a variable grid condenser and, after finding the best capacity, leaving the setting at that point permanently.

Panel and Assembly

Use Fig. 2 as your guide. Take a sheet of paper the size of the panel, 7x24", and mark just where holes are to be drilled for mounting condensers, jacks and rheostats. Paste templates for drill holes for condenser mounting right on the piece of paper you are using. Be careful, however, that the centers for condenser shafts correspond on the manufacturer's template and your own panel template. Then drill the panel and mount the parts that go on it. Distance should be measured between centers.

Fig. 3 shows the assembly, except for the C battery, which may be placed where you prefer. No terminal strip is shown. This is a strip of insulation, about 1x7", on which are binding posts and lugs, the leads from the set to be soldered to the lugs, and the external connections—aerial, ground and batteries—being made to the corresponding binding posts on the strip. Those desiring such a strip may include it, but I brought the leads through bushing-protected holes drilled in the cabinet, and fastened the external leads direct to wires or posts in the set. The ground was connected outside the set, direct to A— on the battery. The B battery leads were brought right out to proper places on the batteries, leaving only the aerial to be fastened to L1 with a Fahnestock clip. The B 22½-volt lead was brought from the B post of the first AFT to the battery.

Wiring Directions

1. Connect the A— to one side of the rheostat R1, the other side of the rheostat going to the F— post on the first socket (extreme left). This is the post behind which is the G socket post; that is, both are on the same side of the socket. This is the RF rheostat. Connect A— from battery to one side of R2, the other side of R2 going to the F— post of the second socket from left in Fig. 1. This is the detector rheostat. The A—, again from the battery, goes to one side of R3, the rheostat controlling both audio tubes, or, if a switch is used here, to one side of the switch. The other side of this rheostat (or switch) goes to the F— posts of both audio sockets (the two at right in Fig. 1). The F+ in every case goes direct from the A+ to the F+ posts of the four sockets. That completes the A battery wiring, except for the F posts of the audio transformers, which will be covered later, because they involve the introduction of the C battery, and mistaken connections as between F— on sockets and C— to transformers will thus be avoided.

2. Connect the aerial to the beginning of L1. This is the single coil at left in Figs. 1 and 3. This lead goes also to the stator of variable condenser C1 and to the grid of the first tube. The grid post is marked G on the socket. The beginning of L1, or any other duolateral or honeycomb coil, is that lead which emerges from under the winding. The

(*Continued on page* 21)

RF Sets Got Europe in Tests

THE trans-Atlantic tests during International Radio Week proved fairly successful. Hundreds of sets in the United States and Canada picked up at least part of test programs broadcast from Great Britain, Madrid, Mexico City and other radio centers. In the great majority of cases at least one stage of tuned radio-frequency amplification was used by the successful endeavorers. Where one tube alone was used on the detector side of the circuit, with no RF ahead of the detector, there were few instances of actual reception, and in those few cases regeneration was used and had to be so strong that the signals were almost unintelligible, even the music. Thus the tests were at least a lesson to DX hunters that they should incorporate at least one stage of tuned RF ahead of a regenerative detector, or have a regenerative RF stage ahead of a non-regenerative detector. It is impractical to add more than one stage of RF to where regeneration is employed in RF or detector.

Due to the foreign stations using only their accustomed power the trans-Atlantic tests were not so successful as they might have been.

On the whole, the American stations observed quite faithfully the promise to get off the air by 11 p. m. so that the hunters for the foreign game might have a chance. In the few cases where competitive domestic broadcasting was the source of interference small stations were the offenders.

Two of the seven nights were good for DX reception, the five others either fair or poor. Toward the end of the week the atmospheric conditions were bothersome.

In no case was the reception reported as excellent. The most common complaint from those who actually heard foreign stations (even when the announcer spoke English) was that they could not distinguish any of his words, else caught only a few of them. The tests, however, spurred on the interest in radio, and were thrilling. The great majority of those attempting to hear stations aroad were disappointed, but it was not to be expected that a great proportion of attempters would have their efforts crowned with success. The tests merely were corroborative evidence of the gaining possibilities of extreme DX, and suggested that greater power, rather than any radical improvement in present-day receivers, would be the ultimate solution even of round-the-world reception.

On each evening of International Radio Week, from 10 to 11, Eastern Standard Time, North American broadcasters broadcast special programs for the benefit of European listeners, during which period European stations remained silent. The North American broadcasters include 44 stations in Canada, practically all of the stations in the United States, the four Mexican stations and those in Cuba and Porto Rico. Nine big stations on the European Continent broadcast special programs in several different languages for a different hour for the American listeners-in. The European program was broadcast by stations of the British Broadcasting Company, who alternated with the Continental stations throughout the remainder of the test week.

Foreign stations broadcasting were:

Brussels, SBR; Paris (Petit Parisien); Hamburg; Madrid, PTT; Berlin, Vox Haus; Rome, IRO; Lyons, France, PTT; Radio Paris, SFR; Eiffel Tower, FL.

British stations:

Sheffield, 6FL; Liverpool, 6LV; Edinburgh, 2EH; Plymouth, 2PY; Leeds, 2LS; Cardiff, 5WA; London, 2LO; Manchester, 2ZY; Bournemouth, 6BM; Newcastle, 5NO; Glasgow, 5SC; Birmingham, 5IT; Aberdeen, 2PD; Chelmsford, 5XX.

Listeners in this country who heard any of the foreign programs were asked to write, telephone or telegraph to RADIO WORLD, which was official listening station 00616.

The idea of an International Radio Week was the outgrowth of National Radio Week, first recommended by RADIO WORLD two years ago. The RADIO WORLD idea was adopted. Soon radio advanced to such a stage that international tests became possible.

"Radio Broadcast," through its managing editor, Arthur H. Lynch, co-operating with "Wireless World," London, arranged this year's tests.

ARMY sets heard Europe during the international tests. Photo shows night scene at Mitchel Field, N. Y. The 5th Observation Squad, Air Service, is busy trying to tune in 2LO. The sets, on motor trucks, did very well. Signals came in clearly. (Foto Topics.)

THE NEW high-wave experimental station of the British Broadcasting Co., call letters 5XX, uses the above cage aerial. The station, at Chelmsford, tried to transmit to America during the tests.

Radio Cross-Word Puzzle

Send your solution to Radio Cross-Word Puzzle Editor, RADIO WORLD, 1493 Broadway, New York City. The names of those sending the correct solution will be published.

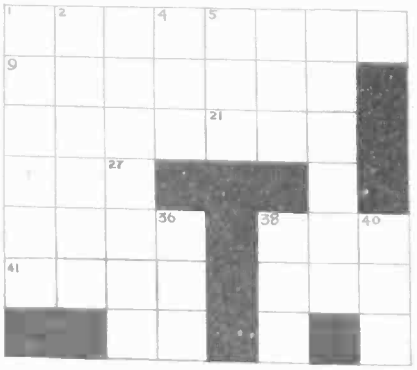
RADIO CROSS-WORD PUZZLE NO. 3

Horizontal

1. Used across a .00025 fixed condenser.
9. To diffuse energy in the ether.
21. The form of the most commonly used connecting wire.
38. The prefix of an adjustable type of crystal detector.
41. A tuning adjunct.

Vertical

1. The aerial's return.
2. What we're all deeply interested in.
4. What we hear when we wire wrongly.
5. Colloquialism for laboratory.
27. Coil to boost wavelength.
36. Those who should have sets.
38. Receptacle containing a crystal.
40. Covering on some copper wire, e. g., bus bar.



PUZZLE No. 3 (above).

ANSWER to Puzzle No. 2.

Why Fans Favor Superdyne

THE Superdyne, like most other sets, is sometimes rather a difficult set to handle, but the most trouble seems to be in the construction. For the beginner this is especially true.

My set was for experimental use and was made of table-mounting parts.

Fig. 1 is the circuit, there being no amplifier, but one could be easily added in the usual way. L_1, L_2 and L_4 are the tuning controls, L_3 is the oscillation controls, L_1, L_2 and L_3 are made of an old coupler, 180 degrees preferred. Remove all of the wire and wind 50 turns of No. 22 D. S. C. wire around the stator, taps being taken off at the 30th, 40th and 50th turns. Wind a strip of empire cloth or paper over the 50 just wound and wind 10 turns of the same wire on this. Then the primary and secondary are wound. L_4 is the plate coil, which is made by winding 40 turns of the same wire used before on a bakelite tube 3 inches in diameter and 2 inches long, two taps being taken off, one at the 30th and one at the 40th turn. L_3 is wound on the rotor of the coupler with 35 turns of the same wire used before.

C_1 and C_2 are .0005 low loss condensers, R_1 and R_2 can be either the fixed or the variable resistances and must be matched for the tubes that they were intended for to get the best results. R_3 is the tubular type of grid leak, 2 megohms.

By putting this set on a 7x21 inch panel and mounting the coupler, tuning condenser and plate condenser in a row and having the two rheostat dials on the end the set will look the same as a neutrodyne.

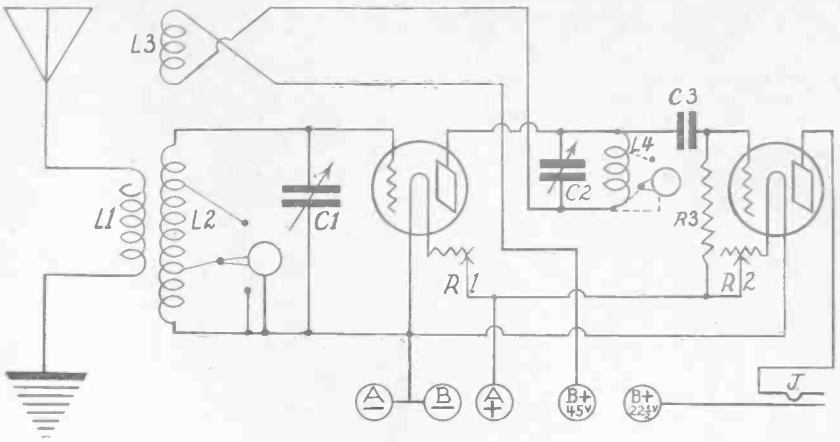
The results obtained from this set are exceptional in volume. It is as loud as any "Super Het." and as selective as is desirable for any set. I would recommend this set to any one who is building a set.

CYRIL E. RECHE,
Big Pine, Cal.

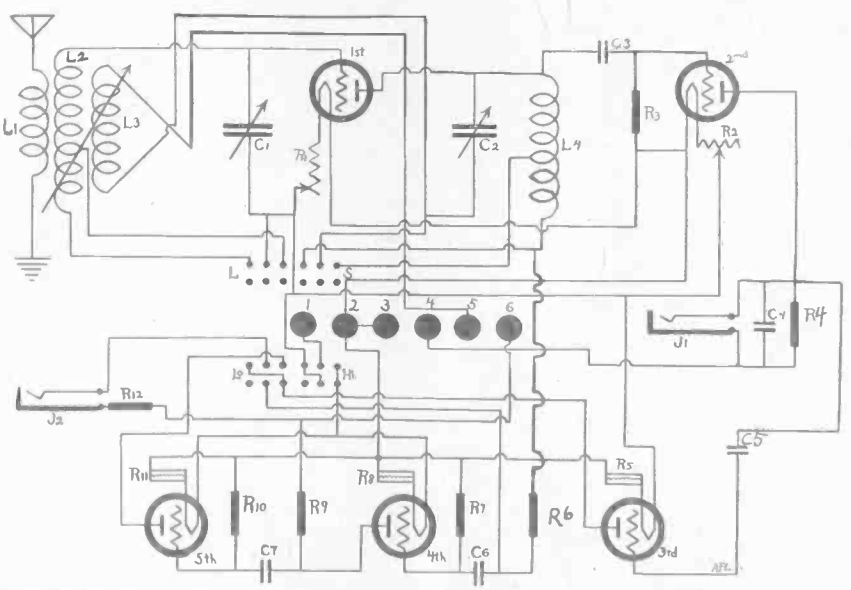
* * *

I NOTE in RADIO WORLD that some favor the Neutrodyne over the Superdyne. I have a 4-tube superdyne that I have built from the hookup published in RADIO WORLD using the low loss condensers and low loss coils in the 5-tube set. It will positively outwork any neutrodyne ever built for DX work, clearness, volume, selectivity or anything else. Recently I received the church services from KGO, Oakland, Cal., loud enough to be heard through four rooms of the house, also the program from KHJ, Los Angeles, also CKY, of Winnipeg, and about 35 others from Texas to Vancouver. These stations are positively all tuned in on the loud speaker and I am ready to make anyone a present of the set if I fail to get the Pacific coast stations any night. The superdyne is by far the finest set built for the number of tubes used. For the past three years I have built over 300 sets, of all makes, including the super-heterodyne, of which I have a very fine 8-tube set. When one states that the superdyne is more critical to tune he is right, but it is worth it. My set is so well balanced that it will tune with the two condenser dials at the same setting. The tickler dial is always used at 68 or 70. For instance, to tune in KGO I set my first dial at 68, second dial at 13 and the third dial at 13, so you will see that the tuning is about as simple as a single circuit set. WGY comes in at 68-24-24, KHJ at 70-27½-27½. WGR at 68-12½-12½ only ½ degree on the dial. I worked KGO with WGR only ½ degree on the dial and could completely eliminate WGR. Try this on the neutrodyne. I can give you volume to fill a large dance hall and show no distortion and it comes out like the morning dew.

C. W. FLOWER,
Richmond (Lenox P. O.) Mich.



THE SUPERDYNE as built by Cyril E. Reche, Big Pine, Cal., the grid coil (L2) being tapped, as well as the plate coil (L4).



CIRCUIT DIAGRAM of the 5-tube Superdyne, including three stages of resistance-coupled audio-frequency amplification. The wiring conforms to that used in a set operated in Detroit, from which point California was brought in on a speaker. The battery side of R6 goes to amplifier B+, while the condenser C5 bridges the grid of the third tube and the detector plate.

"The Cat's Meow" He Calls His Set

RESULTS EDITOR:

I HAVE built the Superdyne as described in RADIO WORLD last August, making two changes, and this set is the cat's meow. Stations that I never heard before on any other set came in on roller bearings, including California, Winnipeg and other Canadian stations which are claimed to be so hard to get in this section. The volume and clearness are wonderful. I made my own coils and used General Instrument Corporation no-loss variable condensers, with Accuratune micrometer control dials, both of which I think are the last word in condensers and dials. Using the best of parts the low-loss Superdyne, when tuned carefully, is a wonderful set.

I believe that the diagram as originally published will not produce these results, but to remedy this, R6 should go to the 90-volt lead instead of to the positive filament, and C5 should go to the plate side of R4, and not to the battery side.

FREDERICK CROSSLEY,
8 Brighton Ave.,
Detroit, Mich.

Low-Loss from the Ground Up

By Charles H. M. White
Consulting Engineer.

ON a casual glance through the pages of a radio magazine we see advertisements speaking of various low-loss parts.

CHARLES H. M. WHITE

The demand for low-loss parts and equipment is large and is growing all the time. The field is extensive already.

Indeed there are low-loss parts for every piece of apparatus that goes into a set. "Why so much low-loss talk?" asks the average radio fan who has been content with the apparatus he has been using during the past year. Now stop to consider the amount of radio-frequency energy that is collected on even the most efficient outdoor aerial. It at once becomes apparent that conservatism of this minute amount of energy is very imperative. Just to give an example of the diminution of energy in even telephone transmission, which is directional and not broadcast, let us take for example a telephone conversation from New York City to Denver Colorado. Now if we draw a picture of the energy received at Denver to the scale of one foot, then the energy input at New York City to get audibility at Denver would be fourteen miles high in proportion. Of course this is assuming that no repeaters or voice amplifiers are used. Now in radio this diminuation is many times more because the energy is being sent out almost equally in all directions through the ether. Hence it is obvious that even a small leak of energy is serious in the reception of distant stations.

Low-Loss Aerial and Ground

The energy collected by the aerial is proportional to the height and length of the entire aerial system. The higher the aerial, the more energy collected. But a high or very efficient aerial is of little avail if it is not properly insulated. The antenna insulating system should be complete to the aerial post of the set. Many radio fans will use a good grade of porcelain or glass aerial insulators and then run the lead-in wire over the cornice of the roof uninsulated except for the covering that might be on the wire itself. This wire should be insulated by means of porcelain or glass stand-off insulators to prevent it from coming too near the roof and walls. Then again to make an aerial low-loss it should be prevented from swinging in the wind. As the aerial is metallic and therefor subject to expansion and contraction due to temperature changes from summer to winter, some form of slack take-up device should be employed, otherwise the wire would become too slack or too tight. The best device I have seen for this purpose is a little spring called an aerial tensionator (made by R. Mitchell & Co., Boston). This simple little weatherproof spring keeps your aerial tight and straight summer and winter and prevents serious "fading" or signal absorption through swinging. Another point of aerial loss is to bring the lead-in wire through the window to the aerial terminal on the set. In many cases the wire is just run in without any attempted insulation and when the window sill becomes moist the signal loss is very great. The most convenient insulations for this purpose are the little window lead-in strips, the best type being one of the standard porcelain or glass lead-in insulators which come directly through the roof or window pane.

After reaching the receiver the signal encounters many paths for loss before detection, one being the condensers used in tuning. The plates of a variable air condenser are the source of various lines or fields of electrostatic energy and the directional path of this field is at right angles to the plane of the plates, or, in other words, along the direction of the condenser shaft. Any insulation that is in the path of these electrostatic lines of force causes a loss, therefore a condenser with end plates made of some insulating compound absorbs valuable signal energy from the condenser plates, thereby causing less signal energy for detection and much broader tuning. To solve this problem the low-loss condenser has been designed. This condenser has metal end plates known as grounded rotor construction and has the stator plates insulated by thin strips of some insulating material placed as far as possible away from the shaft of the condenser, which is the dense center of the electrostatic field. Some designers have refined this even still further by the use of special low-loss insulating materials such as pyrex glass, quartz and isolantite, thereby bringing the losses as close to zero as possible.

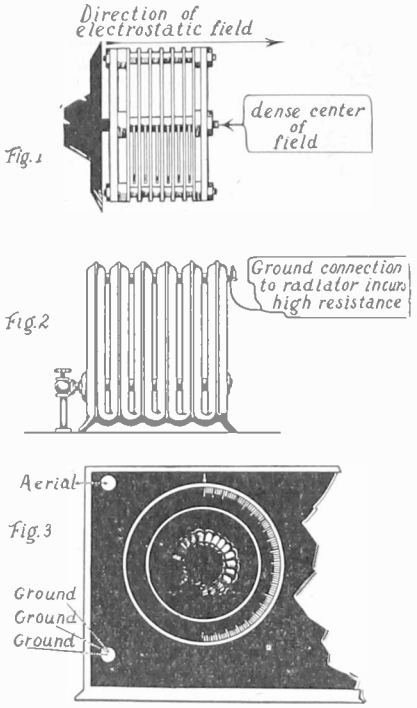


FIG. 1, showing the direction of the electrostatic field, which should be free of metallic or other external "parasite" substances. FIG. 2 shows a radiator ground which is high-resistance, hence not low-loss. Several different ground connections may be used (Fig. 3) and if all of them are good a wonderful improvement in DX and quality may be expected.

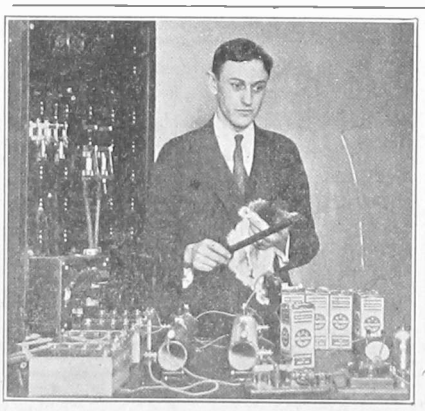
Litz in Glass Advised

The coils are the next sourse of loss. Similarly the center of a coil is the center of an electromagnetic field which causes signal energy absorption if an imperfect support is used for the coil, or if metal lies in the direct path. An insulating coil support as free from metallic conduction as possible must be used for the coil. Some use air-insulated coils, such as spider-web or honeycomb coils, which are self-supporting; that is, they are not wound on a tubing. The next thing to this in efficiency is the use of Litz wire on a low-loss insulator, such as pyrex glass or isolantite. Of course air is the lowest-loss insulator, therefore a coil of Litz wire of the honeycomb self-supporting type would be the best possible construction scientifically, but not the most feasible, since it would tune too sharply to give good quality reproduction. There is even a limit in how low to make the losses for practical work.

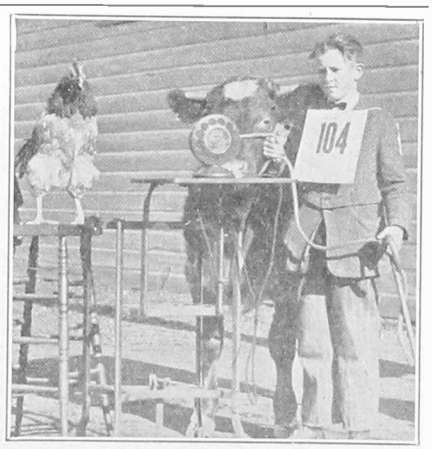
The next source of loss are the tube sockets. These are indeed the most overlooked item in a receiver. First of all, good insulating material must be used, otherwise there will be leakage from grid to filament. Next is the quality of the contact points. Since this is a pressure contact, a good hard pressure should be exerted against the tips of the tube, some designers advocating a side pressure on the tube prong as well as a bottom pressure. In my mind the best would be an upward pressure, using sterling silver as one contact surface. This would prevent ageing of the contact surface, since silver oxide is a conductor of electricity and is the only oxide that possesses such a valuable property.

Use Several Grounds

Last, but not least in the path of radio-frequency losses in a typical receiver, is the type of ground connection. A poor ground, such as a radiator, means a high resistance for the radio-frequency currents to ground, therefore a loss in energy. The best possible ground is a cold water pipe with the ground connection made as close to where the pipe enters the ground as possible. There is no harm incurred by having more than one ground on your receiver. In fact, the more the better. I know of several cases where as many as ten different grounds have been used to great advantage. Not only does a poor ground mean less distance, but also means poorer quality on the local reception. Try more grounds on your set.



PROF. H. H. SHELDON, N. Y. University, who is trying to convert quicksilver into gold at least can generate electric current by rubbing cat's fur. (Kadel & Herbert.)



YOU can lead a cow to the microphone, but you can't make her talk. (Fotograms.)

800 Miles on a Loudspeaker

Three Controls in 3-Tube Set That Has Great Sensitivity —Primary and Secondary Coils Are Spider Webs, While Split Variometer Is Used for Regeneration.

By Abner J. Gelula

HERE is an ultra-selective circuit. Every part of the detector circuit is controlled. C1 controls the wavelength. C2 cares for the secondary resonance. L4, a split variometer, controls the regeneration or feedback.

When splitting the variometer it is necessary to break the connection between the rotor and the stator. There are two ways in which this connection is made: by friction contact or by a pig tail, a direct wire connection of the rotor with the stator. First determine what type variometer you have.

With the friction-contact type it is necessary to remove the front plate. This is easily done by merely unscrewing. Under the plate a wire will be found. This wire must be insulated from the plate that you have just removed. After the wire has been insulated, preferably by means of a piece of empire tubing, bring the wire out past the plate, as this will be one of the stator connections. Replace the plate.

If the connection is pig-tailed it greatly simplifies matters. Merely cut the connection in the center and you will have the four connections necessary for the split-variometer, the two original terminals and the two resulting from the clipping of the pig-tail connection.

We combine the ease of control of the two-circuit tuner with the sensitivity and selectivity of the three-circuit tuner. The circuit has three controls.

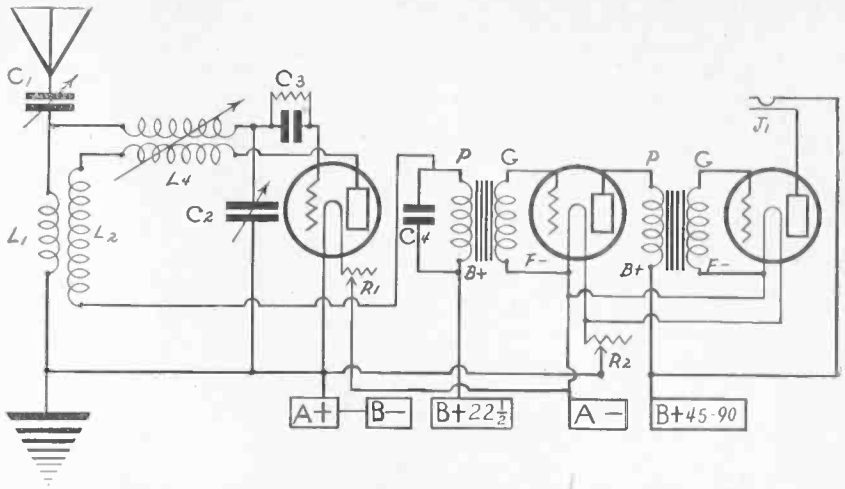
Unless you can tune correctly, or are willing to learn, do not attempt to build this outfit. It is comparatively difficult to tune, being a three-circuit regenerative circuit. The circuit requires no more dexterity to get distance than locals.

The set is particularly fine, in the order named for, sensitivity, selectivity, volume, tone and ease of control.

L1 and L2 are two spider-web wound coils; L1, 10 turns; L2, 30 turns. Use No. 20 double cotton-covered wire. All windings are in the same direction. C1 is a 43-plate variable condenser, C2 a 23-plate variable condenser. The standard .00025 grid condenser (C3) with the 2-megohm leak is used. C4 is a .001 fixed condenser. For the first stage of audio, the transformer should have a ratio of 5 or 6-to-1; second stage 3½-to-1.

Type 201A or 199 tubes may be used throughout; a 200 may be used for detector with increased sensitivity, but lowered stability.

On a 50-foot aerial, water-pipe ground, I received WOC, Davenport, Ia., at New York City, on a loud speaker, clear, for 45 minutes while locals were on the air. I was able to cut out WOR at 400 meters, and receive PWX, Cuba, with but slight interference from WOR. KSD, St. Louis, I can receive almost any evening. In short, this set is all that the heart of a DX man could ask for.



A DX CIRCUIT that has three controls, one for primary, one secondary and one tickler. The feature of this circuit is its extreme selectivity. L4 is a split variometer. If hard tubes are used throughout, experiment with the detector B battery voltage until the proper voltage is obtained. It may even be necessary to use as high a voltage as 45 for proper detection. If a 200 is used, no higher than 22 volts should be applied.

NEW 5-TUBE RADIO FREQUENCY RECEIVER

A new radio receiver is being put out by the Gluck Radio Mfg. Co., of 115 West 23rd St., New York City. It is called the "Gluckson" and is having a remarkable sale among fans. Simple in tuning and highly selective, it is a 5-tube tuned radio receiver, guaranteed not to oscillate, as it is stabilized. It is made of highest grade parts enclosed in an artistically designed closed desk type cabinet. Its tone quality, selectivity, volume and range compare very favorably with some receivers selling at considerably more.

Photos Transmitted Across Atlantic

ONE evening in February, 1923, the Static Club, an organization of radio officials, gave a dinner in honor of General James G. Harbord, president of the Radio Corporation of America. At the dinner Owen D. Young, chairman of the board, said:

"The day is not far distant when a man will press a button in London, and zip! the front page of a London newspaper will be flashed, photograph-like, across the ocean by radio, for me to read at my breakfast."

A friendly retort was flashed across the table by one of the engineers present:

"Mighty easy for a man not hampered with engineering facts to make such a suggestion."

Every one enjoyed the "joke" except two men, General Harbord and E. F. W. Alexanderson, engineer of the Radio Corporation.

Upon meeting next morning General Harbord broached the subject again saying:

"It can be done. How long before we can transmit pictures by radio?"

The Promise Fulfilled

Alexanderson replied:

"In one week I'll know; in one month you'll know; in two years the public will know."

On the morning of November 30, before the expiration of the two years, Alexanderson's promise was fulfilled. Photos were radioed from London to New York. The "front page" idea may come soon.

The picture is transmitted across the ocean a horizontal line every one and three-quarter seconds. There are 128 lines to an inch, so that it takes about twenty minutes to transmit the entire picture over a distance of 3,000 miles.

After the light passes through the photograph at the sending end it is changed to electricity by a special photo-electric cell developed in the laboratories of the General Electric Co. The cell is filled with argon gas and its inner surface is covered with potassium.

In the glass wall of this cell a small window is left uncovered by the potassium. As the light passes through the film, the beam enters this window, striking a small mirror, from which it is flashed upon the coated surfaces of the special cell. As the tube is always kept in a state of agitation by being placed in a magnetic field, and adjusted to a point just below electronic emission, the entering light ray just upsets this balance. The varying degree of light entering the tube varies the electronic flow.

Ranger Developed the Idea

It was necessary to find a means of keeping the transmitted current steady. Capt. Richard H. Ranger, who developed the idea for the R. C. A., made possible transmission sufficiently powerful to be steady.

Instead of sending the current directly to the aerial and transmitting continuously, he introduced an electrical reservoir which stored the current until the reservoir was completely filled, when it was instantaneously emptied, a sort of condenser effect.

Every time this electrical reservoir is emptied, a dot is transmitted. However, this action is so rapid that the dots fuse and become dashes. They are transmitted as dots and dashes, and are reproduced by the pen and camera at the receiving end.

The apparatus for both the transmitting and receiving ends is very complicated, as the photograph shows. The time required for sending a complete picture, such as the picture of President Coolidge on this page, was 22 minutes. It is the hope of engineers that this will be speeded up.

The price to be charged for the trans-Atlantic picture will be approximately the same as for sending a message taking the same length of time. In 20 minutes about 600 words can be sent. At 7 cents per word (press rate) this would mean approximately $42 per picture.

On this page are the pictures of notables whose photos were transmitted during the first public test. Those whose photos were received were the Prince of Wales, President Coolidge, Ellen Terry, a New York policeman, Ambassador Kellogg, Dowager Queen Alexander, Secretary of State Hughes, Premier Stanley Baldwin. A Chinese proverb was transmitted, "A picture is worth 10,000 words." Also transmitted were photos of the Statue of Liberty, a sinking ship and the finish of an athletic race.

(PHOTOS ON PAGES 16 AND 17)

BROADCAST PROGRAMS

THURSDAY, DECEMBER 11

KYW, Chicago, 536 (C. S. T.)—6:30 A. M., morning physical exercises. 9:30, late news and comment. 10:30, farm and home service. 11:35, table talk by Mrs. Anna J. Peterson. 2:35 P. M., "Afternoon Frolic." 6:02, news, financial and final markets. 6:35, children's bedtime story, by Walter Wilson. 7, Joska DeBabary's Orch. 7:10, Coon-Sanders Original Nighthawks. 7:20, DeBabary's Orch. 8, "Twenty Minutes of Good Reading," by Rev. C. J. Pernin. 8:20, musical program. 9:20, "Safety First," by Mr. Z. C. Elkin. 10, "Evening at Home" program.

WCCO, Minneapolis, 417 (C. S. T.)—10:45 A. M., Home Service, Betty Crocker. 2 P. M., Woman's Hour. 4, Magazine Hour. 5:30, Children's Hour, Gold Medal Lady. 6, health talk. 6:30, Dick Long's Nankin Orch. 7:30, food talk. 7:45, lecture. 8, Disabled American Veterans Orch. 10, Long's Nankin Orch.

WMAQ, Chicago, 447.5 (C. S. T.)—4 P. M., [illegible] hour. 4:30, Illinois Federation of Women's clubs. 6, organ recital. 6:30, Hotel La Salle orch. 8, garden talk by J. H. Burdett. 8:15, Boy Scout talk. 8:30, "Chocolate," by Mrs. Snyder. 9, lecture from University of Chicago. 9:15, musical program.

WGR, Buffalo, N. Y., 319 (E. S. T.)—2:30 P. M., concert. 6, Hallpryd String Quartet.

KDKA, E. Pittsburgh, Pa., 326 (E. S. T.)—9:45 A. M., Stockman reports. 11:55, time. 12, weather; Stockman reports. 12:15 P. M., Scalzo's Orch. 3:30, closing quotations. 6:15, KDKA Little Symphony Orch. 7:15, Stockman reports. 7:30, Santa Claus. 7:45, automobile talk. 8, program by National Stockman. 8:30, minstrel show. 9:55, time; weather. 11, concert from the Post Studio.

KFMT, Minneapolis, 261 (C. S. T.)—9 P. M., musical program. (Classic).

WJZ, New York City, 455 (E. S. T.)—10 A. M., Housewives League Menu, Julian Heath. 10:20, "The Progress of the World." 10:30, Household Equipment, Ethel Peyser. 10:40, "How to Make French Boudoir Dolls." 10:50, Eleanor Gunn's fashion talk. 1 P. M., Hotel Pennsylvania Orch. 4, specialty number. 4:15, Kenneth Burdick, baritone. 4:30, Bernhard Levitow's Hotel Commodore Orch. 5:30, State and Federal reports. 7, Bernhard Levitow's Hotel Commodore Orch. 8, Wall Street Journal review. 8:10, N. Y. U. Air College, "Story of Words," Prof. Vernon Loggins. 8:30, Wanamaker Concert; Dr. Alexander Russell. 9:30, Military Order of Foreign Wars Dinner, Col. Cornelius A. Seoane and Augustus Thomas. 11, Waldorf Astoria Dance Orch.

WJY, New York City, 405 (E. S. T.)—7:30 P. M., Berlitz weekly French lesson. 8, Sandu Albu, violinist, Mrs. Nickeloff, accompanist. 8:30, choir concert. 10:15, Al Reiser's Corinthians.

KFI, Los Angeles, 469 (P. S. T.)—5 P. M., News Bulletins. 5:30, bulletins. 6:45, Y. M. C. A. lecture. 7, dance orch. 7:30, Maud Reeves Barnard, mezzo soprano. 8, instrumental trio. 9, program from Studio. 10, John Smallman Night.

WGBS, New York City, 316 (E. S. T.)—10 A. M., talks by Terese. 10:10, Jeanette Freed, soprano. 10:20, "The Useful Gift for the Busy Woman," by Anne Dean Dowell. 10:30, Jeanette Freed, soprano. 10:40, fashion talk by Mabel A. Burgess. 10:50, Jeanette Freed, soprano. 1:30 P. M., Arnold Vorsey and His Ritz Carlton Orch. 3, interview with Martha Stanley, author of "My Son" and June Gordon and Herbert Clark, by Terese Rose Nagel. 3:10, Nanette Stevenson, soprano. 3:20, The Real Romance of America, by Gertrude B. Tucker. 3:30, Nanette Marchand Stevenson. 3:40, William J. Stuart in Reading of Serial Romance. 3:50, Nanette Marchand Stevenson. 6, Uncle Geebee. 6:30, Loretta Ellen Brady, Children's Stories. 6:30, a Jazz Symphony Concert with Larry Funk's and Van and His Collegian's Combined Orchestras. 8:30, the Washington Square College Players of the N. Y. University in "The Taming of the Shrew." 9, Arthur Feldman, tenor solos and monologues. 9:30, piano recital, Thompson and Cassini.

KSD, St. Louis, 546 (C. S. T.)—4 P. M., The Home Hour.

WDAR, Philadelphia, 395 (E. S. T.)—11:45 A. M., Daily Almanac. 12:02 P. M., organ recital; concert orch., Paul Sarkozi, director. 2, Arcadia Concert Orch.; artist recital. 4:30, artist recital. 5, question period in the educational talks, C. E. Schermerhorn.

WCBD, Zion, Ill., 345 (C. S. T.)—Zion Orch.; Mrs. Inman, Mrs. Crowe and Messrs. Mahaffey and Bagg, mixed quartet; Mrs. Thomas and Mr. Barton, vocal duets; Mrs. Bagg and Mrs. Crowe, vocal duets; Beulah Mitchell, soprano; Chester S. Bagg, baritone; Mrs. P. M. LaRose, contralto; Daniel Mason, trombone.

KFDY, Brookings, S. D., 273 (C. S. T.)—8 P. M., Mr. and Mrs. E. M. Endresen and Lucille Woods. Special cornet solo by Mr. E. M. Endresen. 8:15, "Analyzing South Dakota Soil." 8:35, music by trio. Special saxophone solo by P. M. Endresen. 8:40, "Medicinal Plants of South Dakota," talk by Anton Hogstad. 9:00, piano solo by Lucille Woods.

WLW, Cincinnati, O., 423 (C. S. T.)—10:45 A. M., weather and business reports. 1:30 P. M., business reports. 3, market reports. 4, French lesson by Madame Ida Tempjolie; piano recital by Adelaide Apfel. 6, Santa Claus Hour. 10, message from the U. S. Civil Service. 10:05, Doherty Melody Boys. 10:20, Milnor Instrumental Trio. 11, tenor solos by Carl E. Cornnelle. 11:15, Doherty Melody Boys and Milnor Instrumental Trio.

WFAA, Dallas, Tex., 476 (C. S. T.)—12:30 P. M., address, Dewitt McMurray, in a medley of humor, pathos and wisdom. 8:30, Pythian Band and Orch. 11:12, Adolphus Hotel Orch., playing in the Junior ballroom.

WEEI, Boston, 303 (E. S. T.)—6 P. M., Jack Renard and his Mansion Inn orch. 7, Big Brother club. 7:30, musicale.

WOO, Philadelphia, 509 (E. S. T.)—11 A. M., organ. 11:30, weather. 11:55, time. 12, Tea Room orch. 5:10 P. M., sports results and police reports. 5:15, organ and trumpets. 9:55, time. 10:02, weather.

WOR, Newark, N. J., 405 (E.S.T.)—7 A. M., Morning gym class. 2:30 P. M., Jean Motteson, tenor, and Norman Hennefeld, concert pianist. 2:45, Elizabeth Buckley Jeffries, soprano; Dr. Rae S. Adams at the piano. 3, tenor. 3:15, soprano. 3:30, Alan Moran and Walter Feldkamp on two pianos. 6:15, "The Bunny from Bunnyland." 6:30, Albert E. Sunn. 6:30, Jimmy Lent's Society Orch. 7:15, Resume of the day's sports by "Jolly Bill" Steinke.

WAAM, Newark, N. J., 263 (E.S.T.)—11 A. M., Rev. Edmond Haines and John A. Scott. 11:45, Fisher Boer Musical.

WHN, New York City, 360 (E.S.T.)—12:30 P. M., Chas. Strickland and his Palais D'Or Orch. 2:15, Bob Schaefer, song writer. 2:30, Bouger's Memphis Six Orch. 3, Bob Miller and Ira Schuster, songs. 3:45, Harry Israels, popular and classical pianist. 3:55, Metropolis Trio, songs. 4:15, Max Miller, concert violinist. 4:25, Olga Rossi, soprano. 4:40, Loretto C. Lynch in "Tea Time Talk." 4:50, Ray D. O'Flynn, tenor. 5, Tangoland Ballroom Orch. 6:30, Vincent Catanese and his Alamac Orch. 7:40, WHN Employment Broadcasting. 9:30, Evening Bulletin current news. 9:37, Spear's Dance Orch. 10, "What Becomes of Old Watches?" 10:05, Fain and Cross, harmony singers. 10:15, Marconi Brothers, accordian solos. 10:30, Fox and his orch. 10:45, Healey and Camp, piano and song act. 11, Jack Fagan and Blanche Vincent, harmony singers. 11:15, Leo Wood's entertainers. 11:30, Bob Emmerich, jazz pianist. 12, Ted Lewis and his symphonic clowns. 12:30, Lou Gold and his orch.

FRIDAY, DECEMBER 12

KYW, Chicago, 536 (C. S. T.)—6:30 A. M., morning physical exercises. 9:30, late news and comment of the markets. 11:35, table talk by Mrs. Anna J. Peterson. 6 P. M., news, financial and final markets Dun's and Bradstreet's Weekly Review. 6:35, children's bedtime story by Walter Wilson. 7, Joska DeBabary's Orch. 7:10, Coon-Sanders Original Nighthawks. 7:20, DeBabary's Orch. 7:30, program from KYW's studio. 8, speeches, auspices of the American Farm Bureau Federation. 10, midnight revue. 11, midnight revue continued.

WCCO, Minneapolis, 417 (C. S. T.)—10:45 A. M., Home Service, Betty Crocker. 2 P. M., Woman's Hour. 3:30, matinee musical. 4, magazine hour, Kathleen Norris. 5:30, children's hour, Tess Cooperman. 6, sport hour. 6:30, Dick Long's Nankin Orch. 7:30, "Metal Rust and Its Causes," J. D. Frazer. 8:30, Twin City Lines Band.

WGR, Buffalo, N. Y., 319 (E. S. T.)—2:30 P. M., concert. 6:30, Vincent Lopez Orch. 8, Santa Claus. 9, B. Fischer & Co.'s Orch. 10, concert.

KDKA, E. Pittsburgh, Pa., 326 (E. S. T.)—7 A. M., morning physical exercises. 8, morning exercises. 9:45, Stockman reports. 11:55, time. 12, weather; Stockman reports. 12:20 P. M., Sunday School lesson. 3:30, closing agricultural quotations. 6:30, Meyer Davis Orch. 7:15, Stockman reports. 7:30, Daddy Winkum. 7:45, Business Review, by S. F. Fannon. 8:30, Star Electric Male Quartet. 9:55, time; weather.

WJY, New York City, 405 (E. S. T.)—7:30 P. M., Billy Wynne's Orch. 8:15, Current Topics, William H. Allen. 8:30, Dr. Thomas E. Hall, baritone. 8:50, "Taxes," Frank Sherrit. 9, Men's Community Bible Class Orch. 9:45, Erna Korn, contralto.

KFI, Los Angeles, 469 (P. S. T.)—5 P. M., news. 5:30, news. 6:45, organ. 8, Herald program. 9, program from Studio. 10, vocal concert.

WIP, Philadelphia, 509 (E. S. T.)—1 P. M., Gimbel Tea Room Orch. 3:30, weather. 3, artists' recital by Louis Pearlman, violinist, Albert E. Baynham, baritone, Joseph J. McCullough, banjoist; Flora Ryske at the piano. 6, weather. 6:15, Harvey Marburger and his Vaudeville Orch. 6:45, U. S. Department of Agriculture, livestock and produce market reports. 7, Uncle Wip's Bedtime Story, roll call and birthday list for the children of the Kiddie Klub; Master John Challenger, 13-year-old soloist, will render several popular selections, assisted by his mother at the piano.

KSD, St. Louis, 546 (C. S. T.)—6:45 P. M., Abergh's Concert Ensemble, Arno Arnean, violinist. 9, program announced.

WDAR, Philadelphia, 395 (E. S. T.)—11:45 A. M., Daily Almanac. 12:02 P. M., organ recital; features from the Studio; Arcadia Concert Orch., Paul Sarkozi, director. 2, Arcadia Concert Orch.; recital. 4:30, dance program. 7:30, Dream Daddy. 8, "Turning the Pages," a book review. 8:20, "Fifteen Minutes with Sam Wingfield," humor editor of "The Country Gentleman." 10, meeting of the Morning Glory Club, Arcadia Dance Orch., Salvatore Pinto, director; features from the Studio.

WJZ, New York City, 455 (E. S. T.)—10 A. M., Housewives League Menu, Julian Heath. 10:20, Book Review by Grace Isabel Colbron. 10:30, "What Composers Have Accomplished," Mary D. Payne. 10:40, Arts and Decorations, Mrs. Mary Roberts. 10:50, Eleanor Gunn's fashion talk. 11, Ami Mali Hicks. 1 P. M., Henry Vander Zanden's Hotel Ambassador Trio. 4, Estelle Mason, violinist. 4:15, George Cox, tenor. 4:30, Fred Hall's Royal Terrace Orch. 5:30, State and Federal reports. 7, Savarin Ensemble. 8, Wall Street Journal review. 8:10, N. Y. U. Air College, "Story of Words," Prof. Vernon Loggins. 8:30, Cumbe Performers Orch., Della Samoiloff, soprano; Sol Friedman, baritone. 9, Radio Franks, Wright and Bessinger. 9:30, "The Land of the Golden Fleece," George Lowe Cheesman. 9:50, sporting summary. 10:30, Boston Area Orch.

WOS, Jefferson City, Mo., 441 (C. S. T.)—8 P. M., address, "Proven Facts About Hog Cholera and Its Control," by Homer A. Watson. 8:15, students of George R. Smith College, Sedalia, Mo.

WEEI, Boston, 303 (E. S. T.)—6:30 P. M., Dok Eisenbourg and his Sinfonians. 7, Big Brother club. 7:30, "A Few Minutes with Santa Claus." 8, musicale. 9, Astor Coffee orch.

WOO, Philadelphia, 509 (E. S. T.)—11 A. M., organ. 11:30, weather. 11:55, time. 12, Tea Room orch. 5:10 P. M., sports results and police reports. 5:15, organ and trumpets. 7:30, sports results and police reports. A. Candelori and his Adelphia orch. 8:30, special program. 9:25, Midrael trio, Frances Cushing Campbell, violinist; Elsie Fisher Craig, cellist; Hilda Reiter, pianist; Jessie Lovejoy MacGregor, soprano. 9:55, time. 10:02, weather. 10:05, organ recital, Harriette G. Ridley. 10:30, Vincent Rizzo and his Sylvania orch.

WOR, Newark, N. J., 405 (E.S.T.)—7 A. M., Morning gym class. 2:30 P. M., violin recital by Bessie Elkin. 2:45, Helen Richmond on "Neglected Daylight." 3, violin recital. 3:15, Allan R. Cullimore, "How to Find the Right Job." 3:30, Edmond Haines, baritone, and John A. Scott, tenor. 6:15, "The Bunny from Bunnyland." 6:30, Naburhood Quartet. 6:30, "Man in the Moon" stories. 7, Naburhood Quartet. 7:15, Resume of the day's sports by "Jolly Bill" Steinke.

WAAM, Newark, N. J., 263 (E.S.T.)—11 A. M., Ada Brosse Swann. 11:30, Rev. Edmont Haines and John A. Scott. 11:45, Fisher Boer musical program. 8 P. M., resume of day's sports, J. B. Bayley. 8:10, Ben Friedman, Broadway's joy boy. 8:25, Frank Catello and his orch. 9, Four Precious Jewels. 9:15, orchestra. 9:25, Jewels. 9:40, Irving Porter. 9:50, Musical Surprise. 10, The Elizabeth Town Players Club.

WHN, New York City, 360 (E.S.T.)—2:15 P. M., Richard Hitter's orch. 2:45, Anne Bronaugh. 3, Jack Morrissey, tenor. 3:45, serial story by Wm. J. Stuart. 3:55, Jack Spiegel, tenor. 4:10, Uncle Robert. 5, Alja and his orch. 6:30, Vincent Catanese and his Alamac orch. 7, Harry Richmond and entertainers, Eddie Elkins and his orch. 9:30, Evening Bulletins news. 9:37, Dan Gregory and orch. 10, fashion chats by Mme. Belle. 10:10, Bob Miller, popular songs. 10:20, "Storage Batteries," by H. B. Shontz. 10:30, Roseland dance orch. 11, Judith Roth and Al Wilson, popular songs. 11:15, Ray D. O'Flynn, popular tenor. 11:30, Sam Wooding and his Club Alabam orch. 12, Ted Lewis and his Symphonic Clowns.

SATURDAY, DECEMBER 13

WCCO, Minneapolis, 417 (C. S. T.)—10:45 A. M., Home Service, Betty Crocker. 8 P. M., "Fireside Philosophies," Rev. Roy L. Smith. 8:15, "Parliamentary Law," Mrs. W. L. Spencer. 8:30, musical program. 9:30, St. Paul Athletic Club Orch.

WLW, Cincinnati, O., 423 (C. S. T.)—10:45 A. M., weather. 12:15 P. M., Conservatory of Music. 1:30, business reports. 3, market reports. 4, Babson reports. 6, Santa Claus Hour. 8, Alvin Roehr's Music Makers, Crosley Theatrical Review. 8:30, second part of Herman Sundermann's drama "The Joy of Living." 9, Cooper Orch. and Quartet, orch. program, male quartet.

KYW, Chicago, 536 (C. S. T.)—6:30 A. M., morning physical exercises. 9:30, late news and comment of the markets. 10:30, Farm and Home service. 11:35, table talk by Mrs. Anna J. Peterson. 6:02 P. M., news, financial, and final markets. 6:35, children's bedtime story by Walter Wilson. 7, Joska DeBabary's Orch. 7:10, Coon-Sanders Original Nighthawks. 7:20, Joska DeBabary's Orch. 8, Ballentin Ladies, quartette; Mary Judah, soprano; Oscar Heather, tenor; Harold O'Brien, violinist. 9:05, Youth's Companion. 9:35, "Congress Classic", artists announced. 12, "Congress Carnival."

WMAQ, Chicago, 447.5 (C. S. T.)—6 P. M., Armour Tech band. 8, Hotel LaSalle Orch. 8:40, radio photologue. 9, weekly Chicago theatre revue.

WGR, Buffalo, N. Y., 319 (E. S. T.)—2:30 P. M., concert. 6, Hallpryd String Quartet.

KDKA, E. Pittsburgh, Pa., 326 (E. S. T.)—9:45 A. M., Stockman reports. 11:55, time. 12, weather. 1:30 P. M., Daugherty's Orch. 6, Westinghouse Band. 7:15, Stockman reports. 7:30, Storytime. 7:45, feature. 8:30, Charles Wakefield Cadman Program of Indian Music. 9:55, time; weather.

KFI, Los Angeles, 469 (P. S. T.)—5 P. M., news. 5:30, news. 6:45, speaker. 7, dance orch. 8, song recital. 9, program from Studio. 10, Radio Club.

KSD, St. Louis, 546 (C. S. T.)—8 P. M., concert by St. Louis Symphony Orch., Rudolph Ganz, director. 11:30, dance program by Varsity Club Orch.

WIP, Philadelphia, 509 (E. S. T.)—1 P. M., organ recital by Karl Bonawitz. 1:30, weather. 3, concert by Aloha Hawaiian Glee Club, direction of H. C. Carter. 4:10, Harmonica Recital accompanied by a Concert Grand Auto-harp, both played by George W. Roberts. 6, weather. 6:05, Hotel St. James Orch. 6:45, livestock and produce market. 7, Uncle Wip's Bedtime Stories. 8, "Chemistry and Color," by J. W. Stutsman. 8:15, direct broadcast from the Metropolitan Opera House of the German Opera. 10:30, Art Coogan and his Club Madrid Orch. 11:05, organ recital by Karl Bonawitz.

PWX, Havana, Cuba, 400 (E. S. T.)—8:30 P. M., 1, piano solo, Eva Giner Ibanez. 2, violin solo, Sal-

vador Alcon, with piano accompaniment by José Campos. 3. duet of tenor and baritone by Messrs. Mendizabal and Fernandez. 4. Margarita Pintado. 9:10 ,piano solo by Prof. José Campos; Sustaquio Fernandez; violin solo, Salvador Alcon; Mr. Mendizabal, tenor. 10, musical program.

WDAR, Philadelphia, 395 (E. S. T.)—11:45 A. M., Daily Almanac. 12:02 P. M., organ recital; features from the Studio; Arcadia Concert Orch., Feri Sarkozi, director. 2, Arcadia Concert Orch.; artist recital. 4:30, The Cotton Pickers, Wilbur De Pais. 7:30, Arcadia Dance Orch., Salvatore Pizza, director.

WJZ, New York City, 455 (E. S. T.)—1 P. M., music. 4, Robert F. Campbell, baritone. 4:15, specialty number. 7, Waldorf-Astoria Orch. 8, course on Jewish History and Literature. 9:30, "Jaunting in France," Wirt W. Barnitz. 10:30, Hotel Astor Dance Orch.

WFAA, Dallas, Tex., 476 (C. S. T.)—12:30 P. M., address, Hugo Swan. 8:30- Kidd-Key College faculty recital. 11, Adolphus Hotel orch.

WOR, Newark, N. J., 405 (E. S. T.)—7 A. M., morning gym class. 2:30 P. M., Edna Dahl, contralto, and Ida Fehleisien, soprano. 3, Edward Farley, pianist. 315, contralto and soprano. 3:45, Sidney Webster, baritone. 6:15, "The Bunny from Bunnyland." 6:20, Clifford Lodge orch. 7:15, resume of the day's sports by "Jolly Bill" Steinke. 8, Schubert string quartet. 8:20, readings of original poems by Gordon Johnstone. 8:35, Helen O'Shea, soprano, and Dorothy Hoyle, violinist. 9, Schubert string quartet. 9:20, Captain Jerome Hart on "Personalities and Humors of Modern Music." 9:35, readings of poems. 9:50, joint recital by Helen O'Shea, soprano, and Dorothy Hoyle, violinist. 10:10, "Make Your City Musical" by Philip Gordon; Senior orch. of Temple B'nai Abraham. 10:45, Ben Friedman entertainers.

WHN, New York City, 360 (E. S. T.)—2:15 P. M., Victor Dietz, pianist. 2:30, Bella Walzer, soprano. 2:45, Tom Banks and his trio. 3:45, Gregoria Soler, dramatic soprano. 4, William Spence, tenor. 4:10, Vincent D. Daniels, jazz pianist. 4:20, Cooper and Bourne, songs. 4:30, Ingri Fiane, soprano, and Albert Valnor, baritone. 5, Harry Moss' dance orch. 6:30, Vincent Catanese orch. 7:30, Carlton Terrace orch. 8, Arthur Stone, blind pianist. 8:10, "The Modern Girl and Her Physical Education" by Jeanne LaMar. 8:20, Metropolis trio, popular songs. 8:30, Strand Roof entertainers. 9, Alfred Dulin, concert pianist. 9:10, Evan Evans, baritone. 9:20, Jimmy Flynn, tenor. 9:30, City College Five, Wm. Fox, leader. 10, "Immigration and Rural Situation" by Mrs. Estelle M. Sternberger. 10:10, Howard Kirsch, tenor. 10:25, Clarence Williams and his radio trio. 10:45, Fitzpatrick Brothers, old-time medlies. 11, Jimmy Clark and his entertainers. 1130, Roseland dance orch.

SUNDAY, DECEMBER 14

WLW, Cincinnati, O., 423 (C. S. T.)—9:30 A. M., Sunday School. 11, services; Dr. Frank Stevenson, minister. 7:30 P. M., services; Dr. Frederick McMillan, minister. 8:30, concert by the Western and Southern Orch.

WHAS, Louisville, Ky., 400 (C. S. T.)—9:57 A. M., organ music. 10, church service; Mrs. O. W. Edinger, soprano; Angeline McCrocklin, contralto; Charles H. Barnes, Jr., tenor; William Cornwall, baritone. 4, vesper song service.

KGO, Oakland, Cal., 312 (P. S. T.)—11 A. M., service of the First Baptist Church; Rev. John Snape, pastor. 3:30 P. M., KGO Little Symphony Orch. 7:30, service, Rev. John Snape, pastor.

KFMT, Minneapolis, 261 (C. S. T.)—1:30 P. M., sacred and folk songs.

WIP, Philadelphia, 509 (E. S. T.)—10:45 A. M., morning service, Rev. Floyd W. Tomkins, rector. 4 P. M., "Sunday Talk" Meeting, "Is Civilization a Success, or What's Wrong with the World," by William Forkell.

WEEI, Boston, 303 (E. S. T.)—3:45 P. M., regular Sunday Men's conference. 7:20, musical program.

WOS, Jefferson City, Mo., 441 (C. S. T.)—7:30 P. M., religious services of the First Presbyterian Church, Rev. W. Hooper Adams, pastor.

WBZ, Springfield, Mass., 337 (E. S. T.)—10:55 A. M., church services. 3:30 P. M., People's symphony orch. 8:30, organ; Gertrude Wood, contralto; Eric Anderson, tenor. 9:30, Charles L. W. Wagner, radio poet; Lindal Rogers, violinist; P. Harold Morrison, baritone; Harold Hoyle, pianist; Helen Morrison Dunlap, accompanist.

KGW, Portland, Ore., 492 (P. S. T.)—3 P. M., municipal concert. 6, church services. 7, Colburn concert orch.

MONDAY, DECEMBER 15

WHAS, Louisville, Ky., 400 (C. S. T.)—4 P. M., Alamo Theater Orch.; police bulletins; weather; "Just Among Home Folks"; readings; late news. 4:55, market reports. 5, time. 7:30, silent.

WCBD, Zion, Ill., 345 (C. S. T.)—8 P. M., Ladies Chorus; Messrs. McElroy, saxophone quintet; R. F. Hire, piano; Mark Whiteside, baritone; M. P. Barton, tenor; Erma Reynolds, soprano; George Beem, marimba; Glenn Sparrow, tenor.

WFAA, Dallas, Tex., 476 (C. S. T.)—12:30 P. M., address, Dr. J. D. Boon, astronomer. 8:30, piano recital.

KGO, Oakland, Cal., 312 (P. S. T.)—9 A. M., music and lectures by California State Department of Education. 10:40, classroom instruction. 1:30 P. M., N. Y. and S. F. stock reports and weather. 3, musical program and speaker. 4, Henry Halstead's Dance Orch. 5:30, Aunt Betty stories. 6:45, final reading, stock reports, weather, S. F. produce news, and news items. 8, educational program; music by Arion Trio. 10, Henry Halstead's Orch.

KFMT, Minneapolis, 261 (E. S. T.)—7 P. M., Harmony Four; Ed. Janicke, director.

WWJ, Detroit, 517 (E. S. T.)—8 A. M., setting-up exercises. 9:30, "Tonight's dinner" and a special talk. 9:45, Public Health Service bulletins. 10:25, weather. 11:55, time. 3, The Detroit News Orch. 3:50, weather. 3:55, market. 8:30, Central Concert Quartet.

WDAF, Kansas City, Mo., 411 (C. S. T.)—3:30 P. M., Star's radio trio. 5, Boy Scout program. 5:50, marketgram, weather, time and road report. 6, (School of the Air): address, personal message from Roger W. Babson; the Tell-Me-a-Story Lady. The Hanlein-Knutson Trianon Ensemble. 8, "Around the Town With WDAF." 11:45, Nighthawk Frolic.

WBZ, Springfield, Mass., 337 (E. S. T.)—11:55 A. M., time, weather, market. 6 P. M., Westing house Philharmonic trio. 7, market report. 7:05, bedtime story. 7:15, "Bringing the World to America"; news from the National Industrial Conference. 7:30, lesson in a course in modern literature, Robert Emmons Rogers, professor of English literature. 8:05, broadcast of hockey game. 9:45, Westinghouse Philharmonic trio; Fred W. Gardner, tenor; Katherine Gravelin, accompanist. 9:55, time, weather. 10:01, continuation of musical program.

KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather. 5 P. M., children's program. 7:15, markets, weather, news and police reports. 8, The Oregonian concert orch. 10, Metropolitan orch.

TUESDAY, DECEMBER 16

WLW, Cincinnati, O., 423 (C. S. T.)—10:45 A. M., weather; business. 12:15 P. M., Delta Omicron Sorority Music. 1:30, business reports. 3, market reports. 4, "The Christmas Dinner," by Eleanor Ahearn; piano recital by pupils of William Kyle; "Mah Jongg," by Lucy Blackburn. 6, Santa Claus Hour. 10, Ohio Rubber & Textile Co. program; entertainment from Goodwins; Gordon Kibler & his Pennsylvanians.

WFAA, Dallas, Tex., 476 (C. S. T.)—12:30 P. M., address, Charles E. Osborne, physical director. 8:30, musical recital by G. Haydn Jones and soloists. 11, grand organ recital.

KGO, Oakland, Cal., 312 (P. S. T.)—1:30 P. M., N. Y. and S. F. stock reports and weather. 4, concert orch. 6:45, final reading, stock reports, weather, S. F. produce news, and news. 8, first concert, male chorus of 100 voices. 10, Henry Halstead's Orch.

WWJ, Detroit, 517 (E. S. T.)—8 A. M., setting-up exercises. 9:30, "Tonight's Dinner" and a special talk. 9:45, Fred Shaw, pianist and popular songster. 10:25, weather. 11:55, time. 3 P. M., The News Orch. 3:50, weather. 3:55, market. 8:30, The News Orch.

WDAF, Kansas City, Mo., 411 (C. S. T.)—3:30 P. M., The Star's radio trio. 5, weekly child talent program. 5:50, marketgram, weather, time, and road report. 6, (School of the Air): The Tell-Me-a-Story Lady; tenth of a series of radio piano lessons, Maudelien Littlefield; the Haulein-Knutson Trianon Ensemble. 11:45, Nighthawk Frolic.

WHAS, Louisville, Ky., 400 (C. S. T.)—4 P. M., Alamo Theater Orch.; police bulletins; weather; "Just Among Home Folks"; readings; late news. 4:55, market reports. 5, time. 7:30, concert by Carl Zoeller's Melodists; time.

WBZ, Springfield, Mass., 337 (E. S. T.)—11:55 A. M., time, weather, market. 6 P. M., Hotel Lenox ensemble. 6:30, Copley-Plaza orch. 7, market report. 7:05, bedtime story. 7:15, world market survey. 7:30, Leo Reisman and his Hotel Brunswick orch. 8, Amelia Marcus, soprano, and Marjorie Lieberman, pianist. 8:30, program arranged by Pauline Hammond Clark. 9:30, talk on "Starlore," by George Leo Patterson.

WKAQ, San Juan, P. R., 360 (P. S. T.)—9 P. M., time; Euterpe jazz band; "Panhispanismo," speech by Dr. Enrique Lefebre; latest news, and information.

KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather. 12:30 P. M., concert. 5, children's program. 7:15, markets, weather, news and police reports. 8, agricultural lecture, G. R. Hyslop, "Progress in Wheat Production." 8:30, Knowlton quartet. 10, Multnomah Hotel Strollers.

WEDNESDAY, DECEMBER 17

WLW, Cincinnati, O., 423 (C. S. T.)—10:45 A. M., weather; business. 12:15 P. M., program from College of Music. 1:30, business reports. 3, market reports. 4, program for the "Shut Ins." 6, Santa Claus Hour. 8, Henry Fillmore and the Syrian Temple Shrine Band; special stunts by Clarence Betzner; Mum Platt; Bob Alter Vox-Ferro; Billy Kunkel, piccolo; August Schaefer, trumpet; George Carr, clarinet; Jake Bohrer, and Edwin Schath, humorous duets on clarinet; John Klohr, internationally known composer, and Howard Haffold, Eddie Ball and Billy Waterworth.

WHAS, Louisville, Ky., 400 (C. S. T.)—4 P. M., Alamo Theater Orch.; police bulletins; weather; "Just Among Home Folks"; readings; late news. 4:55, market reports. 5, time. 7:30, Keith Kannard and his Kentucky Ramblers; late news; time.

WFAA, Dallas, Tex., 476 (C. S. T.)—12:30 P. M., music by the Red-Head Girl.

KGO, Oakland, Cal., 312 (P. S. T.)—1:30 P. M., N. Y. and S. F. stock reports and weather. 3, musical program and speaker. 4, concert orch. 6:45, stock reports, weather, S. F. produce news, and news items.

KMFT, Minneapolis, 261 (E. S. T.)—8 P. M., comic and musical program.

WWJ, Detroit, 517 (E. S. T.)—8 A. M., setting-up exercises. 9:30, "Tonight's Dinner" and a special talk. 9:45, Public Health Service bulletins. 10:25, weather. 11:55, time. 3 P. M., the Detroit News Orch. 3:50, weather. 3:55, market. 8:30, The News Orch., Paul A. Smith, baritone.

WDAF, Kansas City, Mo., 411 (C. S. T.)—3:30 P. M., Star's radio trio. 5:50, marketgram, weather, time and road report. 6, (School of the Air): address, speaker under the auspices of the Health Conservation Association; address, speaker The Tell-Me-a-Story Lady; the Hanlein-Knutson Trianon Ensemble. 8, program from the home of C. W. Jenkins. 11:45, Nighthawk Frolic.

KFAE, Pullman, Wash., 330 (P. S. T.)—Alpha Chi Omega national sorority; musicale; Extension Service Jamboree; pointers on Dairy Farming, Prof. E. V. Ellington.

WKAQ, San Juan, P. R., 360 (P. S. T.)—8 P. M., municipal band of San Juan.

WOO, Philadelphia, 509 (E. S. T.—11 A. M., grand organ. 11:30, United States weather forecast. 11:55, United States Naval Observatory time signal. 12, luncheon music by the Tea Room orch. 5:40 P. M., police reports. 5:45, grand organ and trumpets. 7:30, sports results and police reports; dinner music by A. Candelori and his Hotel Adelphia French room orch. 8:15, program by Tioga Choral Society with the grand organ; James B. Hartzell, director; Mary E. Vogt, at the console. 9, WOO orch., Robert E. Golden, director; Gertrude Schultz, contralto; Harriette G. Ridley, accompaniste. 9:55, United States Naval Observatory time signal. 10:02, United States weather forecast. 10:03, silent.

KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather. 12:30 P. M., concert by Bill Darby's orch. 5, children's program. 7:15, markets, weather, news and police reports. 8, concert by J. S. Vann. 10, Multnomah Hotel Strollers.

WBZ, Springfield, Mass., 337 (E. S. T.)—11:55 A. M., time signals, weather, Springfield market report. 6 P. M., Westinghouse Philharmonic trio. 7, market report. 7:05, Radio Nature story by Thornton B. Burgess. 7:15, information Civil Service Exam. 7:30, Marchesi quartet; Esther E. Wrisley, first soprano; E. Maud Hugett, second soprano; Evelyn Marcil, first alto; Elizabeth Marcil Fellows, second alto; Angelina D'Esope De Mino, accompanist; assisted by the Westinghouse Philharmonic trio. 8:30, Mme. Emilia Ippolito. 9:30, solos by Clarence H. Jones; Mrs. A. Symington. 9:55, time, weather. 11, Leo Reisman orch. 11:30, popular song recital. 11:45, Leo Reisman and orch.

THURSDAY, DECEMBER 18

WLW, Cincinnati, O., 423 (C. S. T.)—10:45 A. M., weather. 12:15 P. M., program by Mu Phi Epsilon. 1:30, business reports. 3, market reports. 4, French lesson by Madame Ida Tcimpidis; piano recital by Adelaide Apfel. 6, Santa Claus Hour. 10, message from Civil Service Department. 10:03, cello solos by Karl Kirksmith, first cellist with the Cincinnati Symphony Orch.; selections by the Milnor Instrumental Trio; Doherty Melody Boys; Milnor Instrumental Trio.

WHAS, Louisville, Ky., 400 (C. S. T.)—4 P. M., Alamo Theater Orch.; police bulletins; weather; "Just Among Home Folks"; readings; late news. 4:55, market reports. 5, time. 7:30, "Dix" Bluegrass Serenaders, Henry L. Dixon, director; International Sunday School lesson; four-minute welfare talk; late news; time.

WCBD, Zion, Ill., 345 (C. S. T.)—8 P. M., Cornet Quintet; Mrs. Mayfield, Mrs. Faassen, Mr. Maynard, and Mr. Reid, mixed quartet; Mrs. Evelyn Depew, contralto; P. B. Newcomer, cornet; Carl Newcomer, saxophone; Messrs. Newcomer and Newcomer, cornet and saxophone; Ida Peterson, soprano; Ida Peterson and Mrs. Evelyn Depew, vocal duet; Mrs. Grace Lund and Erwin Rendall, piano; Erwin Rendall, flute.

KGO, Oakland, Cal., 312 (P. S. T.)—10:40 A. M., classroom instruction. 1:30 P. M., N. Y. and S. F. stock reports and weather. 4, concert orch. 6:45, stock reports; weather; S. F. produce news, and news items. 8, Viennese Orch.; George Anderson, baritone; Grace LePage, soprano; address, "The Automobile," F. N. Coats; male quartet selections; Mazda Banjo Quartet; Ruth Waterman, contralto; duets for steel guitars, by Norman Dean and Gladys Steel; KGO Mixed Quartet; Carl Anderson, tenor; Richard Lundgren, bass; Julia Hannas Cochrane, violinist; "The Vocal Teacher and His Japanese Pupil," by Carl Anderson and Al Evers. 10, Henry Halstead's Orch.

WFAA, Dallas, Tex., 476 (C. S. T.)—12:30 P. M., address, DeWitt McMurray, editor The Semi-Weekly Farm News. 8:30, musical recital. 11, Adolphus Hotel Orch.

KFMT, Minneapolis, 261 (E. S. T.)—9 P. M., dance program by Roy Ewald's Orch.

WWJ, Detroit, 517 (C. S. T.—8 A. M., setting-up exercises. 9:30, "Tonight's Dinner" and a special talk. 9:45, Public Health Service bulletins. 10:25, weather. 11:55, time. 3 P. M., The Detroit News Orch. 3:50, weather. 3:55, market. 8:30, Jean Goldkette's Orch.; Mrs. T. Earl Ouellette, soprano. 10, dance music. 11:30, the News Orch.

WDAF, Kansas City, Mo., 411 (C. S. T.)—3:30 P. M., Star's radio trio. 5:50, marketgram, weather, time and road report. 6-7, School of the Air; reading, Miss Cecile Burton; The Tell-Me-a-Story Lady; the Hanlein-Knutson Trianon Ensemble. 11:45, Nighthawk Frolic.

WBZ, Springfield, Mass., 337 (E. S. T.)—11:55 A. M., time, weather. 6 P. M., L. S. Wiggin ensemble. 6:30, Leo Reisman Hotel Lenox ensemble. 7, market report. 7:05, bedtime story. 7:15, letter from the New England Homestead, "At the Theatres" with A. L. S. Wood. 7:45, Charles R. Hector with his St. Jamse Theatre orch. 8:15, Whitman S. Brown, tenor; Edward I. Adelman, violin; Evelyn Murray, dramatic interpreter; J. R. Rouse, pianist. 9:15, concert. 9:55, time, weather. 10:01, continuation of musical program.

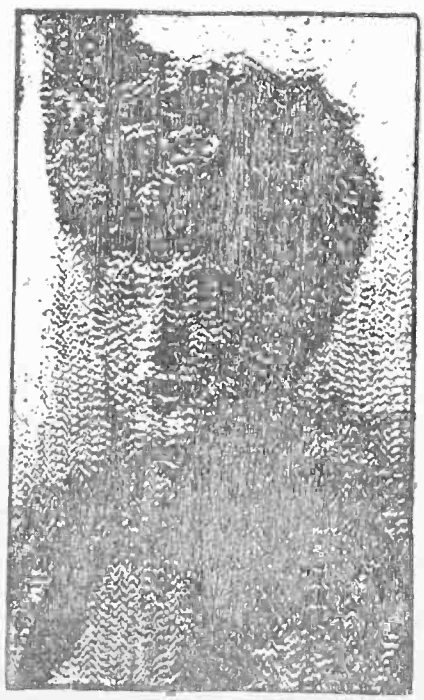
WOO, Philadelphia, 509 (E. S. T.)—11 A. M., grand organ. 11:30, weather. 11:55, time. 12, Tea Room orch. 5:40 P. M., police reports. 5:45, grand organ and trumpets. 9:55, time. 10:02, weather.

KGW, Portland, Ore., 492 (P. S. T.)—11:30 A. M., weather. 12:30 P. M., concert. 5, children's program. 7:15, markets, weather, news and police reports.

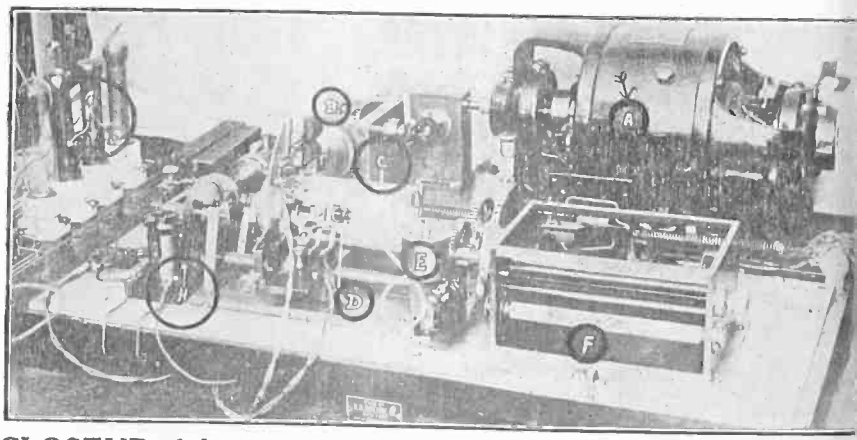
WKAQ, San Juan, P. R., 360 (P. S. T.)—8:30 P. M., muiscale.

FIRST PHOTOS ARE RADIOED

PRESIDENT COOLIDGE came out first and an anonymous New York City policeman finished second, defeating the Prince of Wales, Premier Stanley Baldwin and others, in the first public "competition" to see who "took the best picture" at the receiving end of a device in New York City that reproduced photographs sent from London through the air. sidering the infancy of the inv a step nearer. Royalty made result. The photographs of t President Coolidge, Statue of



[FOR NEWS ARTICLE ON RADIO PHOTOS, SEE PAGE 13]



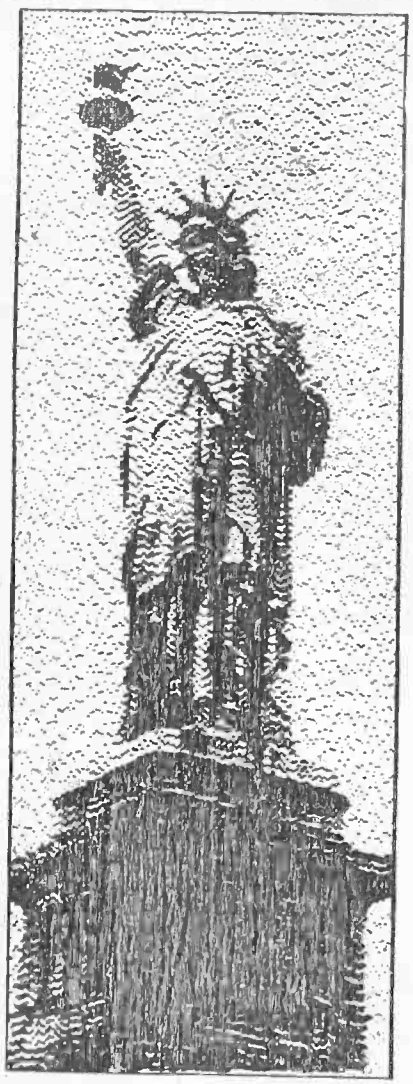
CLOSEUP of the receiving mechanism, invented by Capt. Richar H. Ranger of the Radio Corporation of America, which publicl reproduced photographs sent by radio from London to New Yor Motor "A" operates through gearing "B" to rotate cylinder wit recording paper "C." Special fountain pen "D," fed with in from a reservoir "E," is wiggled by the received signal impulse to make a direct record on the paper of the transmitted picture To the right in a camera box open at "F" a photograph record simultaneously made with a small electric light on a sensitiv photograph film. Magnet "H" advances pen support and light t right stroke at a time with each reversal of recording cylinder, t build up finished picture line upon line. Resistance "K," to lef controls current values supplied to recorder.

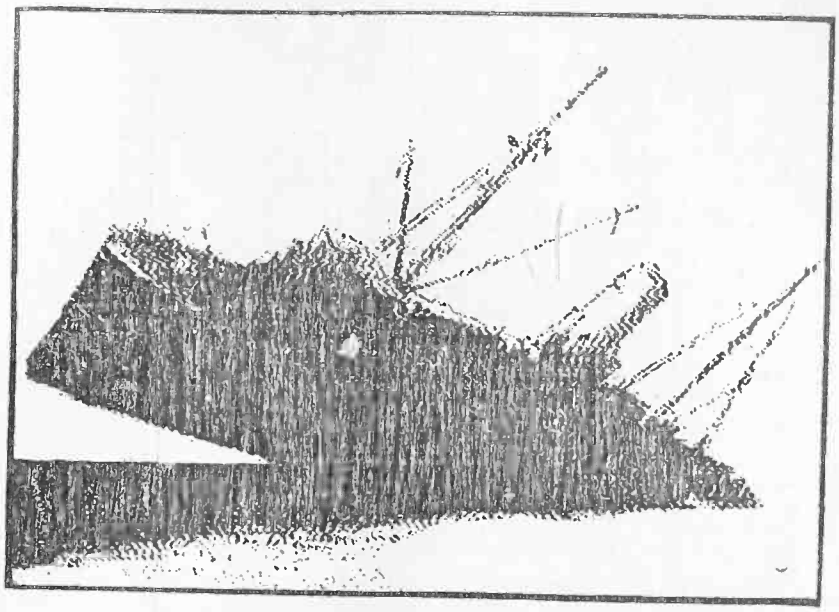
(Underwood & Underwoo

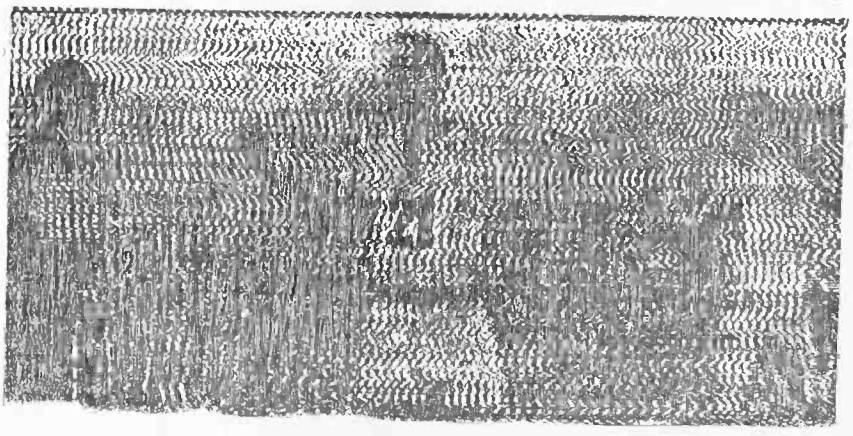
FROM LONDON TO NEW YORK

The result was so successful, con-ion, that broadcast movies seemed poor showing in the photographic policeman, Ambassador Kellogg, erty, a shipwreck off Scapa Flow, the finish of a British footrace, Dowager Queen Alexandra, the Prince of Wales, Secretary Hughes, Premier Baldwin, and Ellen Terry, the actress, are shown here in just the condition in which they were received in New York. Each photo was transmitted in about 22 minutes.

(Photos by courtesy of the Radio Corporation of America)







The Radio University

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

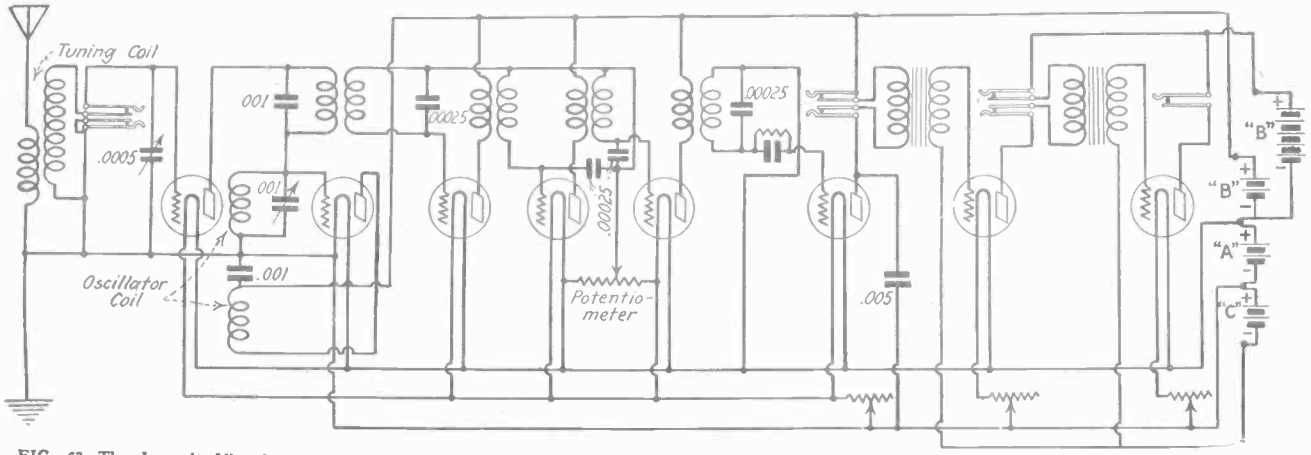


FIG. 62—The Lacault Ultradyne. The intermediate transformers require a good deal of patience to build. 500 turns of No. 28 D. S. C. wire for the primary; 550 turns No. 30 D. S. C. for secondary. They are wound on two separate grooved forms, but at very close proximity. The oscillator coil is wound on a form 3 inches diameter, 4 inches long, 24 turns of No. 20 D. C. C for grid coil, 32 turns No. 20 D. C. C. for the plate coil. The tuning coil may be a standard coupler. The parts may be purchased ready-made. This is one of the most selective sets known.

CAN you give me a circuit for the 8-tube Ultradyne? Can it get DX? Is there a better circuit for utilizing the 8 tubes?—Jack Rielley, 905 Hawthorne St., Newark, N. J.

See Fig. 62. It gets DX and gives full value for 8 tubes.

• • •

I HAVE a 4-tube Superdyne that tunes exceedingly broad. Can you suggest a remedy?—G. S. Brower, 57 St. Nicholas Pl., New York City.

Cut down your aerial to 50 feet. Do not allow the lead from grid condenser to socket to be longer than one inch. Use a 200 tube as detector and watch the plate voltage carefully. Reduce the aperiodic primary even to two turns.

• • •

I HAVE a crystal set consisting merely of a tuning coil and crystal detector. I am unable to get Schenectady. Can you suggest anything that will allow me to cover the 40 miles using this equipment?—Fred V. Van Dyke, Valatie, N. Y.

It is a question whether, in your location, you can cover this distance with any degree of regularity. Try the selective crystal described in the December 6 issue of RADIO WORLD.

• • •

IS IT WELL to add one stage of radio-frequency amplification to a 3-circuit tuner?—A. E. Hinman, 227 Valley Ave., N. W., Grand Rapids, Mich.

Yes.

• • •

CAN you tell me how to find the frequencies and cycles of any receiving set?—Michael Novach, E. Millsboro, Pa.

Frequency and cycles are synonymous. If you desire to calibrate a set, it is necessary to use a wavemeter. See Brainard Foote's article on set calibration in the issue of Aug. 30 RADIO WORLD.

• • •

CAN I use a Hilco variometer in the $20 DX set in the issue of Nov. 1? (2) How many turns of wire on the coupler form? (3) Would a type 12 tube work well in this set?—H. C. Hagerty, 217 W. 9th St., Michigan City, Ind.

Yes. (2) Primary 10 turns, secondary 45 turns, No. 20 DCC wire. (3) Yes.

• • •

WHEN my hand goes near the binding posts there is a lot of rumbling and whistling. Can I eliminate this in any way?—A. Candy, 498 Lansdowne Ave., Toronto, Can.

Take the leads from the set through the rear of the cabinet or back of the set.

• • •

IN SERIES with the aerial is it better to use a 23 or 43-plate variable condenser?—J. Kuest, 5367 Easton Ave., St. Louis, Mo.

43 plates (.001 mfd.)

• • •

I DESIRE to build a set using 3 honeycomb coils. Can you give me data?—G. K. Derone, 233 N. 11th St., Sunbury, Pa.

A good set on this order is described by Herman Bernard in this issue.

• • •

I CONSTRUCTED Neal Fitzalan's set in the issue of Nov. 1, but cannot get distant reception. Can you suggest a remedy?—W. W. Massey, 1743 F. St., Washington, D. C.

Your set is not oscillating. Try (1) switching the leads on the tickler coil, (2) using the rotor of the split variometer in the plate, (3) removing the variable condenser from across the fixed plate coil and connecting one side to the beginning of the plate coil, the other side to the beginning of the grid coil.

• • •

FROM the viewpoint only of DX, which of the following would you suggest: Two stages of tuned and neutralized RF, 3 stages of stabilized transformer-coupled RF with loop, the same with aerial outdoors and couplde to it inductively?—Jesse J. Hippe, 2537 Bedford Ave., Brooklyn, N. Y.

The Neutrodyne, with a 100-foot outdoor aerial.

• • •

I CANNOT get below 316 meters on my Solodial circuit as published in RADIO WORLD in the issue of Aug. 30. How can I get lower wavelengths?—Joseph Semrad, 173 Magner St., Brooklyn, N. Y.

Remove turns, two at a time, from the coil, until the low-wave stations you desire come in.

• • •

I HAVE a 1-tube super-regenerative set. Is the tube used supposed to be of the dry-cell type? (2) Will I get much volume out of a loop? (3) How about distance? (4) What do you think of the set? (5) Will a 201A be better than the dry-cell tube?—Michael Mucha, Jr., 205 Cambridge Ave., Garfield, N. J.

The dry-cell tube may be used. (2) Fair. (3) Not much good for distance. (4) Too hard to control oscillations. (5) Yes.

• • •

I HAVE built Bernard's "3-Circuit Tuner That Can Be Logged," as described in the issue of Nov. 8, and find tuning broad.—O. E. Noetling, 10 Irvington Pl., Brooklyn, N. Y.

The two spider-web coils must be a good distance apart—even as much as 8 inches, and the coils at right angles to each other. Reduce turns on the primary of the first coil (at left in wiring diagram). Broad tuning will not be present in this circuit if the coils are properly placed and regeneration is obtained. Perhaps your tube does not oscillate freely. See article on tuned plate in the December 6 issue.

• • •

I AM located within a mile of WEEI and WNAC at Boston. I have a crystal set that is very clear and loud but I can't cut one or the other completely out. Is there any circuit that you know of that will do this?—J. H. Hayes, 214 Huntington Ave., Boston, 17, Mass.

With a crystal set you will find much difficulty in eliminating the undesirable station. We know of no standard crystal circuit that will give you enough selectivity when so close to the broadcasting stations, but the one published in the December 6 issue is as selective as one can expect.

• • •

IN REFERENCE to the 2-tube receiver by Byrt C. Caldwell in the issue of Nov. 15: What DX results might be reasonably expected from this circuit? (2) Will it work satisfactorily using 199 tubes? (3) What ratio AF transformers is best? (4) In mounting the RF transformers, is it well to mount them at the Neutrodyne angle? (5) How does it compare with the Reinartz?—H. L. Hughey, Box 989, Fort Worth, Tex.

(1) Under average conditions and a good aerial and ground, 500 miles average nightly range. (2) Yes. (3). First stage 6 to 1; second stage 3½ to 1. (4) Yes, although it is not vital. (5) Reinartz gets more DX and you seem to be most interested in that.

• • •

IN the Bernard hook-up in the issue of November 22, the diagram gives wiring of the rheostat in the A plus lead and wiring directions give it in the A minus. Which is correct?—William R. Miller.

The rheostat may be in either lead with no difference in results.

• • •

I HEARD someone speaking in Spanish through a station around 400 meters. What station was it?—Edwin L. King, Box 634, Patchogue, N. Y.

We can not undertake to identify stations in the way you suggest, for it involves constantly listening to all stations.

• • •

IN REFERENCE to the reflexed Magnadyne in the issue of Sept. 13: I get a continuous humming sound. Is this characteristic of this set? (2) On local stations I get fairly good volume, but there doesn't seem to be any action on the first condenser in that I can rotate it completely around without noticing any difference. (3) With the ground removed, volume is wonderful and tone quality good. Can you explain it?—

(1) No. (2) (3) All indications point to an open lead in the secondary circuit. Look to your grid condenser for shorts. Look over windings for continuity.

• • •

IN reference to Bernard's 1-tube set in the issue of Nov. 22: Will it receive distances as great as 500 miles? Would a two-stage amplifier increase distance?—S. Davis, St. Paul, Minn.

Yes. A 2-stage audio-frequency amplifier will add to the practical distance of the set.

• • •

I INTEND building a Neutrodyne. Can you give me any pointers?—Irving Pettit, Caldonia, Ont.

We expect soon to publish the best Neutrodyne hookup.

MR. DX HOUND

A Character Created by RADIO WORLD *Artist*

By HAL SINCLAIR

The Radio Trade

Manufacturers Favor Frequency Over Wavelength

RADIO problems affecting the public as well as radio manufacturers and distributors formed the basis of the discussions at the semi-annual meeting of the Radio Section of the Associated Manufacturers of Electrical Supplies in New York City. The general use of frequency rather than wavelength to describe the assignments of broadcasting stations was urged by the Transmitting and Receiving Set Committee. Where tuning dial markings involved frequency or wavelength values, the Committee held, frequency markings only should be used. Other recommendations by this Committee were:

That the controls on receiving sets shall be so arranged that clockwise rotation of rheostat controls shall give increase of voltage on tubes or increase of volume on volume control.

That scale markings for filament control be divided 0 to 10, with the word OFF shown separately.

That the standard for tuning controls shall be that dial markings shall increase with clockwise rotation and that in the case of vernier controls the actuating knob shall turn in the same direction as the index.

Steps to be taken towards the elimination of fraudulent or misleading advertising of radio apparatus and supplies were discussed.

As a result of the informative campaign conducted by the Radio Section of the A. M. E. S. and the splendid educational work by the many newspapers and other publications in familiarizing the general public with technical, as well as industrial, developments both in the radio industry and in the broadcasting art, radio had become an all-year-round industry, it was generally conceded at the meeting.

The Transportation Committee of the Radio Section made a series of recommendations covering standardized terminology and classifications for radio products at present unclassified for rail transportation.

Business Opportunities Radio and Electrical

Rates: 50c a line; Minimum, $1.00

EXPORT correspondent and executive with experience of foreign markets, South America and Europe, speaking French, Spanish, German, besides English. Good knowledge radio parts. Seeks position. Leo Sichel, 6 Cliff Street, New York.

MR. INVENTOR
Have you anything new in the Radio line? We will market it for you. Get in touch with us at once, furnishing full particulars. Radio World, Box No. 16.

WANTED
Thoroughly experienced Radio Engineer. Give experience and references. Radio World, Box No. 17.

CAPITAL SUPPLIED to going concerns that have a good record; we buy and sell all securities that can stand strict investigation. A. D. Braham & Co., 2 Broadway, N. Y. C.

LARGE MANUFACTURER of an advertised automobile and radio product, rapidly expanding into national distribution, offers distributing franchise for this territory to a man of ability and financially responsible, who desires a profitable connection with a reliable firm selling a staple product in daily use all over the world. Address Factory, X-Coil Corporation, 212 Central Ave., Newark, N. J.

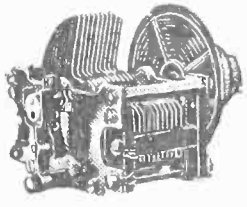
AM ANXIOUS to find meritorious manufacturing business; one that can be moved or started in manufacturing plant, located in Auburn, N. Y.; will invest capital. Correspond with P. O. Box 87, Auburn, N. Y.

RADIO BUSINESS FOR SALE; good location 732 Lexington Ave., near corner 59th St., N. Y. C.

WELL-EQUIPPED machine shop located in the suburbs, desires the manufacturing of small specialties or machines. First-class work at lowest prices. Mohan & Co., Inc., Woolworth Bldg., N. Y. C. Whitehall 1189.

U. S. L. HAS NEW LINE OF LOW-LOSS CONDENSERS

TO meet the demand for a finer product, David Wald, president of the United Scientific Lab., Inc., 92 East 10th Street, New York City, producers of the famous U. S. L. line of radio apparatus, has again set to work and designed a line of low-loss condensers, splendid in mechanical refinement and construction. The years of exerience designing and building electrical motors, apparatus and radio parts, has fitted Mr. Wald to design apparatus with the utmost precision and skill. The new low-loss condenser is the result of manufacturing experience and has unique and sound principles of construction, as may be found in the highest grade apparatus.



Rigid frame construction without depending upon insulation for support, thereof, thereby eliminating all possible chances of misalignment, is one of the features of the new condenser. Straight line capacity is obtained by scientific construction of rotor and stator plates, which are made of a special grade of brass. Pigtail connection on rotor insures absolute electrical contact with rotor. Hard rubber dielectric outside of the electro-static field thereby insure maximum efficiency and low-loss. Stator plates automatically held in retaining posts under a new process eliminating all possibilities of loosening and reducing electrical resistance to a minimum. Adjustable bearing with special take up arrangement for wear and end thrust which can be readily adjusted by the average layman.

Mr. Wald has been featuring distribution to the jobbers only and recognizing territorial rights. His aggressive methods of merchandising have won the good will of the trade with the result that as the manufacturer of a new condenser by an old firm keeps the U. S. L. busy supplying the demand.

Literature Wanted

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

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

Alfred M. Ollis, Springfield, Mo.
H. C. Haggerty, Michigan City, Ind.
Nicholas Holland, 115 Greenpoint Ave., Brooklyn, N. Y.
Warren Guise, 10148 Ewing Ave., Chicago, Ill. (dealer).
Henrietta Battery Co., Henrietta, Tex. (dealer).
Albert Diesk, Harlan, Ky.
Welne Wade, Wadesville, Ind.
Dick Manning, 874 Oventoxo St., Portland, Ore.
W. J. Coon, Lone Free, Iowa.
Wm. J. Seller, Box 37, R 1, New Rockford, N. D.
J. Hollingsworth, Leavenworth, Kan.
A. S. Cooper, Glen Lyon, Pa.
Hary Clare, 2318 I St., Granite City, Ill.
B. C. Elder, Box 257, San Francisco, Cal.
Loyal B. Snodgrass, 333 Grant Ave., San Francisco, Cal.
Roy Whitehurst, 1829 Stephen Ave., Brooklyn, N. Y. (dealer).
M. H. Kelleher, 546 Snell St., Fall River, Mass.
John Johnson, 3748 94th St., Elmhurst, L. I., N. Y.
Anthime Lippe, Gamelin Co., Lavel, Que., Can.
Alfred Donovan, Mt. Morris, N. Y.
F. J. Ensel, 2000 32nd Ave., S., Seattle, Wash.
H. H. Krugg, 416 N. Jackson Ave., Joplin, Mo.
Clyde H. Johnson, Willsboro, N. Y.
M. J. Marston, Box 374, Presque Isle, Me.
Fred Gold, 169 S. 3rd St., E., Salt Lake City, Utah.
Robt. H. Ames, Fairmont, W. Va.
C. Fairweather, 228 E. 120th St., New York City.
H. K. Fuslin, 13501 Chapelside Ave., Cleveland, Ohio.
Chas. Robbins, 13505 Chapelside Ave., Cleveland, Ohio.

JOIN THE A. B. C.

A. B. C. stands for the American Broadcast Club. Join it today. It involves no dues or payment of any kind, and no obligations. It was founded by RADIO WORLD simply to unite the broadcast listeners and radio fans in general in a common bond to promote their welfare as occasion requires. Send your name and address to A. B. C. Editor, RADIO WORLD, 1493 Broadway, New York City.

H. C. Haggerty, 217 W. 9th St., Michigan City, Ind.
Max C. Stumpff, Box 448, Louann, Ark.
Raymond W. Goodspeed, 1141 Commonwealth Ave., Allston, Mass.
Chas. N. Musser, The Radio Shop, Shepardstown, W. Va.
Nicholas Holland, 115 Greenpoint Ave., Brooklyn, N. Y.

A THOUGHT FOR THE WEEK

WHAT must have been in Marconi's mind during the 3,000-mile International Broadcasting Tests of late November as he thought of the time when he was delirious with joy over sending wireless messages a distance of 1,000 feet!

RADIO WORLD

Title Reg. U. S. Pat. Off.

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EDITOR, Roland Burke Hennessy
MANAGING EDITOR, Herman Bernard
TECHNICAL EDITOR, Abner J. Gelula

SUBSCRIPTION RATES

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

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

ADVERTISING RATES

RATES—Page, 7¼x11", $200.00; half page, 3¼ D. C. or 5⅛"x8 col., $100.00; quarter page, 4⅛" D. C., $50.00; one col. 2¼x11", $66.66. $7.00 per inch. Per agate line, 50c. Times Discounts: 52 Consecutive Issues, 20%; 26 Times Consecutively, or E. O. W. One Year, 15%; 4 Consecutive Issues, 10%.

CLASSIFIED ADVERTISEMENTS

Ten cents per word. Minimum, 10 words. Cash with order.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

DECEMBER 13, 1924

The Pointed Program

11 P. M.—It's great to hear foreign stations, if the locals will let you try. 11:08—On our set we can hear the pipers in Aberdeen whenever we want to, but when we seek verification we find that Aberdeen wasn't on the air but that the tubes fried noises beautifully. 11:20—Nobody would have tried very hard in America to hear England if it was proven that Chief Engineer Eckersley of the British Broadcasting Company really said that America has nothing to teach England about radio. 11:27—The international tests proved that it can't be done yet without much imagination, else easy satisfaction with any old kind of cross-ocean reception. 11:35—Nothing gets a man's goat so much as when a 1-tube fiend who owes him money tells of having heard 2LO, when the peeved 8-tube guy couldn't even get static from abroad. 11:47—This business of importing radio programs may give the short session of Congress something new to tinker with on the tariff question. 11:55—Some of these programs that started on their course from Great Britain as opera and arrived here as static should be excluded as undesirable aliens. They didn't pass the literacy test, anyway. We couldn't understand the announcer. If that was discernible English we'll take vanilla. 12—Ten dollars reward and a year's subscription to RADIO WORLD, to make it worth while, for the arrest and conviction of the amateur who said: "This is 2LO signing off," and then laughed when we thought we's like to believe it.

A Bad Point of View Spoils Anything

Tex Rickard's Mistake in Banning Broadcasts of His Fights

TEX RICKARD, a genius in the fight-promoting line and one of the few men who can stage a fight of world-wide importance and do it in a way that pleases the multitudes who attend the battle, has made a tactical blunder. He has decided that fights he stages are not to be broadcast. Mr. Rickard thus proves that he is no sort of a diplomat whatever. The idea seems to have become rooted in his head that attendance at such fights is reduced because fight fans are content to hear the description over the radio. Mr. Rickard's own box-office records probably would not be his best witness if this question came to a show-down.

If the source is not too closely scrutinized, perhaps the radio fraternity may take it as a compliment that Mr. Rickard thinks broadcast descriptions of anything are so fully satisfying that personal attendance at the event is a needless exertion.

For those who delight in fight descriptions over the radio it is to be regretted that such an important figure in the fighting game as the illustrious Mr. Rickard should deny them the opportunity of hearing over the radio what's going on at the fights Mr. Rickard puts on. Those who are opposed to prize fighting will hail with delight his decision to keep off the air his contributions to the promulgation of fistcuffs.

But, solely from the viewpoint of the publicity value of broadcasting a fight, Mr. Rickard really should be thankful that such a medium as radio exists whereby he might further the ends to which he is devoting his life. It is indeed strange to encounter such shrinking modesty in Mr. Rickard's chosen profession, for usually fight promoters are real "artists" when anything like publicity is suggested.

The over-generosity of fight promoters to some sporting editors has long bordered on private philanthropy. Fight promoters are among the most eager space-grabbers with whose adroit tactics newspaper owners have to contend. Any time a fight promoter puts a paid ad. in a newspaper is an occasion for heated celebration, and if the ad. exceeds five agate lines it is time to call out the fire department. The owners of baseball clubs also are a source of annoyance to newspaper owners, since what money these owners pay out somehow doesn't find its way into the coffers of the business office. But the baseball magnates are wiser than Mr. Rickard, in that they welcome broadcasting of games, and attendance is increasing all the time.

An example of what broadcast publicity does may be found in the experience of Vincent Lopez. Through WEAF, New York City, every Thursday and Saturday night, Lopez and his jazz orchestra broadcast from the Pennsylvania Hotel. Lopez made a test. On a recent Sunday afternoon he and his fellow contributors to the elevation of musical intelligence gave a concert at the Metropolitan Opera House. All the ads. in the newspapers and elsewhere read: "This concert will NOT be broadcast." The challenge was plain enough. The Metropolitan Opera House was not big enough to seat all the persons who crowded to this concert. The following Friday night (the usual Thursday program having been upset by the international tests) Lopez, at the microphone, took special pains to thank the radio audience for the large attendance at the Metropolitan, and attributed to them the success of that concert.

Maybe Mr. Rickard will live and learn. At least we hope he will live.

The Duolateral Set

(*Continued from page 9*)

end of the winding is on top. The end of L1 goes to the ground, which also connects with A—. This same lead connects with the rotor plates of C1. The rotor plates are the movable ones. See what binding post on the condenser makes this contact. The rotor plates are marked R in Fig. 1. The object of connecting them with the ground is to reduce or eliminate the possibility of body capacity. The stator or fixed plates are marked S.

3. The beginning of L2 connects to the plate of the RF tube and the end goes to the amplifier B+. No definite voltage is given, because your own tests will answer that question best for you. Try voltages from 45 to 90 and, after a week or ten days, you will know which voltage operates best. Some doubt may arise as to what is the beginning of this coil, L2, the home-made primary. Look at the secondary of this coil, the duolateral from which twelve turns had been removed. See in what direction the beginning of the secondary, L3, points. The terminal of L2 that points in the same direction is the beginning of L2. It does not make any difference if the beginning of L2 is on the opposite side to the beginning of L3.

4. Connect the beginning of L3, the lead emerging from under the winding, to one side of the grid condenser C4 and also to the stator of C2. The other side of the grid condenser goes to the G post of socket No. 2. Across the grid condenser put the leak R4. The end of L3 goes to A+. This connection is the grid return, because it is made to the opposite end of a coil whose beginning goes to the grid. Note that the grid return in the first tube is to the A—, which is correct in all amplifier circuits, radio or audio. But in the detector circuit the rule is to connect the grid return to the A+, except if the 200 or 300 tube is used.

5. Connect the plate of the detector tube to the beginning of L4 and to the stator of C3, the third variable condenser. The end of L4 goes to the remaining unconnected side of this condenser and to one side, either outside leaf, of the jack J1. The other outside leaf goes to B+ 22½ volts, but other voltages, all under 45, may be tried. Sometimes less than 22½ gives better results. Across these two leads, plate and B+ detector is placed the by-pass condenser C5, and it may be soldered right to the jack with bus bar. The connections for C5, which may be omitted in most cases without any sacrifice, as given here slightly contradict the diagram (Fig. 1), and these directions, not the diagram, preferably should be followed to that extent. The inside spring whose tip makes contact with the outside spring or frame that went to the plate is connected to the P post of the first audio-frequency transformer. Follow this lead with your eye, so that the plate of the tube is connected through L4 to the jack and to the P post of the AFT, when there is no plug in the jack. Thus you will have remaining only one unconnected spring on J1, and that goes to the B+ post of the first AFT. The G post of this AFT goes to the grid of the third tube and the F post goes to the C—. The plate of the third tube is connected to the P post of the second and last AFT, whose B post, instead of going to B+ 22½ volts, or detector B+ voltage, goes to the amplifier B+ voltage, from 45 to 90 volts, to be determined by tests. The G of the second AFT goes to the grid of the last tube and the F of the second AFT to the C—. Connect C+ to the A— on the battery. The only remaining connections, save one, are to join the plate of the last tube to one side of the single-circuit jack, J2, and the other side of the jack to B+ amplifier.

The final connection should not be made until a preliminary safety test has been given. Place a tube in the first socket, extreme left. Turn on the rheostat R1. If the tube lights, take it out of that socket and place it in the next one. If it does not light, then check up your wiring and find out why. Continue this, using the same tube, until you find that the rheostat (or switch, where such is used in the audio stages) causes the tube to light. Remember, that the 12 type tube lights very faintly, so do not expect a glare. Now that all the tubes light it is safe to connect the A+ and B—.

Tuning

To tune in a station, first use the earphones. The phone tips are fastened to a jack plug and the plug is inserted in J1. The tubes are turned on. Set C3 at about 50. Turn dials Nos. 1 and 2, counting from left, approximately in step until a signal is heard. If none is heard, tune them together, but out of step, a few degrees apart, starting, say, with C1 at zero and C2 at 5, and keep this difference constant. If no station is heard, vary the difference. Finally, if no signal is heard, slowly rotate the dial of C2, while more quickly turning C1 from 0 to 100. When a signal is heard bring up the volume by adjusting the dial of C3. Now that you have the station tuned in, try to bring it in perfectly, and when you succeed, write down the dial settings, for this circuit can be logged. The same stations always come in at the same dial settings, although the readings may not be in step, that is, 60, 60, 60, etc., all through the scale. Now remove the plug from the detector jack and insert a plug in the audio jack, J2, which plug is connected to loudspeaker terminals. If the audio stages do not function, check up the wiring, and finally, if no audio amplification is obtained, test the AFT for defects. This is a precaution best taken, however, before the set is assembled. One tip of a pair of phones is connected to the plus post of a 1½-volt battery, the other battery pole, that is, minus, being connected to one side of terminal of the primary of the AFT (P or B). The remaining phone tip goes to the other primary post. A click should be heard, a rather distinct one, when the contact is made, for the primary winding has lower impedance than the secondary. If no click is heard, providing your test battery is in condition and your phones likewise, the primary winding of the AFT is broken. In making a similar test of the secondary, expect a faint click. Another advantage of such a test is that, if no identifying marks appear on the AFT, the slight click denotes the secondary, the more distinct one the primary. However, most transformers nowadays are marked. P1 and P2 correspond to P and B, respectively, and constitute the primary. S1 and S2 are the secondary, these connections on most transformers being marked G and F. Hence, P1 = P, P2 = B, S1 = G and S2 = F. Rarely F may be marked A—.

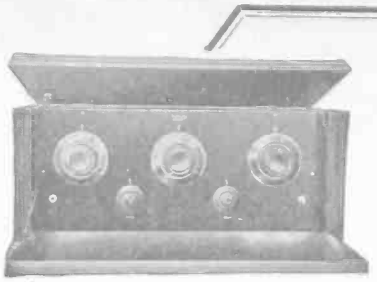
For Greater Selectivity

If greater selectivity is found necessary, which will be rarely, transformer-coupled RF amplification should be used. In that case make a coil just like the L2L3 combination, with home-made primary. Calling the new primary L, the aerial and ground connect to the terminals of that coil. The ground also goes to the end of L1 (now the secondary), hence L_0 and L1 are conductively connected. All the other wiring remains as described.

Remedies

If the set does not tune low enough, remove turns from windings, one at a time. At about 5 to 10, 200 meters should come in, with 545 meters around 90 and 492 meters around 67. Thus, even if there is a slight difference in dial readings for a

(*Concluded on page 30*)



GLUCKSON

BROADCAST RECEIVER

The latest and most remarkable 5-tube tuned radio-frequency receiver on the market to-day. A guaranteed set in every sense.

In justice to your purse come in and hear it. You will not be pressed to buy. We want to prove to you that the *Gluckson* is much superior to any well known receiver selling at the same price or more.

The *Gluckson* is set off in an artistically designed, closed desk type cabinet. Non-oscillating—absolutely stabilized. A revelation! Its tone quality, selectivity, volume and range!

List $98

At any Reliable Dealer or

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115-117 WEST 23RD STREET NEW YORK CITY

Radio Dealers and Distributors. Territories Still Open. Get in Touch with Us.

Have You Heard THE RADIO SHACK

New Shacton Low Loss 3 Circuit Receiver?

Send for our Catalog

The Supreme Achievement *with* VISIDIALS

A SLIGHT turn of the Visidial, then—music, lectures and entertainment of all sorts from all parts of the country. These long, cold winter evenings hold many a surprise for the owners of the new *"SHACTON."*

For design, construction, performance and ease of operation the SHACTON is the most remarkable achievement in present day radio. The most important feature and without a doubt the cause of SHACTON'S success lies in the fact that Low Loss instruments of the highest grade are used throughout the entire circuit. Equipped with VISIDIALS—dials behind the panel, enabling fine, sharp tuning without vernier. The Visidial adds to the appearance and improves the performance to a surprising extent. Something new, something better.

PRICE $29.39

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1 7x18 Drilled Radion Mahoganite Panel, Engraved in Gold.
1 Brunswick Low Loss 3-Circuit Tuning Coil.
1 Genuine Brunswick Low Loss Condenser.
1 Brunswick Triploid Mounting Socket and Binding Post Strip.
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1 Freshman Mica Grid Condenser.
1 Standard Glass-Enclosed Grid Leak.
2 30-Ohm Shacton Bakelite Rheostats with Gold-Plated Indicators.
2 Molded Mahogany Dials grained to match panel.
5 Lengths Professional Bus-Bar.
1 Special Blue Print for this circuit. Not an ordinary hook-up but a clear picture form that a child can understand and make.
2 Premier Hedgehog Transformers.

ALL ASSEMBLED READY TO WIRE

THE RADIO SHACK

55 Vesey Street New York City

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Everything needed to operate after building is listed here—

3 Type 201A Tested Tubes	$10.35
1 60-Ampere Hour Storage Battery	11.25
2-45-Volt Extra Large Enco "B" Batteries	6.50
1 Pr. 3000-Ohm Head Phones and Cord	3.75
1 Antenna Equipment	1.50
1 Phone Plug, Double	.70
COMPLETE OUTFIT	$34.05

Parts also sold separately

CABINET FREE

Order Set and Accessory Outfit both together, and we will send Fine Mahogany Finish Cabinet FREE!

MAIL COUPON TODAY

THE RADIO SHACK, Dept. L-156
55 Vesey St., New York, N. Y.

Please send me the "Shacton" outfit I have marked. When it arrives I will pay the postman the amount. If I am not satisfied I will return it in 5 days, and you agree to refund my money instantly. Mark choice in square.

(A) Complete Building Kit...$29.39 ☐
(B) Operating Outfit.....$34.05 ☐

Name.....

Address.....

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

LOW LOSS INDUCTANCE FORMS—Linen Impregnated Bakelite. 50c each. The Kehler Radio Laboratories, Abilene, Kansas.

WIRELESS IN THE HOME. By DeForest. Sent postpaid on receipt of 15c. The Columbia Print, 1493 Broadway, N. Y. C.

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—CABINETS—

Easy to Build your Set with NATIONAL Cabinets. Latest styles in knocked-down type and Leatherette covered. Write for prices and descriptive matter.

NATIONAL CABINET CO., 6 Cintl. St., Dayton, Ohio

NEW AMPLITRON TUBES $2.50

Our special introductory price
All tubes repaired (Detectors or Amplifiers) Guaranteed like new
Buy direct from manufacturers

American Radio Tube Works
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Agents, Please Write

RADIO BARGAINS

Radio Set Complete, with R. C. A. Tube Batteries and Antenna Equipment, ready to tune in.....$19.85
Journal Low-Loss Coils, set..... 3.95
Engraved Binding Posts, Complete set..... 1.00
Guaranteed Crystals ..... .89
Famous Chapin Transformers, 5-1 or 8-1... 3.85

Mail orders filled promptly C.O.D. Parcel Post
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Dept. 4 442 Dilston Ave., Newark, N. J.

RADIO Buyer's GUIDE FREE

For Consumers
Get it now—before you buy any set or parts to build one. 100 Pages Just send your name. *Bargains in all kinds of complete Sets, Parts and Accessories* (Will you be so kind as to add the name of one or more friends you believe will soon want radio goods? Thank you!)

Liberty M. O. House, Dept. X-681 106 Liberty St., N.Y.

RE-NU Radio "B" Batteries

RE-FILL-A-BLE ALWAYS FULL VOLTAGE

Use any brand standard flashlight cells. No springs—No loose connections. Can replace one or more cells without soldering. Cost less to maintain. Order direct—Mail orders our specialty. Money-back guarantee. Free descriptive literature upon request. Price complete with cells: 22.5 Volt—$2.75. 45 Volt—$4.50, postpaid in U. S. A.

Ten cents (10c) additional when sent C.O.D.

STEINER BATTERY CO., Lancaster, Ohio

Campbell

RADIO CABINETS

"From the Lumber to You"

PRICES—Cash with order, prepaid east of Missouri River; west, add 15 cents to quoted price. Send Post Office or Express Money Order.

Panel Sizes	Imitation Walnut or Mahogany	Genuine Walnut or Mahogany
7x10x 7	$3.00	$4.75
7x14x 7	3.30	5.50
7x18x 7	3.82	6.75
7x24x 7	5.25	9.00
7x26x 7	6.05	10.00
7x28x 8	7.25	11.50
7x27x 9	7.25	12.50
7x40x10	11.25	18.00

Special Sizes to Order

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SIMPLE 1-TUBE SET

(*Continued from page 6*)

arms having to be cut away from the central hub. Besides, the basket-weave coil that will result from the present procedure has a higher inductive value for a given amount of winding than the spider-web, has less distributed capacity, affords sharper tuning and is in every way more efficient than a spider-web coil, including the factor of facility of mounting. The whole trend in coil making is away from the spider-web and toward the basket-weave coil, although the spider-web with form removed was a great improvement over the old-style coils wound on a heavy insulation tubing that sapped precious radio impulses.

Now, using No. 20 double cotton covered wire, measure off 5" for later connection, and at this point start winding in and out of every second rod until a total of 36 turns of wire have been put in. Do not wind this coil in and out of alternate rods, but, taking the starting post as an example, skip two rods and pass the wire to the inside of the third rod from the beginning. Now skip two more and pass the wire to the outside of the fifth rod, and so on until the whole 36 turns have been put on, when 5" excess is left for later connections and the wire cut.

Now, get some twine and cut it into fifteen 6" lengths. Move the coil gently until the bottom of the coil (really the beginning, for it was there you started to wind it) is about 1" from the base. Take pains with this operation, lest you destroy the symmetry of the coil. However, if you do not do this part of the work hurriedly you will have no trouble whatever. The object of lifting the coil is to enable you to pass the tie-string with great facility and comfort. There are several ways of using this tie-string. The best way is to pass one of the 6" lengths between inside and outside winding, at a given point, using a needle through which the tie-string is threaded. Simply drop the needle between the inside and the outside layers of the winding at a given place and pull the needle through the 1" free space at bottom. Now pass the needle up through the corresponding aperture, or space between windings, in the adjacent aperture. This time the needle is passed upward and this is more difficult than dropping it down, for the same reason that it is easier to skate downhill than uphill. Then the needle is brought to the top and is freed from the thread. The two ends of the thread are pulled until the coil is secured at this point without altering the spacings between successive windings. That is, don't pull so hard that you squeeze the coil together. Just apply enough pressure to get the tie-string

(*Continued on next page*)

O'Rourke's Low-Loss Coil

(Continued from preceding page)

taut. Then knot the string. Your tie-string will be binding the coil where two V-shaped criss-crossed points of the windings meet and the thread, you will notice, runs down, but at right angles too, one V and comes up at right angles to the next V. The up and down strokes of the tie-string will be ¼" apart or less. Do not mistake the manner of tieing the coil. The tie-string is not placed mid-way between two of the V points and then brought around the winding, but, so to speak, ties two succeeding Vs together. In actually making the coil anybody will see at a glance what these directions mean. The process of binding the coil is continued until the operation is completed at each of the fifteen intersecting points. Each intersection has its own tie-string. The result should be a low-loss coil that is self-supporting and one of the finest made.

Condenser

Having gone to such pains to safeguard against avoidable losses, it would be a pity not to get a good low-loss condenser. One with vernier, that is, a device for extra-fine adjustment, is not necessary, for this circuit is not critical in its tuning. But get a variable condenser such as General Radio, Cardwell, Bruno, D. X. L., Flewelling, Bremer-Tully, Malone-Lemmon, Acme, General Instrument, or the like. The condenser should have a maximum capacity of .001 microfarad, normally 43 plates, because .0005 mfd., normally 23 plates, has not sufficient range to cover the new broadcast band in conjunction with a fixed coil, and there are few condensers between 23 and 43 plates. This band will go into effect soon after January 1 next. Instead of a 43-plate conde .001

(Continued on next page)

Completing the Set

(*Continued from preceding page*)

mfd. condenser ,a .00075 may be used. The only such that I know of is the Bruno, which is a series of four 11-plate condensers in one. By connecting the binding posts with wire two, three or four of the series may be used, three giving .00075 mfd. In that case, your coil should have 42 turns, instead of 36.

Wiring Directions

1. Connect the minus post of the 1½-volt dry cell, which is the A "battery," to one terminal of the rheostat, the other rheostat terminal going to the F— post of the tube socket. The minus on the cell is on the circumference. The A+ is connected direct to the F+ post on the socket. A+ is synonymous with F+ and A— synonymous with F—, but on tube socket the F designations are used to denote filament connections, while for a dry cell or battery the A designations are used. The A+ on the dry cell is in the center.

2. Now connect the aerial to one terminal of the coil you just made. Either terminal may be selected. Call this the beginning. This lead also goes to the fixed or stator plates of the variable condenser C1 and to one side of the grid condenser. The other side of the grid condenser is connected to the G post of the socket. Put a grid leak across the grid condenser. The end of the coil L1 goes to the ground (a cold water pipe) and to the movable or rotary plates of C1, which lead is continued directly to the plate of the tube, that is, the P post on the socket. One of the phone tips also goes to this same point, the plate. If a jack is used, as shown in Fig. 1, the plate lead is connected to the spring of the jack, while the frame or right-angle of the jack goes to B+ 22½ volts. If no jack is used, the second phone tip goes to the 22½-volt post of the B battery.

Turn on the rheostat. If the tube lights, go ahead. If it does not, check up your wiring. Re-read these directions. Study the circuit diagram. Finally when you get the tube to light, connect the B— with the A+, from battery post to battery

(*Concluded on page 27*)

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O'ROURKE'S SET

(Concluded from page 25)

post. Do NOT connect the B+ with the A+!

Now you are ready to listen in. Pick out some local station that is on the air. If it is a station on a high wave, such as 492 or 526 meters, the station should be tuned toward the end of the condenser dial, 492 at about 76 and 546 at about 90. The tuning is very simple and anybody in the family can operate the set, but should not forget to turn on the rheostat when about to tune in and to turn it off after he or she is finished with the listening-in.

LIST OF PARTS

¼" lb. No. 20 double cotton covered wire.
One wooden block, 4x4", 1" thick.
One .001 mfd. low-loss variable condenser (normally 43 plates). Vernier not necessary. (C1).
One 4" dial.
One fixed grid condenser, .00025 mfd. (C2).
One variable grid leak, range at least ½ to 5 megohms.
One 7x7" hard rubber panel.
One cabinet to match.
One 6x7" baseboard.
One 12 type tube.
One socket to match.
One 6-ohm rheostat.
One pair of earphones.
One single-circuit jack.
One jack plug.
One 1½-volt dry cell.
One 22½-volt B battery.
100 ft. 7-strand bare aerial wire, 50 ft. No. 14 insulated leadin wire, half dozen Fahnestock clips for connections, 6 ft. flexible connecting wire (No. 20 DCC may be used for this); one ground clamp.

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BERNARD'S SET

(Concluded from page 21)

given station, turns may be removed (to increase dial number) so that the settings are in step. It will not be found that any turns will have to be added.

LIST OF PARTS

Two 50-turn duolateral coils (L1, L4).
One 75-turn duolateral coil (L3).
Three variable condensers, low-loss, .001 mfd. capacity. Vernier not vital (C1, C2, C3).
Three 4" dials.
Four tubes.
Four low-loss sockets to match tubes.
Three rheostats to match tubes (R1, R2, R3). If possible, audio (R3) rheostat should have half the resistance of the other two.
One A battery (four 1½-volt dry cells for type 12 tubes).
Two 45-volt B batteries.
One C battery.
One single-circuit jack (J2).
One double-circuit jack (J1).
Two jack plugs, or one multiple plug.
Two audio-frequency transformers (5-to-1).
One .001 mfd. mica fixed condenser (optional).
One grid condenser (C4).
One variable grid leak (R4).
One panel, hard rubber, 7x22".
One cabinet to match.
One baseboard, 7x21".
Four strips of hard rubber, 1x4".
Four brass angles (1" to 2" arms).
One loudspeaker.
One pair earphones.
100 ft. 7-strand aerial wire, two aerial insulators, 50 ft. No. 14 insulated lead-in wire, connecting wire, strip of adhesive tape, ground clamp, one lighting arrestor, screws, nuts, hardware.

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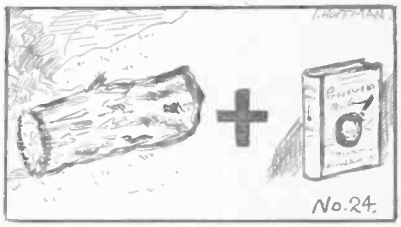

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